Abstract Submitted
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Living liquid crystals[1] SHUANG ZHOU, Liquid crystal institute, Kent State University, Kent, Ohio, USA, 44242, ANDREY SOKOLOV, Material Science Division, Argonne National Laboratory, Illinois, 60439, USA, OLEG LAVRENTOVICH, Liquid crystal institute, Kent State University, Kent, Ohio, USA, 44242, IGOR ARONSON, Material Science Division, Argonne National Laboratory, Illinois, 60439, USA — Bio-mechanical hybrids are an emerging class of engineered composite soft materials. By transducing energy stored in the environment to drive systematic movements, they can move and reconfigure their structure and properties in response to external stimuli. This functionality is critical for a variety of applications, from bioinspired micromachines and sensors to self-assembled microrobots. Here, by combining two seemingly incompatible concepts, living swimming bacteria and inanimate but orientationally ordered lyotropic liquid crystal, we conceive a fundamentally new class of matter - living liquid crystals (LLCs). The coupling between the activity-triggered flows and director reorientations results in a wealth of phenomena, including: (a) a characteristic length 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.

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