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Computational model for living nematic MIKHAIL GENKIN, Department of Engineering Sciences and Applied Mathematics, Northwestern University; Materials Science Division, Argonne National Laboratory, ANDREY SOKOLOV, Materials Science Division, Argonne National Laboratory, OLEG LAVRENTOVICH, Liquid Crystal Institute and Chemical Physics Interdisciplinary Program, Kent State University, IGOR ARANSON, Materials Science Division, Argonne National Laboratory; Department of Engineering Sciences and Applied Mathematics, Northwestern University — A realization of an active system has been conceived by combining swimming bacteria and a lyotropic nematic liquid crystal. Here, by coupling the well-established and validated model of nematic liquid crystals with the bacterial dynamics we developed a computational model describing intricate properties of such a living nematic. In faithful agreement with the experiment, the model reproduces the onset of periodic undulation of the nematic director and consequent proliferation of topological defects with the increase in bacterial concentration. It yields testable prediction on the accumulation and transport of bacteria in the cores of $+1/2$ topological defects and depletion of bacteria in the cores of $-1/2$ defects. Our new experiment on motile bacteria suspended in a free-standing liquid crystalline film fully confirmed this prediction. This effect can be used to capture and manipulation of small amounts of bacteria.

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