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Numerical simulations on active rod like particles as a model for the collective behavior of Myxococcus xanthus MANON WIGBERS, Department of Physics and Astronomy, Vrije Universiteit, Amsterdam, 1081HV, The Netherlands, SHASHI THUTUPALLI, JOSHUA SHAEVITZ, Department of Physics, Princeton University, Princeton, NJ, 08544, USA — We study collective behavior of Myxococcus xanthus using numerical simulations. Under starvation conditions, these social bacteria organize into multi-cellular structures, called "fruiting bodies," within which cells sporulate. During the process of fruiting body formation, cells show various collective motion patterns. One of the most striking of these patterns is the so called rippling motility, characterized by standing density waves of reversing bacteria. Similar rippling behaviour is also observed during predatory feeding of the bacteria. Until now, the principles underlying this rippling behavior are not fully elucidated. Analogous to the well studied liquid crystalline phases in condensed matter physics, the ordering of the baceria within these rippling waves resembles a smectic like layered structure. In contrast to active nematic liquid crystalline phases widely studied in recent times, this represents the first known empirical example of an active smectic phase. Inspired by single-cell resolution experimental data of the bacteria, we develop a modelof active rod like particles and use numerical simulations to study the organizing principles that drive the transitions between the various active liquid crystalline phases in the myxobacterial collective behavior.

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