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Phase separation dynamics during *Myxococcus xanthus* fruiting body formation GUANNAN LIU, Princeton University , FATMAGUL BAHAR, ADAM PATCH, Syracuse University, SHASHI THUTUPALLI, Princeton University, DAVID YLLANES, M. CRISTINA MARCHETTI , ROY WELCH, Syracuse University, JOSHUA SHAEVITZ, Princeton University — Many living systems take advantage of collective behavior for group survival. We use the soil-dwelling bacterium *Myxococcus xanthus* as a model to study out-of-equilibrium phase separation during fruiting body formation. *M. xanthus* cells have the ability to glide on solid surfaces and reverse their direction periodically. When starved, *M. xanthus* cells aggregate together and form structures called fruiting bodies, inside of which cells sporulate to survive stressful conditions. We show that at high cell density the formation of fruiting bodies is a phase separation process. From experimental data that combines single-cell tracking, population-scale imaging, mutants, and drug applications, we construct the phase diagram of *M. xanthus* in the space of Péclet number and cell density. When wild type cells are starved, we find that they actively increase their Péclet number by modulating gliding speed and reversal frequency which induces a phase separation from a gas-like state to an aggregated fruiting body state.

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