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Periodic reversals allow bacteria to swarm YILIN WU, University of Notre Dame, DALE KAISER, Stanford University, YI JIANG, Los Alamos National Laboratory, MARK ALBER, University of Notre Dame — Many bacteria can rapidly traverse surfaces from which they are extracting nutrient for growth. They generate flat, spreading colonies, called swarms because they resemble swarms of insects. We seek to understand how members of any dense swarm track their neighbors while interfering minimally with the motion of others'. We choose myxobacteria as our model system. Individual myxobacteria cells regularly reverse their gliding directions. With a cell- and behavior-based computational model, we show that reversals of gliding direction are essential for swarming and that reversals increase the outflow of cells across the edge of the swarm. We also find that the reversal period predicted to maximize the outflow of cells is the same (within the errors of measurement) as the period observed in experiments with normal myxobacteria cells. This coincidence suggests that the circuit regulating reversals evolved to its current sensitivity under selection for growth achieved by swarming. Our work suggests a crucial componentin the general behavioral algorithm governing bacterial swarming.

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