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Behavior of Caulobacter Crescentus Diagnosed Using a 3-Channel Microfluidic Device[1] JAY TANG, MICHAEL MORSE, Brown University, REMY COLIN, Max Planck Institute-Marburg, LAURENCE WILSON, University of York — Many motile microorganisms are able to detect chemical gradients in their surroundings in order to bias their motion towards more favorable conditions. We study the biased motility of Caulobacter crescentus, a singly flagellated bacteria, which alternate between forward and backward swimming, driven by its flagella motor, which switches in rotation direction. We observe the swimming patterns of C. crescents in an oxygen gradient, which is established by flowing atmospheric air and pure nitrogen through a 3 parallel channel microfluidic device. In this setup, oxygen diffuses through the PDMS device and the bacterial medium, creating a linear gradient. Using low magnification, dark field microscopy, individual cells are tracked over a large field of view, with particular interest in the cells' motion relative to the oxygen gradient. Utilizing observable differences between backward and forward swimming motion, motor switching events can be identified. By analyzing these run time intervals between motor switches as a function of a cell's local oxygen level, we demonstrate that C. crescentus displays aerotacitc behavior by extending forward swimming run times while moving up an oxygen gradient, resulting in directed motility towards oxygen sources. Additionally, motor switching response is sensitive to both the steepness of the gradient experienced and background oxygen levels with cells exhibiting a logarithmic response to oxygen levels.

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