PHYSICAL MATHEMATICS SEMINAR

The Effect of Cell Motion on the Motility of Flagellated Bacteria

BIN LIU

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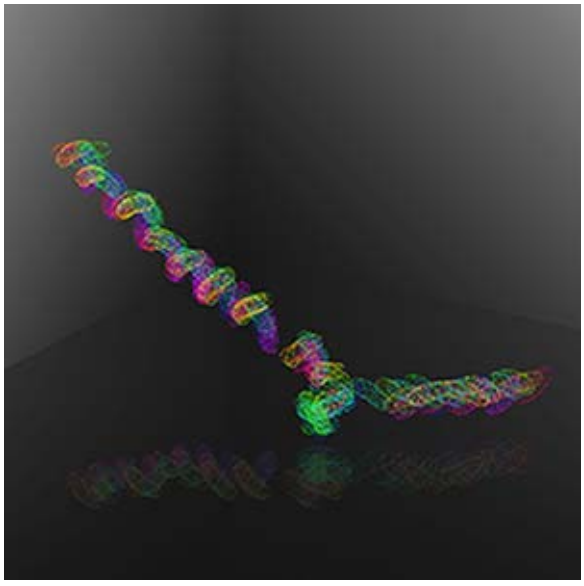
ABSTRACT:

The cell body of a flagellated bacterium is often regarded as a passive cargo when describing the cell motility, regardless of its complicated motion. To study the role of the cell body in bacterial swimming, we have developed a tracking technique with which we can resolve both the 3-d trajectory and the orientation of individual cells over extended times. We have used this technique to study the motility of the uni-flagellated bacterium Caulobacter cresentus and have found that each cell displays two distinct modes of motility, depending on the rotation direction of the flagellar motor. In the "forward" mode with the flagellum pushing the cell, the cell body is tilted and precesses with respect to the direction of swimming. In this mode, the orientation of the cell body traces a helical phase. In the "reverse" mode with the flagellum pulling the cell, the precession is much smaller and the cell motility significantly lower. We show that the helical motion of the cell body can introduce thrust rather than drag, and can explain the direction-dependent changes in swimming motility.



TUESDAY, OCTOBER 28, 2014
2:30 PM
Building E17, Room 122

Reception following in Building E17, Room 401A
(Math Dept. Common Room)

http://math.mit.edu/pms/

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