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Bacterial thermotaxis by modulation of the swimming speed MAHMUT DEMIR, HANNA SALMAN, Department of Physics and Astronomy, University of Pittsburgh, SALMAN LAB TEAM — It has been long established that random walkers such as bacteria can migrate in inhomogeneous environments, even without actively responding to changes they sense around them, by modulating their swimming speed and/or run time. We will show that *E.coli* bacteria migrate in shallow temperature gradients due to their speed dependence on temperature even without the presence of sensing receptors. Interestingly however, we find that the direction of their migration in the gradient depends on the serine concentration in the medium. This results from the fact that the bacterial swimming speed exhibits a two-state function of serine concentration and the difference between the two states increases with temperature. Our results show that the swimming speed of the bacteria increases monotonically with temperature when serine is present at high concentration, while it decreases for temperatures above 30 $^\circ$C at low serine concentration. This observed difference in the speed dependence on temperature is found to be due to a change in the intracellular pH of the bacteria when serine is added to their surroundings, which occurs only in the presence of the serine receptor Tsr. We will discuss some details of the mechanism underlying this effect and its consequences for the bacterial behavior.

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