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Constant torque in flagellar bacterial motors optimizes space exploration CARLOS A. CONDAT, MARIO E. DI SALVO, IFEG-CONICET and National University of Cordoba, Cordoba, Argentina — Experiments indicate that the torque provided by the bacterial rotary motor is approximately constant over a large range of angular speeds. Constant torque implies that the power spent in active motion is proportional to the instantaneous bacterial speed, if the relation between angular speed and swimming speed is linear. Here we show that a constant torque maximizes the volume of the region explored by a bacterium in a resource-depleted medium. Given that nutrients in the ocean are often concentrated in separate, ephemeral patches, we propose that the observed constancy of the torque may be a trait evolved to maximize bacterial survival in the ocean. We also discuss the dependence of the explored volume with the particular features of the bacterial propulsion mechanism.

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