Adaptation, Bacteria and Maxwell’s Demons

PETER GALAJDA, JUAN E. KEYMER, ROBERT H. AUSTIN, Department of Physics, Princeton University — We propose a method to study the adaptation of bacterial populations with an asymmetric wall of Maxwell Demon openings. A Maxwell Demon opening is a funnel which is easier to enter than to leave. The interaction of swimming cells with such a Maxwell Demon Wall results in a population density separation, in apparent (but not real) violation of the Second Law of Thermodynamics, as we will show. Bacteria can be exposed to spatial challenges in order to move to e.g. higher food levels. The question we address in these experiments is: do the bacteria adapt and overcome the Maxwell Demon Wall?

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