Review of: "The evolution of E. coli is NOT driven by genetic variance but by thermodynamics."

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The article by Keith Baverstock and Arto Annila represents a rather unconventional interpretation of a genetic experiment on *E. coli* bacteria. The authors derive three conclusions that contradict common knowledge on genetic mechanisms connected to an evolution process. Therefore, the general message of this publication could be qualified as highly controversial.

Not being a biologist, I will not discuss some deficits that are outside my area (such as the existence of gametes or the applicability of Mendel's laws for *E. coli*). I will rather take the perspective from the thermodynamic point of view, as the authors claim thermodynamics to be the responsible mechanism.

Thermodynamic processes in equilibrium and in non-equilibrium can be interpreted from a statistical point of view. If we take a look at the phenomenon of entropy and the process that is connected to the minimization of free energy, we can fully understand all situations and changes by using statistical thermodynamics, which in the last consequence also leads to the observed power law. Evolution, on the other hand, is governed by statistics as well. This includes the number of accumulated mutations, the efficiency of selection, the diminishing returns epistasis, the interaction between several genes, cell-to-cell gene transfer etc. All in all, I would not be surprised if all these influences add up to a statistical effect that is quite similar to a thermodynamic non-equilibrium situation.

While I clearly disagree with conclusion 1 (I believe the mechanism of evolution is over-simplified in this discussion) and conclusion 3 (to my knowledge, Mendel's rules and gametes that fuse into a zygote do not apply in case of *E. coli*), I see some attraction in the potential thermodynamic interpretation of the LTE experiment. Maybe, there is a point in trying to understand the classical mechanisms of evolution (as a complex superposition of random formation and selection, diminishing returns epistasis, gene transfer etc.) in a thermodynamic context. It is this perspective where I recognize value in this paper.