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

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Potential competing interests: No potential competing interests to declare.

As my research interest and experience are not in the field of biology, I do not want to give more comments on their results. As for the adopted methodology, I support the authors' exploration of E. coli evolution by using the viewpoint and methodology of modern physics. With the use of advanced experimental tools, a huge of experiment data and the relevant theoretical models give us a chance to reexamine the previous theory in different temporal and spatial scales. However, I reserve my opinion that if the evolution rules of E. coli obtained in special time and space scales can be generalized to other objects in different time and space scales. According to modern physics, "more is different", I think that the longer does also possibly mean different results especially for nonlinear dynamical system.

In addition, it is suggested that more attention should be paid to environmental factors in the comparative study if E. coli is treated as a thermodynamics system. Different initial states will make the physical system have different evolving history and results. Even if a system has steady states (quasi-static) due to energy dispersal, the final state sensitivity will make the system have different final states due to nonlinear attractor. Perhaps people only saw one possible state in one special time and space even for LTEE. It's a bit like the Chinese idiom story of the blind man touching the elephant.

Grebogi, C., McDonald, S. W., Ott, E., & Yorke, J. A. (1983). Final state sensitivity: An obstruction to predictability. Physics Letters A, 99(9), 415-418. https://doi.org/10.1016/0375-9601(83)90945-3