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.

The article challenges traditional views of genetic variance and the role of genes in the evolution of E. coli, proposing that thermodynamics is the primary driver of this evolution. Here are some comments and thoughts on the key points of the article:

E. coli Evolution and Genetic Variance: The study of E. coli's long-term evolution experiment (LTEE) and the finding that the 12 independent replicate cultures exhibited identical fitness trajectories despite diverse spectra of mutations is intriguing. This challenges the idea that genetic variation is the primary driver of evolution in E. coli.

Thermodynamics as the Driver: The proposition that thermodynamics, specifically the Second Law of Thermodynamics, plays a fundamental role in the evolution of natural systems, is a novel and intriguing concept. It suggests that evolution is governed by the principle of least action, which is associated with minimizing free energy in the least time. The assertion that this principle applies not only to E. coli but also to galaxies and other natural systems is a bold claim that warrants further exploration and validation.

Genes as Mendel's Units of Inheritance: The article challenges the traditional view that genes are Mendel's units of inheritance. It argues that Mendel's laws were based on a special category of mutations, and most genetic variation, such as single nucleotide polymorphisms, does not influence the cellular phenotype and, therefore, does not drive evolution. This perspective challenges the prevailing assumptions in genetics and genomics research.

Genome-Wide Association Studies (GWAS): The criticism of GWAS studies and their limited contributions to public health advances is noteworthy. It suggests that the assumptions underlying these studies, which often focus on identifying the genetic basis of common diseases, may need reevaluation.

Implications for Evolutionary Biology: If the article's assertions hold true, they have profound implications for our understanding of evolutionary biology. It challenges established theories like the Modern Synthesis and Fisher's Genetical Theory of Natural Selection. Further research and analysis are needed to validate the claims and assess their broader applicability to the field of biology.

Need for Further Research: The article presents intriguing ideas but would benefit from further empirical evidence and experimentation to solidify its claims. Scientific progress often hinges on rigorous testing and validation of novel theories and ideas.

In summary, the article challenges conventional wisdom regarding the role of genetic variation in evolution and suggests that thermodynamics may be a fundamental driver of evolutionary processes. While these ideas are thought-provoking, they require further research and scrutiny to determine their validity and broader applicability in the field of biology.