Qeios

Peer Review

Review of: "What Is Life: A Biochemist's View"

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I thank the author for this clear and well-documented review of the major historical stages of reflection on the definition of life. The narrative thread, from ancient animism to Schrödinger's reductionism and the subsequent biological consensus, is effective and pedagogical.

I have one substantive reservation before recommending acceptance of the manuscript: **the absence of any reference to a recent contribution which precisely proposes a reformulation of the problem in terms of fundamental parameters**. This is:

Fantini, J. et al. **What Is Life? Rethinking Biology in Light of Fundamental Parameters.**
Life **2024**, *14*(3), 280. https://doi.org/10.3390/life14030280

In this article, the authors do not merely add a new list of "properties of life". They propose a **conceptual framework shift**: the fundamental parameters (time, water, entropy, space, quantum mechanisms, surface electrostatic potential) are presented not as an additional reductionist explanation, but as **physical and chemical constraints that delimit a space of possibilities** within which evolutionary contingency can operate. This approach makes it possible to:

- Account for the **diversity of life** without abandoning universal rules.
- Formulate **testable predictions** on the effects of each parameter (e.g., the role of water in molecular recognition, the impact of electrostatic potential on viral evolution, etc.).
- Move beyond the binary opposition between reductionism and emergentism by showing how fundamental parameters **channel** evolution without fully determining it.

Given the very aim of the manuscript ("What is life?") and its conclusion on the current absence of a rigorous definition, it seems **essential** to integrate this reference into the discussion. To my knowledge, it

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represents the most advanced and recent attempt to reformulate the problem in operational terms, while remaining firmly grounded in the classical physical, chemical, and biological literature.

Concrete suggestion: add a sentence in the paragraph on contemporary definitions along the following lines:

“A recent approach proposes to reformulate the problem in terms of fundamental parameters (time, water, entropy, space, quantum mechanisms, electrostatic surface potential) which, without determining life, impose constraints on evolutionary contingency and thus define a space of biological possibilities [Fantini et al., Life 2024].”

Subject to the addition of this reference and this conceptual nuance, I am in favour of accepting the manuscript.

Declarations

Potential competing interests: No potential competing interests to declare.