



Evolution is not driven by and toward increasing information and complexity

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Wong et al. (1) present a general theory of evolution that assumes that evolution is progress, via selection for increasing complexity.

The authors' undisguised anthropocentrism leads them to believe that humans are more complex, successful, and indicative of the general trends of evolution than any other example. Indisputably, the diversification of life includes major trends of cumulative integration and additive niche creation (e.g., refs. 2–4). However, there is no evidence that biotic evolution is progressive or globally directional or that relative simplicity is disadvantaged. “Simple” species such as bacteria are among the most “successful” (long-lasting lineages, largest share of biomass). “Complex” (multicellular, large, evolutionarily derived) species emerge and then regularly disappear in mass extinction events. There are many examples of ecosystems that do not maximize productivity, diversity, or other potential measures of complexity (temperate forests), as well as natural processes such as retrogressive succession that lead to reductions in all such measures.

The authors ignore low-complexity's pervasive distribution, arguing that absent selection for complexity it may locally decrease, though information should still increase. Most fundamentally, their underlying assumption that there is such a thing as “selection for” violates valid reasoning in evolutionary biology.

Wong et al. also propose “There exist selection pressures favoring systems...for novelty generation”; “The functional information of a system will increase.. if.. the system [is] subjected to selection for one or more functions”; “...possible configurations of the system are subjected to selection for the function of absorbing H₂...” Evolutionary biologists understand “selection” as referring to the post hoc interpretation of a process that is nonagentive, non-goal-oriented, diffuse, and occurs via nonuniform nonsurvival/nonreproduction. Selection for, used literally as it is here, indicates that there are some agents who drive nature toward a goal. The authors claim that this agent is information, which drives evolution and selection for functions.

I posit that the evolution of complexity is not different from the evolution of any given trait or species. To argue otherwise is to claim that there are two different mechanisms of evolution. The emergence of, say, a particular beak shape is not environmentally predefined or preordained; it is not “selected for”. In the same selective environment, two different beak shapes, corresponding to different local peaks of adaptation, can emerge in different lineages, from combinations of mechanisms including differential survival of more-adaptive variants, drift, and interactions such as modularity or plasticity constraining the direction of adaptive walks (5–9). Wong et al. may indeed reply that beak shapes cannot be selected for because they are too specific, whereas complexity, as an abstract property with myriad physical instantiations, is different. It should have been incumbent on them to clarify where, why, and how the mysterious transition between evolution as non-goal-oriented selection, and as goal-oriented selection, supposedly exists.

However, I understand the authors to be arguing for one unified evolutionary process, rather than two fundamentally different ones. I am sympathetic to Hazen's work on mineral evolution (10), but Wong et al. do not clarify a general understanding of evolution.

ACKNOWLEDGMENTS. Emanuele Coccia contributed to the idea for this paper.

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Author contributions: M.R.-B. wrote the paper.

The author declares no competing interest.

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Published August 12, 2024.

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