# Silvia De Cesare, *Organic Progress and Evolutionary Theory*, Cambridge University Press, Cambridge 2026, pp. 86, € 21.01, ISBN 9781108954501

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Even today, the notion of progress remains a contentious issue in evolutionary biology. It evokes images that contemporary biology has largely sought to abandon since the Darwinian revolution, such as the chain of being. Nevertheless, biologists seem unable to avoid engaging with the possibility of progressive trends in evolution. In *Organic Progress and Evolutionary Theory*, Silvia De Cesare attempts to rehabilitate the concept of evolutionary progress by arguing for its theoretical coherence and usefulness.

This Cambridge Element is organized into nine chapters and follows a bottom-up approach, moving from local processes in evolutionary interactions to the alleged global progressive tendency in the history of life. In doing so, De Cesare draws on empirical case studies to test the hypothesis of "betterment" and engages extensively with contemporary literature in philosophy of biology. The introduction is devoted to clarifying the issue of "Organic Progress", namely, whether change towards the better has occurred and, if so, what it means for evolutionary theory. The overall aim is to investigate whether there are theoretical grounds for using normative terms such as "better" in describing evolutionary trajectories.

The second chapter addresses the "rivalry" between the Darwinian conception of evolution as the survival of the fittest and Gould's rejection of any notion of evolutionary improvement (p. 6). Darwin characterized living forms that prevail over others as superior. This becomes clear when comparing two forms at different times under constant abiotic conditions. Such "competitive highness" (p. 6) is often correlated with morphological differentiation and functional specialization, although these two senses of highness are, in principle, decoupled. In this Darwinian framework, adaptation directly implies that "something gets better". Conversely,

Stephen J. Gould rejects improvement in favor of contextual adaptation to ever-changing local environments: there is no common background against which progress can be measured. The misconception stems from the confusion between distinct tiers of causal processes, from the ecological moment to lineage trajectories. The intuition for organic progress should be limited to the first level, while in the others, competition is not the main driver. Even if some progressive changes occur, they do not constitute a general pattern of evolution, particularly in light of mass extinctions. Following Gould, organic progress with a "global scope" seems unsound.

The next chapter draws on Richard Dawkins to justify a notion of progress at a local scale. By limiting the comparison to a single lineage over short to medium timescales, it becomes possible to assess, according to "engineering criteria" (p. 17), the improvement of a specific property. Indeed, evolutionary theory conceptually admits processes of adaptive fine-tuning driven by natural selection, which would amount to local progress. Nevertheless, for De Cesare, Dawkins does not fully justify the introduction of normative and evaluative terms such as "progress" and, consequently, "good" into biological discourse.

Addressing this gap is precisely the aim of the fourth chapter. Following Alex Rosenberg and Daniel McShea, she argues for the unavoidability of instrumental normativity in evolutionary biology. To explain why organisms exist, we appeal to the fact that their ancestors bore traits that were instrumentally good for survival and reproduction. This introduces an "organic value" that involves neither ethical considerations nor the attribution of intrinsic value to survival and reproduction. The evaluative polarity thus introduced is justified by deriving it from functional attributions. Indeed, functions and dysfunctions necessarily imply axiological polarity. For De Cesare, properties of organisms (and artifacts) call for functional explanations. In organisms, functional effects play an explanatory role with respect to their causes, since traits were selected for their effects on differential reproduction.

The following chapter focuses on empirical examples to assess whether there is evidence of improvement, mainly based on fossil documentation. Cases of progress have been observed in the anti-predatory properties of organisms, such as the thickness of shells. Other examples involve the swimming

appendages of seals. Improved swimming performance over longer distances has led to differential survival, favoring certain seals over others. When comparing forms from two points in time, more recent forms tend to display traits that are instrumentally better for swimming than those of earlier forms.

The sixth chapter aims to redefine Dawkins's characterization of local progress as Functional Improvement of Organic Traits (FIOT). The assessment of progress is based on a comparison between the ways the ancestor's trait *y* and the descendant's trait *x* perform the same function *F*. Furthermore, De Cesare proposes to narrow down the homogeneity condition for the common environmental background. The improvement should be evaluated by referring to a specific "environmental problem", namely, the physical condition of the environment responsible for differential fitness among individuals in a population. A second caveat concerns a *ceteris paribus* condition. One must isolate both a biological function and the corresponding environmental problem in order to evaluate their interactions over time without interference from other factors. When i) an environmental problem remains relatively constant, ii) it corresponds to a biological function, iii) intrapopulation variations result in better performance of the function, and iv) *ceteris paribus*, therefore, the process of adaptation involves betterment. If so, evolutionary theory, argues De Cesare, implies the possibility of FIOT. In this manner, FIOT can serve as an *explanandum* for at least some cases of adaptation, particularly when addressing ecological fitness, i.e., the correspondence between organismal traits and aspects of the environment.

The next chapter describes a "long-term evolutionary experiment" with *Escherichia coli*. The aim is to show that, in a simple environment with controlled interactions, certain functional performances tend to improve over time, as indicated by, for instance, growth rate and energy efficiency. Descendant individuals appear to be better "in terms of quickly growing and reproducing, and in terms of growing by using a small amount of resources" (p. 55). This suggests that, under the appropriate conditions, FIOT can be directly observed in the evolution of *Escherichia coli*.

Chapter eight is devoted to addressing the issue of global progress, i.e., the possibility of assessing macroevolutionary

progressive trends. According to De Cesare, the only consistent driver that may constrain evolutionary trajectories toward organic goodness is natural selection, since it acts externally by favoring adaptation. However, identifying the causal mechanisms underlying these trends and the operational criteria for assessing progress both remain in need of further development. For the author, evolvability is a candidate criterion for global progress. Drawing on George Canguilhem's conception of vital normativity, evolvability is understood as "a good organic solution with respect to an inescapable environmental contingency" (p. 71). Since it represents an organic disposition to cope with a changing environment, organisms possessing it may be favored over forms of local, relatively fixed adaptation. De Cesare argues that further investigation is required to determine whether a global trend toward improved evolvability can be measured.

*Organic Progress and Evolutionary Theory* deals with an infamous task: to rehabilitate "progress" as a conceptual tool for investigating evolutionary phenomena, "without fear of discrediting the scientific status of evolutionary biology" (p. 75). Despite the suspicion surrounding "progressivist" reasoning, De Cesare successfully demonstrates its involvement in a broad body of literature on evolutionary variation. She revitalizes the explanatory power of "progress" with respect to adaptive fine-tuning and paves the way for new directions to operationally investigate the extent of such phenomena in the history of life. In doing so, the author productively brings together reflections by different authors, showing how they contribute to an overall view of evolutionary phenomena in which progress toward goodness plays a role.

However, the framework rests on the alleged legitimacy of functional discourse in biology. The justification of progress-based reasoning largely rests on value polarity implied by functional attributions. The evaluation of adaptive improvement requires the isolation of a specific environmental problem and traits based on their functional specificity (p. 44). Furthermore, the very need for progressivist explanations in evolution rests on the intuition that functions have played a relevant role in the selection of traits. Indeed, following Larry Wright (1976), De Cesare argues that functional explanations are justified for certain organismal properties that require

appeal to their functions to explain their existence, persistence, or maintenance (p. 30).

Nevertheless, neither explanatoriness nor historical trajectory, taken in themselves, grounds evaluative hierarchies among degrees of functioning and malfunctioning (Christensen 2012). This presupposes that living organisms tend to gradually adapt to their environment by increasing the efficiency of the functional relationships between their "equipment" and specific "environmental problems". In legitimizing organic values, De Cesare appeals to the evaluation of how well a trait functions, which, in turn, requires efficiency as an organic value driving selective processes. She does not fully ground evaluative comparisons between distinct functional ecological couplings over time. For instance, Jakob von Uexküll (1927) conceives the temporal succession of living forms as different ways of specific, "perfect adaptation", rather than as a process of improvement. De Cesare does not fully explain what makes one functional form better than another beyond their influence on differential reproduction and survival. One can treat differential reproduction as an "endpoint of instrumental value attributions" (p. 24) only if efficiency makes a normatively relevant difference in functional attributions and allows for evaluations in biology. The account risks presupposing the very evaluative hierarchy it aims to justify.

The book is a compelling and ambitious attempt to restore a legitimate role for progress in evolutionary biology. It highlights the need to reconsider our aversion to progressivist explanations, especially when they are implicitly involved in other biological categories that appear more acceptable, such as adaptation. Indeed, level-relative progressive processes may help problematize a potential tension between specificity in local adaptation and generality as a global good: the attribution of positive value to local fine-tuning appears to be in tension with evolvability as a global criterion. This tension calls for further theoretical clarification (e.g., Montévil 2025). Nevertheless, De Cesare's overall theoretical framework rests on an insufficiently clarified account of value within a naturalistic conception of biology.

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