

Please cite as: Veit, W. & Browning, H. (2022). Darwinian and Autopoietic Views of the Organism. Preprint.

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Darwinian and Autopoietic Views of the Organism

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Abstract: The goal of this commentary is to illustrate that Darwinian and autopoietic views of the organism are not as squarely opposed to each other as is often assumed. Indeed, we will argue that there is much common ground between them and that they can usefully supplement each other.

Keywords: Darwinism, Autopoietic Tradition, Organisms, Evolutionary Theory, Philosophy of Biology

In his target article, Jorge Mpodozis (2022) defends an interesting alternative way of viewing the processes of development and evolutionary change that challenges the more traditional gene-centred perspective associated with Darwinian theorizing. However, we do not think that the mode of presentation, as a stark dichotomy between his view and the standard picture, is necessary or indeed helpful. Instead, we argue that both perspectives provide something useful for understanding evolution, and there is more common ground between them than he allows.

In particular, we doubt that there are many contemporary defenders of the strong genetic determinism that he pits his view against. For example, the view that “envisages the process of development as the deployment of a set of instructions encoded in the DNA of some of the initial cellular components of a living being” (§17) seems like a straw man, one that any modern biologist is unlikely to endorse without acknowledgement of the range of other structures and processes that influence development. Even if biologists often idealise non-genetic processes away, that is not evidence in itself for a stronger metaphysical commitment to genetic determinism. Contemporary biologists recognise a variety of influences on ontogeny, phenotype, and inheritance, such as epigenetics and differential gene expression - even if they might disagree about how important they think these processes are (Jablonka & Lamb 2020). When Mpodozis states that “characters are not inherited, but recreated by the process of systemic reproduction” (§23), this does therefore not appear at odds with mainstream thinking since no one thinks that traits are somehow inherited whole, but rather that genetic inheritance provides a rough ‘blueprint’ or better ‘scaffold’ from which they are reconstructed in feedback-loops with the environment (Veit 2021). It is thus hardly surprising that the specific outcome is highly sensitive to particular environmental conditions, gene expression, and other epigenetic factors. While the older metaphors are still persisting, the mainstream views of biologists have already shifted substantially in the last decades.

Unfortunately, Mpodozis sets up his position as an absolute that stands in contrast with constructivist discourse:

“Reproduction is a systemic process of conservation of a particular organism-medium relation, or way of living, and *not a genetic process* ... A lineage arises in the systemic reproductive conservation of a way of living and *not in the conservation of a particular genotype*” (§1) [italics added for emphasis]. (Mpodozis 2022: §1)

We believe that there is a more fruitful middle ground that can take into account features of both views. For instance, while he may be correct that “it is not possible to claim that any features that arise in the life history of an organism are genetically determined” (§1), neither is it the case that they are completely independent of genetic conditions. He admits that the genotype is something like a gatekeeper, constraining the space of possible structure and action, and it is here that we see the most common ground – the difference between the views start seeming more like one of degree rather than kind. The degree to which these constraints, rather than developmental or epigenetic conditions, influence the organism’s phenotype and actions, will differ in different contexts, but it is obvious that both sets of influences play a role. The answer lies neither in one extreme nor the other.

Many of the claims in the target article can be viewed through a more traditional lens, illustrating the level of overlap. Mpodozis states that for a living being to ‘know’ the environment is to “form an internal representation of the objects in that environment through some special mechanism that captures the relevant characteristics of those objects” (§10), something that we take genes to be able to do over time – in a deflationary sense, genetic coding can be taken to be a representation of the past environments a lineage has encountered, and the traits that benefited the organism’s survival and reproduction. Similarly, when he says that “the structural present of a living being (molecular autopoietic system) is the historical result of the flow of actions that this living being has carried out during its life” (§14), we take it to also be a result of the actions that ancestral organisms have carried out, and the consequences of those actions, as represented by the genome (and epigenome). When Mpodozis claims that “environmental factors do not drive, nor do they select changes in the pool of total genotypes, but only allow them to occur” (§29) this does not appear so different from a traditional evolutionary picture – what else would it mean for an environment to ‘allow’ or ‘disallow’ a trait or genotype, if not to select for or against them? Those traits that an environment does not ‘allow’ would be those that go on to disappear from a population.

In the end, our question is what role Mpodozis wants his view to play. We see two possibilities. The first is the provision of a new lens through which to view the processes of development and evolution, foregrounding different factors than more traditional gene-focussed views attend to. This is then consistent with both views having a place, each theory providing a useful perspective within different contexts. Which we should adopt in any given situation will then depend in large part on the goals of enquiry and what type of explanation is sought. We could see each view as compatible, at a different level of explanation. What we would want to see then, would be the explicit rationale for preferring this view – what are its theoretical virtues, which phenomena does it capture better than the alternatives?

The second possibility is that the different theories are provided as empirical and explanatory competitors. That is, that they are both taken to in some sense describe what the processes of development and evolution are *really* like, such that both cannot be correct. Here, what we would like to see would be a set of testable predictions arising from each theory, such that they could be empirically differentiated. Which phenomena, were they to be observed, would provide support or refutation of this theory (or the alternative)? We suspect that such tests cannot be provided because both theories have different aims and operate with different idealizations; abstracting away different features of the world in order to enable understanding of particular

features of organisms. We therefore prefer a more pluralistic approach - in line with constructivist philosophy - in which different theories are not inherently seen as competitors where only one can be true whereas all others must be false (see also Veit 2020). Darwinian and autopoietic views of the organism both play an important role in advancing biological science.

Finally, we do not just want to make the point that a more moderate position is to be preferred, but rather that Mpodozis actively harms his own case for an organism-centric view of biological evolution by misrepresenting contemporary biological thought without providing sufficient evidence for what amount to strong assertions that many biologists would deny. Indeed, we believe that this is a larger problem in some of the literature in the autopoietic tradition that has sometimes suffered from being framed in ways very antagonistic to mainstream Darwinian thinking (see also Veit 2022), which has actually progressed significantly in the last decades. This has made it hard to bring many of the important insights of Maturana & Varela (1986) into mainstream biology and we hope to have made a case here for a more conciliatory approach that may have more success in integrating autopoietic ideas into the modern Darwinian revolution. Indeed, we believe that such an approach would emphasise much more clearly how valuable the contribution of Mpodozis (2022) really is.

Funding

This paper is part of a project that has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement number 101018533).

Competing interests

The authors declare that they have no competing interests.

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