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# ORGANISMS, AGENCY, AND EVOLUTION

## D. M. WALSH

Reviewed by John Dupré

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*Organisms, Agency, and Evolution*

D. M. Walsh

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The mantle of heir to Darwin's famous theory of evolution by natural selection is generally claimed by the so-called neo-Darwinism that derives from the Modern Synthesis, announced by Huxley, Dobzhansky, Mayr and others in the 1930s and 1940s. Its most distinctive theses are the unlimited power of natural selection to explain evolutionary change and adaptation, and the unique role of the gene as the currency in which evolution is to be measured. Uncompromising versions of both these ideas are well known from Richard Dawkins' classic, *The Selfish Gene* ([1976]). Dissatisfaction with this version of neo-Darwinism has been growing rapidly in recent years, however, especially as advances in both molecular and developmental biology have made increasingly clear that the image of the gene that underlies the second thesis is entirely misguided.

In *Organisms, Agency and Evolution*, Denis Walsh provides an admirably clear and well-informed account of neo-Darwinism and its failings, and develops as an alternative a view he calls *Situated Darwinism*.

Central to Situated Darwinism is something that was an integral part of Darwin's own view, but has been lost in neo-Darwinism, namely, the vital role of the organism. The core aim of this book is to reinstate the organism in its rightful place.

The great virtue of neo-Darwinism, according to Walsh, though ultimately also its fatal vice, is what he calls the 'fractionation' of evolution, the way in which defining evolution in terms of genes enables it to be divided into component processes—development, inheritance, adaptation, and the generation of novelty—that can be treated independently from one another (pp. 72–3). Notoriously, development is black-boxed by neo-Darwinism, since it is assumed that the developed phenotype is determined, more or less, by the genes. Further, as evolution is defined in terms of changes in gene frequencies, inheritance, in so far as it is relevant to evolution, can be defined solely as transmission of genes. Selection, again by definition, is the differential survival of fitter genes, so that in the end the phenotypic traits caused by these genes must be better adapted to their environments than their predecessors. And evolutionary novelty, finally, can only be grounded in changes to genes. The Weismann barrier—the assumption officially turned dogma by Francis Crick that genetic information could only travel from germ cells to somatic cells, never in the reverse direction—meant that only changes directly to germ cells could be inherited. Moreover, since the germ cells were not directly involved in any functional activities of the organism, it appeared that such changes could only be random; only by luck could they be adaptive.

Walsh is scrupulously careful to give due credit to the Modern Synthesis. For example, after showing that there are multiple channels of inheritance in addition to the transmission of genes that can underlie evolutionary change, he insists nonetheless that neo-Darwinists can reply, on the basis of their proprietary concept of inheritance, that 'any phenomenon that is not underwritten by the transmission of genes [...] is just not inheritance. This commitment is justified and rightly earned by the success of the Modern Synthesis' (p. 102).

Personally, I am a bit more sceptical about this success. Certainly, the centrality of the gene concept, despite its growing empirical problems, has been extremely productive in molecular and developmental biology. Whether population genetics, the theoretical activity at the core of neo-Darwinist evolutionary theory, has borne comparably nutritious fruit is more debatable. But it is no doubt good strategy to be as placatory as possible to the neo-Darwinists, given their continuing powerful role in evolutionary discussion and notorious hostility to serious dissent.

At any rate, despite such respectful gestures, Walsh aims to bury neo-Darwinism, not to praise it, and he provides a compelling overview of the growing problems that confront that research programme. In particular, and in accordance with the objective of reasserting the centrality of the organism, Walsh consistently argues that the various components of evolution cannot in fact be separated in the way that neo-Darwinism proposes. So, for instance, he defends inheritance holism, according to which, 'The pattern of inheritance is held in place by the self-regulating, adaptive activities of organisms embedded in their environments. Genes have an important role to play in the reliable production of phenotypes, but it is not a role that can be differentiated, and detached, from any other components of the system' (p. 112).

This move from reductionistic and mechanistic atomism to a holistic alternative that provides equal status to top-down explanations permeates Walsh's full-blooded defence of the organism. One of the most original and interesting lines of argument starts with the idea that a traditionally information-based gene-

centrism might be defended by way of David Lewis's game-theoretic account of meaning, and the suggestion that genes be interpreted as signs with imperative force. Genes, in short, and as suggested by familiar metaphors such as blueprints and recipes, give the orders. But in fact, Walsh convincingly argues, things are exactly the other way around. Developmental systems secure the reliable re-production of organisms in the face of a range of unpredictable circumstances by regulating genes. The empirical basis for such a claim will be familiar to those who have encountered works such as James Shapiro's *Evolution* ([2011]), in which he describes the genome as a read/write storage system.

Conservative evolutionists will probably be most disturbed by Walsh's downgrading of the importance of natural selection. Contrary to Elliott Sober's ([1984]) influential account of natural selection as a force acting on populations, Walsh sees it as a 'higher order effect'. That is to say, it is no more than a summation of all the individual births, deaths, and reproductions within the population. This doesn't imply that its results may not be predictable. Just as the pressure on a container of gas is nothing beyond the impacts on its walls of individual molecules, it is nonetheless possible to make precise predictions as to what their joint effect is. Indeed, as Walsh stresses, there are important *explanations* that appeal to higher-order effects; but such explanations do not require the positing of additional population-level causes.

Where this deflationary account of natural selection has bite is with respect to adaptation. It remains common to hear that natural selection is not merely the cause of adaptation, but the only possible cause of adaptation. Clearly this is not compatible with its being merely a higher-order effect, since on that view it is not a cause at all. There is, I think, an obvious but remarkably neglected point here: selection could not be a cause of adaptation, because it can only apply at all if some other cause has provided the adapted phenotypes to be selected. The view that selection causes adaptation really conceals a quite different substantive claim, namely, that small random mutations are sufficient to take a population between arbitrary points in phenotypic space. As it becomes increasingly clear that states of genes do not generally determine phenotypic traits, this claim becomes increasingly hard to defend.

Walsh, on the other hand, argues that adaptation is a result of heritable adaptive tendencies, adaptive plasticity, in the development of organisms. Although he doesn't use the word often, this proposal is thoroughly Lamarckian, at least in the popular sense of involving the inheritance of acquired characteristics, and thereby violates one of the most deeply felt norms in contemporary science. This shunned destination is reached by an equally disreputable route: Walsh believes that organisms are agents, and that their proper understanding requires teleological principles of explanation.

It is interesting to contrast Walsh's arguments for the importance of teleology with the somewhat notorious ones presented recently by Thomas Nagel ([2012]). Whereas the latter were offered in a broadly East Coast Mysterian spirit, grounded in a proud ignorance of vulgar scientific details, Walsh reaches his teleological conclusions from a deep and serious engagement with empirical science. A growing wealth of evidence shows that organisms are developmentally plastic systems capable of generating novel ways to maintain a proper fit with their environment and their conditions of existence, and of providing ways of passing on such novelties to their descendants. The range and limits of such capacities remain very much a matter for further investigation, but the existence of such capacities is beyond serious dispute, and it is increasingly plausible that regularities in terms of the end state that a system will reach must remain an

inescapable complement to the more mechanistic accounts of particular routes by which such states are reached under particular circumstances.

As I have indicated, Walsh's respectful treatment of the Modern Synthesis will not save him from the ire of those whose fondest convictions he attempts to violate. Nonetheless, his critique reflects a growing consensus among a large body of more critical evolutionary theorists, and in the light of such criticisms his positive arguments for the centrality of the organism, for its central role in driving evolutionary change, and for the necessity of a perspective on the organism as an agent are worthy of very serious attention. This is an important book that will advance current debates about evolutionary theory in productive directions.

Without (as yet) being fully convinced by all of the central theses, I don't find much in this book with which I want to take serious issue beyond a slightly irritating number of typos and missing words. In some places, technical language might have been avoided and thereby increased the potential audience for the book. But my main concerns were of omission rather than commission, and these are readily excusable given the ambition and breadth of the book (a breadth, by the way, that greatly exceeds what it has been possible to discuss in this review).

It was surprising that Walsh does not say more about epigenetics. Indeed, the topic was discussed just once, mainly in relation to Conrad Waddington's famous epigenetic landscapes (p. 136). More recent work on epigenetics would surely have been very helpful to the general thesis, both as demonstrating the contingency of gene to phenotype relations, and as potentially linking developmental plasticity to inheritance. Also related to Waddington, it would have been good to hear a little about earlier organism-centred views of evolution, especially the organicist tradition that flourished in the first half of the twentieth century, and which included figures such as J. S. Haldane, Joseph Needham, Paul Weiss, Ludwig von Bertalanffy, and Waddington himself. As is almost mandatory in these debates, Walsh claims that he is recovering lost insights of Darwin; but the centrality of the organism remained an important idea at least until, say, 1953.

On the excuse that many of these early organicists were also more or less committed to process ontologies of various kinds, I shall allow myself a few lines, finally, to grind my own currently favourite axe. Many of the ideas Walsh develops cry out for embedding within an explicitly process biology. The kind of agents that constitute Walsh's organisms, actively exploring their relations to their conditions of existence, sound much more like processes than objects, something he acknowledges in a more recent paper (Walsh [forthcoming]). Walsh sees the organism as 'commingled' with its conditions of existence (or affordances) and holds that to understand this commingling requires abandoning the oppositions of structure and function, inner and outer, and conservatism and change (p. 184). Commingling is hard to describe in a traditional substance, or thing, ontology, but is no problem at all for a process ontology. And in such a context these oppositions, most notably that between structure and function, fall away with little resistance. Plasticity as a means to stability (p. 195) seems paradoxical in a substance ontology, but makes perfect sense in a process ontology, wherein what requires explanation is stability at least as much as change.

But to repeat, this is not a book that could expect to satisfy everyone perfectly. It takes on an important target in a systematic way and, having comprehensively dismantled this, offers an alternative vision of the

entire field of evolutionary biology. Few people are going to accept fully both aspects of the project. However, there is a widespread, if certainly not universal, sense that evolutionary theory is overdue for a fundamental rethink and among those of this opinion, Walsh's book will provide a serious possible way forward. Philosophers of biology, evolutionary theorists, and anyone interested in the state of the field and with a reasonable grasp of the specialist vocabulary, will need to read this book.

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