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# Consequence etiology and biological teleology in Aristotle and Darwin

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ABSTRACT

Aristotle's biological teleology is rooted in an epigenetic account of reproduction. As such, it is best interpreted by consequence etiology. I support this claim by citing the capacity of consequence etiology's key distinctions to explain Aristotle's opposition to Empedocles. There are implications for the relation between ancient and modern biology. The analysis reveals that in an important respect Darwin's account of adaptation is closer to Aristotle's than to Empedocles's. They both rely on consequence etiological considerations to evade attributing the purposiveness of organisms to chance. Two implications follow: (1) Darwinian explanations of adaptation are as teleological as Aristotle's, albeit differently; and (2) these differences show how deeply resistant Aristotle's version of biological teleology is to descent from a common ancestor.





## 1. Consequence etiology

Teleological ascriptions play an explanatory role in language. They appeal to aims, ends, goals, purposes, functions and other such items as causes, reasons, or warrants. Consequence etiology is a family of analyses of the logic of teleological explanations so construed. On this view of teleology, a goal explains a behavior, for example, just in case (i) the behavior in question tends to bring about a certain goal; and (ii) the behavior itself occurs because it (or something very like it) tends to bring about that goal (Wright, 1976, p. 39). A similar two-clause analysis has been applied to functional ascriptions. Consequence etiology explicates functionalist explanations of organic or artifactual parts as asserting that such parts (i) have a certain effect or consequence in the system to which they belong, and (ii) are in that system, in the sense of having come to be there, just because they have that consequence (Wright, 1973, pp. 156–157; 1976, p. 81). The circulation of blood, for example, is a consequence of having a heart, but the fact that the heart exists because it has the consequence of circulating blood is what gives that organ a function. Functional parts and goal-directed behaviors are clearly good for the organisms that have them and the goals toward which they are oriented. But a consequence etiological approach typically takes the good not as an autonomous *explanans* for teleological *explananda* as such, but as a term that consequence etiology's two-clause formula explicates.

Larry Wright, who was the first to propose this kind of analysis of teleology, dubbed these explanations 'etiological'. He did so because they purport to explain in virtue of revealing how or by what path an item with a function or a behavior with a goal got there, that is, its origin or etiology (Wright, 1973, p. 154; 1976, p. 38).[1] Insightfully, Wright recognized that the explanatory import of

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[1] Crucial to Wright's argument is the perception that without an appeal to etiology it will be impossible to distinguish a genuine function from a part that merely 'functions as', in the way, for example, a bookend might 'function as' a doorstop. Robert Cummins has challenged this analysis of functional attributions in ways that depend not on the etiology of functional parts, but on the contributing role they play in maintaining the systems to which they belong, quite apart from how they got there (Cummins, 1975, 2002). I myself think that Cummins's analysis of functional attributions is preferable to Wright's. My dissent from consequence etiological analysis of functions throws no cold water on my support for consequence etiological explications of Darwinian adaptations or Aristotle's aptations because, unlike many consequence etiologists, and indeed Cummins himself, I do not identify biological functions with biological adaptations either intensionally or extensionally. Defending this claim must be left for another day, but it is important for the reader to bear it in mind.

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teleological ascriptions dictates the criteria and relevance conditions by which their adequacy as answers to 'what for' questions is to be judged. But Wright was working in the heyday of philosophical analysis and so was more interested in consequence etiology as revealing 'the essence of teleology' than in finely discriminating the different sorts of conditions on which, he admits, the explanatory power of consequence etiologies of acts, behaviors, adaptations, and other distinct phenomena variously depend (ibid., p. 116; 1973, p. 160). Accordingly, although a number of philosophers of biology, psychology, and other fields have appreciated his insights, they have typically insisted that Wright's analysis of 'the essence of teleology' must remain purely formal, criteriological, or a thesis merely about language unless his two clause schema for teleological explanation is filled out by causal pathways, processes, and mechanisms that do the explanatory work in particular cases.

Robert Brandon has defended a consequence etiological account of adaptation by natural selection that exemplifies this shift toward specificity:

> Adaptation explanations are teleological in the sense that they are answers to what-for questions. But they are also perfectly good causal mechanical explanations ... A what-for question asked of an adaptation A is answered by citing the effects of past instances of A (or precursors of A) and showing how these effects increased the relative adaptedness of A's possessors (or possessors of A's precursors) and so led to the evolution of A ... A's existence is explained in terms of effects of past effects of A; but not just any effects: we cite only those relevant to the possessors of A. (Brandon, 1990, p. 189; cf. Brandon, l981)

This analysis of Darwinian explanations of adaptations by natural selection conforms to Wright's two clause formula. The traits in question have certain effects in the organisms to which they belong. These traits exist, moreover, because their effects, which were at first accidental, enhanced the past reproductive success of any sub-populations that had them or their precursors. Brandon's explication eschews an effort to reveal 'the essence of teleology'. Its range is restricted to explanations of adaptation by means of natural selection. Yet this very restriction has the advantage of showing that in explanations of this particular sort the trait named in the first clause explains because it is an adaptation and it is an adaptation because it has the particular kind of selective history identified in the second clause. In adaptationist etiologies, the physiological, behavioral, or ecological effects of a trait 'feed forward', as Brandon puts it, by elevating the reproductive rates of their bearers over multiple generations in the same selective environment (Brandon, 1990, p. 188 n. 25). If a trait is really an adaptation its engineering efficiency as measured by reproductive success depends on this history. So does its explanatory power.

This construal of adaptation by natural selection carries a significant implication. Brandon's consequence etiological reconstruction of adaptation by natural selection is teleology of a decidedly reassuring sort. The explanatory appeal it makes to ends may not capture everything we tend rightly or wrongly to associate with teleology.[2] But it does show that teleology is not intrinsically compromised by the mysterious pull of non-existent future events that Kant, for one, worried about (ibid., p. 189; Walsh, 2006). In this case at least, and probably in many others, the direction of causality is from past to future.

In this paper, I argue for a perhaps even more surprising thesis: consequence etiology affords a comparably reassuring way of reconstructing Aristotle's appeal to final causes in biology. Analysis of Aristotle's phrase 'for the sake of' (*hou heneka*) allows us to see that Aristotelian aptations have specific effects in bringing about and sustaining the species-specific life of the organisms of which they are body parts (*moria)*, characterological dispositions (*ethê*), behaviors (*praxeis*), or relationships with specific environments (*bioi*).[3] (I call them 'aptations' because 'adaptation' has a decidedly Darwinian ring, implying that descriptively different traits rather than numerically distinct ontogenies of descriptively identical traits, as in Aristotle, come into and pass out of existence.) But apt traits have these effects only if they come to be in a particular way that fills out Wright's second clause.

At first glance, this might seem not to be so. In *Parts of animals* (*PA*), the good effects of traits for dealing with environmental contingencies seem to be explanatory without specifying any particular pathway by which these traits must come to be. Apt traits come to be because their effects enable the organisms that possess them to realize and express in their species-specific environmental niches the psychological (*psychikos*) capacities that define their kind. Their warrant is the formula 'Nature does nothing in vain, but always, given the possibilities, does what is best for the substantial being of each kind of animal' (*On animal locomotion* 2.704b15–17, for example; see Lennox, 2001, pp. 206–208, for other formulations.) So it might seem that Aristotle's biological teleology satisfies only the first of Wright's two clauses. In *Generation of animals* (*GA*), however, Aristotle so narrows the possible ways by which the traits of animals must ontogenetically come to be if they are to count as apt in the sense specified by *PA* that his account qualifies non-trivially as a species of consequence etiology. The good effects of apt traits explain why animals have them only on condition that these traits come to be by way of an ordered process of developmental differentiation that emerges into the present from the past. This process begins with an act of sexual reproduction (or its close relatives like budding) and culminates in another such act. *PA*'s ecological 'for the sake of' thus refers to, and is given an etiology by, *GA*'s ontogenetic-reproductive 'for the sake of'. Aristotle's consequence etiology is not a selectionist history of traits and or a phylogeny of kinds. Still, it is a biological teleology founded on a temporal succession in which a presumably endless cycle of generations has been brought about by an epigenetic process so robust that it can reliably be projected into an indefinite future (ibid., pp. 139). Thus Aristotle is no less resistant than Darwin to efficient causes mysteriously working from the future, even though their appeals to the good in biological teleology differ in ways to which I will return.

I am not the first to explicate Aristotle's biological teleology as a form of consequence etiology (Ayala, 1970; Gotthelf, 1987b, pp. 240–241; Lennox, 2001, p. 257). What I add is enhanced support for this approach by more tightly linking what Aristotle says about chance and 'for an end' in *Physics* (*Ph.*) II with how he describes the etiology of apt traits in *GA*. In *GA*, as well as in *On generation and corruption* (*GC*), Aristotle explicates how the apt traits of *PA* must come to be by pursuing his dialectic with Empedocles in *Ph*. II. His controversy-soaked exposition lets us to see that for Aristotle describing the aptness of the traits of organisms without reference to the ontogenetic pathway by which they come to be is to risk mischaracterizing organisms as badly as Empedocles does when he ascribes their

[2] We should not fix the meaning of the term 'teleology' too rigidly or ahistorically. The term goes back no further than 1728, when the Protestant scholastic Christian Wolff coined it to name the part of natural philosophy that deals with the system of mutual uses among the kinds of being in the universe. It was formulated, accordingly, to name the most external part of an externally, design-dominated conception of teleology (see Wolff, 1983). By this standard taken *ad litteram* Aristotle was not even a teleologist, let alone the father of teleology.

[3] These four terms, each of which names a class of apt traits, form the organizing principle of Aristotle's *History of animals*. They also make an interesting architectonic appearance in *Nicomachean ethics*.