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Modern philosophy is, for what appear to be good reasons, uniformly hostile to *sui generis* final causes. And motivated to develop philosophically and scientifically plausible interpretations, scholars have increasingly offered reductivist and eliminitivist accounts of Aristotle's teleological commitment.[1] On such readings final causes find no place as such in Aristotle's basic ontology. The role of teleology at the biological level is accounted for at the fundamental ontic level by entities and relations presumed to be more palatable — viz. material, efficient and formal causes or minds.

This trend in contemporary scholarship is misguided. First, a strong prima facie case can be made that Aristotle accepted unreduced and ineliminable *sui generis* final causes. Second, reductivist and eliminitivist accounts of all or select portions of Aristotle's invocations of teleology receive insufficient textual support. Moreover, purportedly more charitable reductivist and eliminitivist interpretations of Aristotle's commitments themselves leave Aristotle open to strong philosophical objections. Given that these accounts are motivated by modern doubts concerning the coherence of final causality, the philosophical adequacy

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of the proposed interpretations of Aristotle's teleological commitments is relevant to our overall evaluation of them. We offer Aristotelians cold comfort by replacing Aristotle's apparent commitment to *sui generis* teleology with failed reductive accounts.

Section one below makes the prima facie case for accepting Aristotle's final cause as a *sui generis* real causal factor in the structure of the world. Section two deepens and defends this argument by evaluating extant reductive accounts of Aristotle's teleological commitment.[2] I argue that all such strategies are inadequate on both textual and philosophical grounds. Taken together these constitute ample grounds to conclude that Aristotle is committed to *sui generis* final causes despite whatever misgivings (of modern origin) we have about his position. As the facts stand we must reassess the legitimacy of modern doubts concerning teleology if we are to defend Aristotle's conception of teleological commitment.[3]

1 Final Causes: Ineliminable and *Sui Generis*

While various authors have interpreted Aristotle as an eliminitivist with regard to teleological commitment,[4] I assume mainstream scholarly

2 I classify as reductionist two interpretations whose authors label their views as nonreductionist: Gotthelf (1976/ 1987) and Matthen (1989). Other scholars do not explicitly advertise their accounts on ontic grounds but offer what appear to be reductivist accounts in the course of more comprehensive accounts of Aristotle's teleology that also deal with issues concerning Aristotle's reasons for postulating teleology as well as the scope of his teleological commitments. Insofar as my classifications depart from a scholar's own I will signal this and justify my difference below.

3 This task may not be as hopeless as it seems, for there is room for a robustly naturalistic yet ontologically emergentist account of *sui generis* final causality in the world revealed by contemporary physics. For classical statements of ontological emergence see Broad (1918-19; 1925) and Lovejoy (1927). For application of such views to modern science see especially Silberstein and McGeever (1999) and references. For a model upon which to build an emergentist account of teleology we may, perhaps, look (with appropriate modifications) to William Hasker's emergentist account of the mental (1982; 1999). See also n. 17 below.

4 See Wieland (1975), Nussbaum (1978) and Sorabji (1980).

opinion in this essay and reject such eliminitivist interpretations.[5] No pragmatic or merely heuristic account of Aristotle's commitment to final causes can capture the overwhelming case for believing Aristotle to be a realist about causal relations generally.

Given a realist interpretation of teleological commitment, there are four main arguments for the thesis that Aristotle accepts final causality as a *sui generis* causal factor. First, Aristotle directly announces his view when he contrasts his commitments with those of his reductivist or eliminitivist predecessors. Second, Aristotle's uniform treatment of the four causes as ontological equals lends indirect textual support to the view. Third, dialectical support for the thesis comes from the fact that Aristotle is explicit in holding the final cause not to differ *qua* final cause in its various employments. Finally, the failure of reductive readings on textual and philosophical grounds further undermines the attribution of such a position.

1 1 Criticism of Predecessors

The most direct evidence for the thesis that Aristotle's final cause is a *sui generis* real causal factor in the world draws from Aristotle's frequent contrasts between his commitments vis-à-vis teleology and those of his predecessors. As with textual arguments generally, select passages cannot be decisive in establishing Aristotle's ontological commitments. Nevertheless, they form the core of a prima facie case that Aristotle held the final cause to be a basic element in his causal scheme. This prima facie case must be overcome by proponents of reductive accounts.

Among texts in which Aristotle contrasts his views on final causality with those of his predecessors, *Metaphysics* I 7, 988b6-15 is, perhaps, the most important. Aristotle says,

> That for the sake of which actions and changes and movements take place, they assert to be a cause in a way, but not in this way, i.e., not in the way in which it is its nature to be a cause. For those who speak of reason (*nous*) or friendship class these causes as goods; they do not

5 Those scholars, surveyed below, who offer reductivist accounts of Aristotle's teleological commitment agree with this assumption at least implicitly insofar as they offer realist accounts of Aristotle's commitments. For arguments in support of the assumption see, for instance, Gotthelf (1980), Nussbaum (1980), and Balme (1987).

> speak, however, as if anything that exists either existed or came into being for the sake of these [*ou mên ôs heneka ge toutôn*], but as if movements started from these. In the same way those who say the one (*to hen*) or the existent (*to on*) is the good, say that it is the cause of substance, but not that substance either is or comes to be for the sake of this. Therefore it turns out that in a sense they both say and do not say the good is a cause; for they do not call it a cause *qua* good but only incidentally [*ou gar haplôs alla kata sumbebêkos legousin*]. (cf. I 3, 984b8-22)

In this text as elsewhere Aristotle enlists his richest metaphysical vocabulary in differentiating his conception of the final cause from other types of cause. In distinguishing between causes *qua* good, mover, and being (*to on*) Aristotle gives the strong appearance of distinguishing between the *being* or *nature* of these causes even in cases where they happen to be one in number. *Metaphysics* XII 10, 1075a37-b8 invokes the same kind of rich metaphysical distinction between types of cause, and these distinctions appear consistent with Aristotle's more general remarks elsewhere (see especially *GA* V 8, 789b1-15, V 1, 778b7-19).

In reviewing the differences between his view and those of his predecessors Aristotle marks the final cause as a distinct form of causal factor present in his system but not in those of his rivals. In so doing Aristotle distinguishes being a final cause simply (*haplôs*) and being one by accident (*kata sumbebêkos*) and strongly suggests that the final cause differs in being from other causes just as they differ in being from one another (998b15). These passages constitute strong evidence, then, that Aristotle considered the final cause to be a *sui generis* causal factor operative in its own right in the structure of the world.

1 2 Inter-causal Uniformity in Treatment

Another element in the prima facie case for interpreting Aristotle as accepting a *sui generis* notion of the final cause comes from Aristotle's uniform treatment of the various causes (formal, material, efficient and final). As David Balme notes,

> Aristotle always presents the four causes as four separate factors in a causal situation (*Phys* II 3). They are not one factor plus three alternative descriptions or views of it .... [I]n Aristotle's usage ... causes are objective things and events. Therefore if the efficient cause is one objective feature in nature, so too is the final cause another one. (1987, 281)

The texts cited in the previous section lend positive support to Balme's claim.

While views contrary to Balme's have been popular in the literature,[6] direct textual evidence for such views is sparse. I grant, of course, that Aristotle at times appears to identify one cause with another.[7] Nevertheless, Aristotle never suggests that any two of his causes are one *in being* rather than one *in number*. Indeed, that Aristotle's metaphysical toolkit is rich enough to distinguish between items that are coextensive and yet differ in being or account — coupled with the fact noted in the previous section that Aristotle applies these tools in the case of the final cause — raises the bar for purported reductive accounts. To be true to Aristotle such accounts must establish that he considered final causality not merely one in number with some other cause (in some instances) but also one in being with such causes. No extant reductive account undertakes this textual challenge.

Section two of this essay may be read, in part, as a further development of my case that no adequate textual basis has been provided for interpreting Aristotle as reducing the final to any other entity or causal relation. This constitutes a central premise in my argument that Aristotle's conception of final causality was the notion of an unreduced, ineliminable, *sui generis* causal tie.

1 3 Intra-causal Uniformity: Divide and Conquer?

A final bit of evidence in favor of the *sui generis* reading takes dialectical form and must await its complete development in section two as well. Interpreters have devised various 'divide and conquer' strategies in offering reductive interpretations of Aristotle's teleological commitments.[8] Such strategies work in two stages. First, they divide Aristotle's

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6 See section 2 below for instances of the contrary view.

7 Aristotle apparently identifies the formal and final causes at *Phys* II 7, 198a25, II 8, 199a30-33, *GC* II 9, 335b6, *DA* II 4, 415b10-12, *GA* I 1, 715a4-6, 8-9.

8 Allan Gotthelf (1976/ 1987, n19 & 239 ff.) takes teleology in cases of *coming to be* as basic and claims that Aristotle defined other uses in terms of this basic use. Other scholars (Bradie and Miller 1984; Matthen 1989; Miller 1995) separate some of Aristotle's uses of teleology off from the rest and claim that Aristotle himself understood his final cause to be distinguished *qua* final cause along those lines.

teleological commitments into classes distinguishable by us. Second, they select one set of employments and claim that this use was given a reductive reading by Aristotle. Other uses are either left unaccounted[9] or are supposed to be derived from the favored (reducible) employment.[10] I argue that no such strategy is backed by textual evidence sufficient to overcome the strong prima facie case for the thesis that Aristotle treated cases of teleology (*qua* cases of teleology) equivalently. It is noteworthy that the plausibility of many reductive interpretations varies directly with the plausibility of divide and conquer strategies; insofar as these fail to receive adequate textual support the *sui generis* interpretation gains plausibility.

The general case against all divide and conquer strategies is simple: Aristotle gives us positive reason to believe and no reason to reject that he considers all instances of teleology to be equivalent just insofar as they are instances of teleology. In *Physics* II 8 Aristotle treats art and nature symmetrically (199a9-10, 15-16) and explicitly notes that 'The relation of the later to the earlier items is the same (*homoiôs*) in both' (199a18-20).[11] The essential feature of teleology *qua* teleology seems to be just this relation between the earlier and the later — direction upon an end.[12] When Aristotle does distinguish these it is not *qua* instances of teleology but *qua* location of the efficient cause — within or without the thing acted upon.[13] Further, Aristotle is explicit in rejecting that kinds of teleology

David Charles (1991, 106-11) argues on philosophical rather than textual grounds that Aristotle ought to have distinguished between two types of teleology (agentive and nonagentive) and is therefore concerned about the potential disunity in Aristotle's conception of teleology. David Furley (1996) assumes that agentive teleology is basic on the basis of modern worries and for this reason understands Aristotle's problem to be that of finding an appropriate substitute for agents in biological functions.

9 See especially Bradie and Miller (1984).

10 See Gotthelf (1976/ 1987).

11 See Charles (1991, 114-5).

12 Interesting philosophical and interpretive work remains to be done on the relation between this type of direction upon an end and the intentional variety. See *PN* 450b11-1a2.

13 See *Phys* II 1, 192b24-32, *GA* II 1, 735a3-4, *Metaph* XII 3, 1070a7-8.

can be distinguished (*qua* teleology) insofar as some instances involve deliberation whereas others do not (*Phys* II 8, 199b26-8).

The case against divide and conquer strategies is bolstered by Aristotle's consistent 'ambivalence' (Charles 1991, 118) concerning the supposed distinctions modern interpreters find between kinds of teleology as well as the dearth of textual support offered by those who employ it. All employments of such a strategy call for close scrutiny on textual grounds.

1 4 Conclusion

There is, then, a strong case to be made that Aristotle conceived of the final cause as a *sui generis* causal factor in the structure of the world. Section two deepens this argument by evaluating extant reductivist accounts of Aristotle's commitments. I argue that such interpretations earn our acceptance on neither textual nor more generally philosophical grounds. If this is correct then the case for interpreting Aristotle as committed to the existence of *sui generis* final causes is, all things considered, quite strong.

2 Reductive Accounts

Answers to the question of ontic status may be either eliminitivist or realist. Among realists, one may be a realist of a reductive or nonreductive sort. Among reductive realists, it is possible to hold that commitment to final causality in Aristotle reduces to commitment to the mental or to material, formal, or efficient causality.[14] Reductions to each of these types of cause may take a number of forms. As it happens each of the main types of reductive interpretations has at least one contemporary proponent, and there exist two distinct interpretations that reduce Aristotle's teleology to the material cause. In this section I survey and critically assess extant accounts of the ontic basis of Aristotle's commitment to final causality as the final stage in my argument that Aristotle's final cause was conceived as a *sui generis* real causal factor in the structure of the world.

14 Or, I suppose, some combination of these. I know of no scholar who offers such a view.

We need only a generic notion of reduction to understand the sense in which the accounts to follow are reductive. Our interest is in metaphysical or ontological reduction rather than linguistic or explanatory reductions. The core claim of an ontological reduction is that apparent ontic commitment to entities of type *F* in certain modes of expression really commits us to no more than the ontology of other more ontically perspicuous modes of expression *G*. We can, then, define a generic notion of reducibility as follows. Supposing that expressions of type *E* commit one, prima facie, to entities of type *F*, where *F* things seem to be distinct in kind from entities of type *G*, then:

> *Generic reduction*: *F* properties, relations and entities are reduced to *G* properties, relations and entities iff, for each expression of type *E* there are properties and relations $G_1 \ldots G_n$ such that *x*'s being *F* in E_i *just is* *x*'s having $G_1 \ldots G_n$.[15]

This generic notion of reduction admits of a plurality of understandings depending on how one understands what it is for one thing to 'just be' another. These distinct understandings yield distinct conceptions of reduction.

We need not pursue these more specific forms of reduction in this context, however, since the intuitive notion suffices to understand and evaluate the reductive credentials of the views that follow. In particular, an account will qualify as reductionistic just in case its analysans contains no *sui generis* teleological notions. In such cases teleological properties and relations in the analysandum are claimed to be equivalent to some set of nonteleological properties and relations.[16] In evaluating reductive accounts of Aristotle's commitment to teleology my discussion will focus both on textual concerns and philosophical issues relating to the charity of the account we attribute to Aristotle. Our questions will be twofold: Do any of these accounts provide a viable Aristotelian reduction of final causality to some other (hopefully more palatable) form of causality? Did Aristotle conceive of final causality along any of these reductivist lines?

15 One might also say that *x*'s being *F* in *E* *is nothing over and above* *x*'s having $G_1 \ldots G_n$. In the discussion to follow I use both expressions interchangeably in referring to generic reduction.

16 Alternately, some set of wholly nonteleological conditions may be claimed to be sufficient for or, more strongly, definitive of teleology.

2 1 *Reductions to the Mental*

Although the view is currently — and in my view correctly — out of favor, some commentators have taken Aristotle's notion of teleology to be mentalistic. On a mentalistic conception of teleology, all end-directedness depends for its existence on the mental properties of some agent. All nonagentive teleology is derivative upon the nonderivative ends, purposes, or designs of agents.

Despite potentially misleading linguistic cues in Aristotle's corpus there is strong theoretical reason to reject a mentalistic reduction of Aristotle's final cause. The main reason is that in Aristotle's world there is no mind on which all directedness can depend. Aristotle accepts that plants have goals but do not themselves have minds, and Aristotle's god is too detached to step in and supply the lack.

A further reason to reject such an interpretation was provided above in section 1 3. Aristotle does not appear to distinguish between agentive and nonagentive case of teleology just insofar as they present instances of teleology. On the contrary, Aristotle appears explicitly to endorse the view that they are perfectly on a par *qua* teleology (*Phys* II 8, 199b26-8). The modern preoccupation with discovering a surrogate for the mind in cases of natural teleology is not a preoccupation Aristotle shares.[17]

There appears to be no way to reconcile Aristotle's views on final causation with his theoretical commitments in theology and biology or his explicit statements concerning the relations between mentalistic and nonmentalistic teleology.

17 Scott MacDonald (1989, 165) argues that this is because we associate teleology with intentionality while Aristotle's main association was with completeness (*teleion*). Whatever the cause of Aristotle's distinctive approach he appears to have been correct on this point. David Hume taught us that we have no idea a priori what may cause what. As a corollary, we have no idea a priori what forms of causal connection exist in the world, only experience can answer this question. Thus, the modern drive to reject *sui generis* teleology as incoherent unless it can be modeled on mentalistic teleology is philosophically unsound on Humean grounds; in order to be coherent teleological causation need be nothing other than what it appears to be upon investigation. Our qualms (a priori or otherwise) about the 'strangeness' of such causes are neither here nor there when it comes to whether such connections exist, as Hume should have taught us. See also Bedau (1992b, 285-6).

2 2 *Reductions to the Formal Cause*

While John Cooper's sophisticated (1982) account of Aristotle's natural teleology deals mainly with Aristotle's epistemic grounds for postulating teleology, he does appear to offer a reduction of Aristotle's final cause to the formal cause in the course of his more comprehensive goals. According to Cooper, formal and material explanations are 'both of them basic to the understanding of natural phenomena generally, and equally so — they cannot be dispensed with in favour of anything more basic than they, nor can either be discarded in favour of the other' (199; see also 202). Thus, formal and material causes form the bedrock level of ontic structure in Aristotle's system; other causes are 'derive[d]' from these causes (198). No claims about ontic basicness are made concerning final and efficient causes; instead Cooper makes it part of his project to understand how Aristotle 'connect[s]' these to the bedrock elements of his ontology (200).

Focusing on the final cause, Cooper points out that Aristotle 'regularly identifies the formal and final causes' (200), and suggests two things that Aristotle may have meant in offering such identifications. First, Aristotle may be appealing to the fact that organism growth is explained by appeal to an end state (the mature form of the organism) which is also a good. Since the end state is a good, explaining growth through appeal to the mature (and unactualized) form,

> is reference also to the goal of the process of growth by relation to which, therefore, it is to be understood ... [S]aying that it is an *apple* tree is at the same time to invoke a goal ... and here that form is responsible for what happens only insofar as it is in prospect. Thus explanation by a thing's form is also explanation by its goal. (200).

Second, even in mature members of species there is a kind of final causal explanation justified by simple appeal to the form. Since the mature form specifies an 'interlocking and mutually supportive set of capacities' in the organism no one of which can be understood in isolation from the contribution it makes to the others, we can legitimately refer to the parts' contribution to the whole as the function of those parts. 'Explanation by the formal cause thus involves explanation by final cause' (201). Cooper concludes this discussion by noting what is surely correct, that '[f]inal and formal explanation are, then, for Aristotle very closely linked' (201).

It is not entirely clear that Cooper intends to offer a reductive ontological account of teleology in these passages.[18] He begins by noting that Aristotle 'identifies' final and formal causation, but sensibly concludes his discussion with only the weaker claim that the two are, for Aristotle, closely linked. Nevertheless, this 'linking' of the formal and final cause is supposed to reveal two sufficient conditions for the postulation of final causality, and those conditions themselves involve only nonteleological facts about form, which Cooper's language suggests he takes to be one of two fundamental elements in Aristotle's ontological scheme. However, neither of these formal conditions provides a genuine sufficient condition for final causality either in Aristotle's eyes or in fact.

The first derivation of the final cause involves noting that the immature organism's growth may be explained by reference to its mature form which, even while unactualized, is a good for it. Cooper concludes from this observation that explanation of growth by reference to the (mature) form is also, thereby, explanation by reference to a goal. But this inference is invalid. Given that potentialities are, for Aristotle, definitionally posterior to their actualizations[19] we may account for the mature form's influence on the growth of the organism in wholly nonteleological terms invoking definitional posteriority.[20] Further, the fact that a good is associated with the end of a process goes no way toward establishing that the process is teleologically directed at that good either in Aristotle or in fact. The good result may instead be an accidental concomitant of independent causal processes that lead nonteleologically to that end.[21]

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18 My reason for focusing on Cooper's account despite the unclarity is my desire to take the ontological aspects of Cooper's argument seriously. A shortcoming of contemporary scholarly treatments of Aristotle's teleology involves the intermixing of separate (and individually complex) issues concerning the ontic status of, epistemological grounds for, and scope of Aristotle's teleological commitments. One goal of this essay is to generate focus on the ontic issue, a focus that takes seriously the best contemporary work on both Aristotle and biological teleology.

19 See *DA* II 4, 415a16-21, *EN* IX 9, 1170a15-19, *Metaph* IX 8, 1049b4-16.

20 This same type of criticism applies to Gotthelf's influential account of Aristotle's teleology. See below.

21 That Aristotle accepts this possibility is well attested. He says, '[T]hough even the residua are occasionally used by nature for some useful purpose, yet *we must not in all cases expect to find such a final cause*; for granted the existence of this or that constituent, with such and such properties, many results must ensue as necessary consequences of these properties ... the bile is not for the sake of anything, but is a purifying excretion' (*PA* IV 2, 677a12-31: emphasis added). See also *Pol* VII 8, 1328a24-6 and *PA* I 1, 642a1-2.

A good may be associated, even eternally,[22] with the end result of a process without that process being teleologically directed toward that result.

The second 'linking' of formal and final causation also succumbs to serious philosophical objections. Cooper appeals in the second strategy to the fact that the mature parts of organisms work together in systematic ways and can only be understood individually by making reference to their roles in the larger systems to which they belong. He concludes, therefore, that we can speak of the organs doing what they do in the system *for the sake of* the whole (i.e., the formal nature) to which they belong. In reasoning in this way, however, Cooper appeals to the fact that the word 'function' in the English language has nonteleological uses according to which we can say that the function of an *F* is the contribution it makes to some specifiable system. Thus, I can say with perfect intelligibility that the function of the dust on my desk is to cushion my valuable mugs. In doing so, however, I attribute no genuine teleology to the dust, I simply point to some work the dust does in the (rather contrived) system that includes the dust, my desk, and the mugs. Robert Cummins (1975) has exploited this fact to generate an eliminitivist account of biological functions.[23] The facts, then, to which Cooper appeals in linking

22 This point arises later in Cooper's article. Cooper argues that Aristotle is justified in postulating forms on the basis of facts about the eternality of species, and on p. 213 runs a derivation of the final cause similar to the one just surveyed, but with a special role for the eternality of the forms involved. But the eternality of a good end remains insufficient to establish that the process leading to the end was teleologically directed towards the good: the two may be correlated, even eternally, as the nonteleological causal result of an original 'cosmic accident'. Aristotle seems to hold that something parallel to such a 'cosmic accident' explains why spontaneously generated organisms thrive in the same location generation after generation. See *GA* III 11, 761b24-2a32; *HA* V 19, 551b21-3, and see also *PA* IV 2, 677a12-31, I 1, 642a1-2, and *Pol* VII 8, 1328a24-6.

23 Cummins is explicit that his account is eliminitivist rather than realist about functions — he thinks realism about functions is incoherent. He is, further, explicit in acknowledging that his account of functions — employed knowingly or not here by Cooper — is *far* too broad to work as an account of biological functions. Since this sort of function can be generated for anything so long as we can imagine a system in which the thing does some work the account is wildly liberal in its attribution of functions. This liberality is constrained in Cummins' account only by our lack of interest in most of these functions.

the final to the formal cause in this way are insufficient to ground real teleology.

Given the problems these 'linkings' of the formal and final cause encounter, it is fortunate that we are given insufficient textual support for supposing that Aristotle endorsed them. Cooper's sole textual support for either line of thinking comes from Aristotle's 'identification' of the formal and final causes, but neither the exegetical work explaining Aristotle's intent nor the 'derivations' are provided textual support. We have good philosophical reason, then, to reject these derivations from the formal cause, and no firm textual grounds to attribute them to Aristotle. I conclude, then, that a Cooper-style reduction of the final cause to the formal fails on both philosophical and textual grounds.

2 3 *Reductions to the Efficient Cause*

David Furley (1996) and Terence Irwin (1988) read Aristotle's teleology as an aspect of commitment to efficient causality. As Furley says, 'we can understand the material, formal, and final causes as being different aspects of the efficient cause, or perhaps different kinds of efficient cause' (62).[24] Efficient causality is ontologically basic on this view. Final, material, and formal causes are aspects or kinds of efficient causality.

The reductive account is expressed most completely by Furley:

> The words I am offering him [Aristotle] are something like the following.[25] This kind of animal has such-and-such a manner of life: it is defined by having the capacity for living this kind of life .... Now this kind of physical part is necessary, or good, or at least better than anything else, for leading this kind of life. Hence the possession of this

24 This same thesis is expressed by Irwin: 'To mention the formal, material, final and efficient causes of the statue is not really to maintain four distinct causes of the same thing. When the effect is specified more clearly, reference to the first three causes turns out to be attribution of formal, final, and material properties to the efficient cause' (1988, 96).

25 Note that Irwin also offers the interpretation of Aristotle as 'a restatement, rather than a statement, of Aristotle's doctrine' (96). Susan Sauvé Meyer (1992, 811-12) stops short of attributing this line of thought to Aristotle since he 'nowhere explicitly indicates that these are his reasons for thinking that an animal's or plant's parts develop because they are good.'

> part enables its possessor to survive and reproduce. Through the process of heredity ... each of its (normal) offspring ... is equipped with this part. The cause of this individual's possession of this part, then, is the fact that this part is good for this *kind* of animal and therefore was a part of the form inherited from the parent. (73)

The idea is that an aspect of the efficient causal explanation of a part or process grounds the attribution of teleology to the part or process (Furley 1996, 71 & 77). The relevant aspect of the efficient causality is the *benefit* the organ's doing *F* has for the organism and its ancestors; it is the benefit provided by doing *F* that explains the efficient causal path leading to the organ's presence in contemporary organisms. The organ or behavior is present in this instance because of the benefit it brought to organisms of its kind; it was the part's *being good for leading a kind of life* that enabled its possessors to survive, reproduce, and pass the part (and benefit) along through efficient causal paths.

This account of the ontic basis of Aristotle's final cause cannot succeed. First, Furley gives no textual basis for the claim that Aristotle himself conceived of the final cause as an 'aspect' or 'kind' of efficient cause and thus leaves the interpretation unmotivated.[26] Irwin offers an involved motivation for accepting the interpretation that involves positing the reductivist view as a premise in his reconstruction of Aristotle's argument for teleological commitment in *Physics* II 8. Irwin's reading of this disputed chapter is problematic, however, in that it relies essentially on uncharitably attributing to Empedocles the highly implausible empirical view that most contemporary organisms are born with random configuration of organs. At best Irwin's textual case rests on a highly controversial reading of a disputed passage.

Even if we were to bypass this problem with Irwin's interpretation of *Physics* II 8, however, there is a more fundamental problem with reading

26 Furley offers *Phys* II 7, 198a24, *GA* V 1, 778a29-b1, and *Meteor* IV 12 in support of the thesis that Aristotle 'links' the efficient cause sometimes with the formal and sometimes with the material cause, and concludes that Aristotle 'is aware that both the matter and the *logos* function as agents by virtue of being subsumed in the efficient cause' (72). This conclusion already moves beyond the data Furley cites, however, and the situation is worse with the final cause. As Furley says, Aristotle 'is unfortunately less explicit about the manner in which the final cause is' an aspect of the efficient cause (72-3).

Aristotle's commitment to teleology or his defense in *Physics* II 8 along the lines that Furley and Irwin suggest. This account of teleology is too narrow to be Aristotle's; it cannot account for all of the uses Aristotle makes of the final cause. This is so because the Furley/Irwin account is an account of *biological functions* whereas Aristotle's use of teleology is (apparently) univocal between biological functions and more comprehensive employments of teleology.

Thus, on Aristotle's view *reproduction* itself is one of the goals of the living thing,[27] but reproduction cannot be given an account along the lines indicated above.[28] On Aristotle's view, organisms have goals of individual flourishing,[29] self maintenance,[30] and growth into a mature state,[31] but none of these can be accounted for along the lines of the analysis. Further, Aristotle's god has contemplative ends but neither a species to which it belongs nor a reproductive history.[32] Thus, the supposed reductive analysis of teleology is not broad enough to cover the range of cases of teleological directedness that Aristotle recognizes. Further, as I argued in section 1 3 above, Irwin and Furley may not claim to supply an interpretation of select portions of Aristotle's use without arguing (as they in fact do not) that Aristotle himself distinguishes *qua* teleology between uses along the lines necessary for the success of such a divide and conquer strategy. The reduction to efficient causality is not Aristotle's view because it is too narrow.

In addition to these textual shortcomings, the account is problematic on philosophical grounds. Recall that on this account an aspect of an organ's efficient causal action — its producing *benefit* to the organism — is supposed to warrant teleological explanation. Because the part benefits its possessor it is passed down the generations (through efficient

27 See *Pol* I 2, 1252a28-30, *DA* II 4, 416b23-5, *GA* II 23, 731a25-b7, *HA* VIII 1, 588b25-6.

28 Such an account would proceed along these lines: *reproduction* exists because it was necessary or good or better than anything else for enabling things that did it to survive and *reproduce*. This, however, is no explanation at all.

29 See *Phys* II 2, 194a28-33, II 3, 195a23-5, II 7, 198b8-9; *Pol* I 2, 1252b34-5; *EE* I 8, 1218b9-11, II 1, 1219a9-11; *Metaph* I 3, 983a31-2.

30 *PN* 479a28-9, *DA* II 4, 416b17-18

31 *GA* II 3, 736b4-5

32 *EN* I 1, 1095a15, VI 2, 1139a26, 1139b12; *Metaph* II 1, 993b21; *EE* II 4, 1221b28-30

causal processes). In later generations we come to recognize the function of the part to be the benefit it produces for organisms that possess it. We may formalize the account as follows. Let O_p indicate presently existing organisms and O_a indicate ancestral organisms:

> * The function of a part, *x*, of type *T*, of an organism, O_p, is to *F* just in case (a) *T*s *F*; (b) *T*s *F*ing was good for O_as; and (c) as a result, O_as passed instances of *T* and their ability to *F* on to other O_as and, eventually, passed *x* on to O_p.[33]

This account of functions is inadequate on the basis of sound Aristotelian insights as well as independent philosophical grounds. First, the account does not provide a necessary condition for being a function. Second, the account either fails to ground a causal role for the good or it fails to restrict that role to that of a mere aspect or kind of efficient causality.

The analysis fails to provide a necessary condition for possessing functions because spontaneously generated things may have functions. Indeed, Aristotle accepts each of the following propositions: there exist spontaneously generated organisms; such organisms cannot reproduce after their kind;[34] they nevertheless have parts with functions.[35] Given that these things are possible the account does not provide a necessary condition for biological functions. Given that Aristotle accepts them all as true such a view cannot be considered his view of functions (much less his view of teleology generally).[36]

33 The account is reductionist despite the fact that 'good' appears in my reconstruction. Goodness' role in the causation is supposed to be restricted to that of a *type* or *kind* of efficient causality. Further reason to think the account reductive in intent is genetic: both Furley and Irwin explicitly link their accounts to the modern reductive accounts inspired by Larry Wright's work on functions (1973; 1976).

34 See *GA* I 1, 715a23-5, b4-15.

35 See *HA* IV 7, 532a5, a11; *PA* II 8, 653b38-4a2, IV 5, 678b11-14, 679b35-6, IV 7, 683b10-11.

36 One commonly accepted diagnosis of the shortcoming noted here would be that the Furley/Irwin interpretation of Aristotle cannot appeal to evolution. That is, Furley incorrectly supposes that the Wright (1973; 1976) line on functions 'can work in Aristotle's non-evolutionary cosmology in much the same way as in an evolutionary one' (71). Early non-evolutionary formulations of the etiological account such as Wright's are *very* widely agreed to fall prey to counterexamples that are only overcome (proponents believe) by the introduction of evolutionary concerns into the accounts. For an overview of the contemporary debate as well as the consensus that has formed against the kind of account offered here on Aristotle's behalf see Buller (1999a; 1999b).

In addition, the account either fails to show the final cause to be an aspect or kind of efficient causality or it fails to provide any causal role to the *teleological* aspect of its analysans. Condition (b) of the analysis — that *T*'s *F*ing be good for some O_as — is meant to show how *goodness* enters into the efficient causation of the event, thus providing a role for teleology in explaining the presence of the organ (i.e., *x* is present *because* *T*s provided benefit). But just how does *goodness* contribute to the causal story?

Either the goodness provides a *sui generis* causal contribution to the event or the goodness is an epiphenomenal rider. If we understand goodness' role in the causation in an unreduced way then teleology has a role in the causation but is no longer simply an 'aspect' or 'kind' of efficient causality. Benefit plays an unreduced (and unexplained) role in the causation of the event. The fact that we place this causation in the context of an efficient causal history does nothing to help us in understanding its *final* causation. If we avoid this consequence, however, goodness fails to provide a causal contribution to the effect; all the causing is efficient and done in clause (a) of the analysans.[37]

This point may be made in another way by noting that the 'as a result' clause in (c) is ambiguous. Either the perpetuation happens as a result of *T*s *F*ing, in which case we have a standard efficient causal story but no causal role for the good (a good is *correlated with* the causal chain but not itself involved), or the perpetuation happens as a result of *F*ing's *being good* for O_as — in which case its being good provides a *sui generis* contribution to the course of events. Either way the account is problematic on philosophical grounds: it does not provide a causal role for the

37 It is crucial to keep in mind that we are here dealing with *realist* rather than eliminitivist accounts of teleology. The realist must find a causal role for teleology. Eliminitivists might be happy to accept the argument I make in the text and accept that there is no causal role for the good to play in the course of events. Of course there isn't, the eliminitivist would say, there is after all no ontic ground for teleological explanations. Nevertheless, she might continue, the analysis presented by Furley and Irwin provides a good explanation for why we find it useful and natural to explain things teleologically — the good is, after all, tightly correlated with the causal processes generating organs. This eliminitivist response is not open to those, like Furley and Irwin, who accept that Aristotle's account is realist.

good or it does not make teleology a mere aspect or kind of efficient causality.

I conclude that the Furley/Irwin reduction of the final cause to an aspect of the efficient cause succumbs to textual and philosophical problems.

2 4 Reductions to the Material Cause

2 4 1 The program view

A number of interpreters (Balme 1987; Bradie and Miller 1984; Matthen 1989; and Miller 1995) reduce at least select cases of teleology to a very specific sort of material cause. On such views some portion of Aristotle's use of teleology is identified with his postulation of highly structured low level material potentialities — analogous to molecular 'programs' or DNA molecules — that control organic growth and development (see especially Bradie and Miller 1984, 143). Each account distinguishes this use of final causality from Aristotle's invocation of final causality in other contexts.[38]

This approach therefore employs a divide and conquer strategy in promoting its reductive interpretation. Some set of Aristotle's uses of teleological explanation are well-founded and defensible; others are undefended at best and possibly indefensible. One clear problem for the approach is the fact, noted above in section 1 3, that Aristotle does not distinguish between types of teleology *qua* types of teleology along the lines this interpretation requires. Throughout the corpus the types of teleological cause (if indeed they are distinct types) are treated uniformly

38 Matthen's view is difficult to categorize, and my approach emphasizes only one aspect of his complex account. Matthen accepts, as I argue in this essay, that Aristotle's most frequent use of teleology is *sui generis* and irreducible. But he also considers the view 'reprehensible' (166) — a thesis about which I raise doubts (see notes 3 and 17) — and spends the largest portion of his essay elucidating a 'more modern use of causes' (173) evident in Aristotle's embryology. Unlike the reprehensible uses, this cause may make a contribution 'of lasting importance to reductionist philosophies of mind' (169). In the embryology, Aristotle recognized that 'the events that constitute the development of the embryo are nothing but' principles by which matter is organized (173) — i.e., Aristotle accepts the program view. I categorize Matthen's account as reductionist on the basis of this emphasis on the reductive 'side' of his divide and conquer strategy.

just insofar as each is a final cause. We may conclude on this basis that there is insufficient textual support for supposing that this is Aristotle's view of final causality. Even the supposition that we may look to Aristotle for antecedents to the program view is undermined by the fact that Aristotle himself does not distinguish between 'types' of teleology *qua* teleology in the way required by the interpretations.[39]

Further, the view of teleology invoked here is correctly considered to be a failure by contemporary philosophers working on the problem of biological teleology. The main problem for all such views is that for any sort of material structure that is claimed to ground teleology in biological systems a materially identical counterpart to that structure can be found in systems that are not teleological (see Bedau 1992a; 1992b; Nissen 1997, chapter one).[40] The philosophical poverty of the reductive analysis undermines its plausibility as an interpretation given that these interpreters abandon vast stretches of Aristotle's teleology in order to isolate a place

39 Gotthelf (1997, 80) correctly criticizes the Bradie/Miller interpretation for advancing their interpretation of a portion of Aristotle's uses as Aristotle's without sufficient textual basis.

40 Matthen (1989) is most explicit concerning the analysis of teleology that he claims to find in Aristotle, so the relevance of this point to these Aristotelian accounts is most obvious in his case. On his account, 'a series of events is directed towards a certain end if a) it normally culminates in that end, b) it occurs within a substratum so fashioned that a particular action, performed by a particular sort of agent, will ensure that the series of events occurs in its entirety (unless some subsequent event interferes) and c) this series of motion is *natural* (not fortuitous or forced). The cause of the ordered sequence is *form*' (178). Whether the case of death — a case Matthen is concerned to handle properly — is ruled out by this account depends on how we understand the 'ensuring' that is supposed to occur in the second clause of the definition. This is because death *is* guaranteed by an organism's being born despite the fact that it is not a *per se* result of the organism's form. If the 'ensuring' specified in (b) is read broadly (as indicated by Matthen's claim that development involves 'nothing but' material principles) then the account incorrectly fails to rule death out as an end. If 'ensuring' is read narrowly as restricted to the *per se* results of form then death is ruled out but only at the cost of replacing a reduction to the material cause with a reduction to the formal cause. Assuming that we understand formal and final causation as distinct in being (i.e., with each respectively something 'over and above' the other) the analysans would still contain no *sui generis* teleological concepts and would still, therefore, be reductive. If we were to understand Matthen's account in this way my objections would revert to arguments of the type employed against Cooper's account, above.

for (or at least an antecedent to) this allegedly more adequate modern notion.[41]

I conclude that there are sound textual and philosophical grounds for rejecting the program view of teleology as an interpretation of even a select portion of Aristotle's employments of teleology.

2 4 2 Teleology and irreducible potentials for form

Allan Gotthelf calls his influential interpretation of Aristotle's teleology the '"irreducible potential" interpretation' (Gotthelf 1976/ 1987). On this view to be teleologically directed (in the basic sense)[42] is to be a potentiality (*dunamis*) — irreducible to lower level material potentialities — for a developed form. Officially, Gotthelf says:

> Aristotle's concept of *coming-to-be for the sake of* may be defined as follows:
>
> A stage in development, *A*, comes to be for the sake of the mature, functioning organism which results from the development, *B*, if and only if: (1) *A* is a necessary (or "best possible") stage in a continuous change resulting in *B*, and (2) this change is (in part) the actualization of a potential for *B* which is not reducible to a sum of actualizations of element-potentials whose identification does not mention the form of *B*. (213)

According to Gotthelf, what makes this an explanation of teleological directedness is the fact that 'the identity of a nature or potential is given in part by its object or end (i.e., by what it is irreducibly *for*).' Reference

41 Oddly, Balme (1987) appears both to see this point *and* to offer the interpretation nonetheless. He makes the rather surprising claim at the start of his essay that the 'cybernetic model' which he claims Aristotle was 'moving towards' offers no solution to the basic problem of teleology since the cybernetic model shows only that some 'apparently teleological processes may in fact be necessary outcomes' (275).

42 Gotthelf employs a divide and conquer reductive strategy (see section 1 3 above). He argues that 'being for the sake of' is to be analyzed in terms of a more basic form of teleology, 'coming to be for the sake of', and is concerned to elucidate the latter (see Gotthelf 1997, 72-3). Gotthelf's account, unlike the accounts of Bradie and Miller, Matthen, and Balme (discussed above) claims to cover all cases of Aristotelian teleology. For criticism of Gotthelf's attempt to analyze all Aristotelian teleology in terms of this basic notion see Charles (1991, 106-11).

to a potential for a form that is irreducible to lower level material potentials 'puts into the explanans an irreducible reference to an outcome for which the explanandum is antecedently necessary' (232, emphasis in the original).

This account is clearly reductive — the analysans contains no teleological notions.[43] The central notions in the analysans (being a potentiality, actualization, and being irreducible) are nonteleological notions and have broader application than to cases of teleology. Further, despite Gotthelf's express wish to disavow teleological reduction to *lowest level* material causes, his analysis does count as a form of reduction to the material cause in virtue of the fact that the analysans refers primarily to potentialities and potentialities are material elements in Aristotle's ontology.[44] There can be lower and higher level material potentialities given Aristotle's hylemorphic view of matter (and some higher levels may indeed be irreducible to any lower levels) but this does not undermine the view that potentialities as potentialities play a material role.[45]

This account suffers from each of the problems with which we are by now familiar: it receives insufficient textual support and it fails as a reductive account of final causality. The textual worry is straightforward. Despite forwarding an elaborate, textually sensitive, and powerful case for the claim that Aristotle accepts an unreduced level of potentiality, Gotthelf provides scant textual basis for his employment of the 'divide and conquer' strategy. He cites one passage in support of dividing

43 Gotthelf calls his account the 'irreducible potentials' account, and explicitly denies that his account of teleology is reductionistic. In one sense he is clearly right: he holds that there is in Aristotle a set of material potentialities irreducible to lower level potentialities. But in the sense at stake in this essay Gotthelf's view is paradigmatically reductionist for the reason given in the text. Gotthelf's view undergoes very little development in later presentations and so my account concentrates on the original formulation. See also Gotthelf (1988; 1989; 1997).

44 See *Phys* I 9, 192a25-33, II 1, 193b7-8; *DA* I 1, 412a9, 412a21, II 2, 414a15; *Metaph* IX 8, 1050a15-16, 1050b2, XII 5, 1071a8-9, and XIV 4, 1092a3-4. David Charles describes Gotthelf's view as a version of a reduction to efficient causes (1991, 110-11); I disagree with the classification but our accounts are in other respects similar.

45 See *Phys* II 2, 194b9-10; *PA* I 1, 646a12-b10, II 1, 646b11; *Meteor* IV 12, 389b27-9; and *GA* I 1, 715a9-11.

Aristotle's uses of teleology as he does (*PA* I 1, 640a10-b4), but this text offers the reductive strategy at best ambiguous support.[46]

Setting this problem aside, the reductive hypothesis receives insufficient textual support on its own terms. Given the influence of Gotthelf's account, it is important to emphasize the bold nature of his reductive hypothesis. According to Gotthelf, 'Aristotle's central explanatory concepts are "nature" (*phusis*) and "potential" (*dunamis*)' (209), but only the broadest outlines of this reductive interpretation make it into Gotthelf's published work.[47] Even concerning the one notion on which Gotthelf does focus in his reductive scheme — the final cause — there are prima facie puzzles that Gotthelf's analysis does not address. Consider the following.

The suggestion that final causality is to be analyzed in terms of the possession of a potentiality or *dunamis* ought to come as a surprise — the hypothesis seems to get the priority relations between Aristotle's notions exactly backwards.[48] Final causality is frequently associated with formal causality,[49] form and matter are frequently contrasted,[50] and matter and potentiality are frequently linked.[51] It is unclear how Gotthelf's view is meant to accommodate these facts. My point is *not* that Gotthelf could not reply to these concerns and deepen his account; my point is precisely that before we should accept Gotthelf's bold reductive hypothesis we need to see such an account worked out in plausible detail.

Thus, Gotthelf's reductive reading receives insufficient textual support in two senses: it leaves the 'divide and conquer' strategy employed textually unmotivated and it offers inadequate textual support for the bold reductive hypothesis in its own terms. Moreover, Gotthelf's reductive analysis is highly problematic on philosophical grounds. I have mentioned already that the notion of a potentiality is not a teleological

46 See Charles' criticisms (1991, 106n4).

47 Charles (1991, 106) describes some of the problems involved.

48 David Furley (1996, 69) makes a similar criticism, citing *Physics* 193b17-20.

49 See *Phys* II 7, 198a25, II 8, 199a30-33; *GC* II 9, 335b6; *DA* II 4, 415b10-12; *GA* I 1, 715a4-6, and 715a8-9.

50 See *DA* I 1, 412a9, II 2, 414a15; *Metaph* IX 8, 1050b2; *Phys* II 1, 193b7 and IV 5, 213a2.

51 See *Metaph* IX 8, 1050a15, XII 2, 1069b19, XII 5, 1071a8, XIV 4, 1092a3; *OH* IV 4, 312a16-21.

notion, and that the account is therefore a reductive account. Adding that a potentiality is irreducible to the lowest material level also fails to elucidate teleology, for irreducible potentials may themselves be teleological or nonteleological.[52] We must ask, then, how Gotthelf hopes to bridge the reductive gap and account for teleology in these nonteleological terms.

Given the influence of Gotthelf's account this step in his argument warrants repetition and analysis. Gotthelf invokes the facts that 'the identity of a nature or potential is given in part by its object or end (i.e., by what it is irreducibly *for*)' and notes that reference to a potential for a form which is irreducible to lower level material potentials 'puts into the explanans an irreducible reference to an outcome for which the explanandum is antecedently necessary' (1976/ 1987, 232, emphasis in the original). Thus, the core of Gotthelf's account refers to an undisputed fact about potentialities: potentialities are posterior in definition to actualities.[53] The definition of a potentiality will make reference to what the potentiality is a potentiality *for*.

But here we have a slip: every potentiality is a potentiality *for* some actuality, but the 'for' in this employment carries no teleological connotations. 'For' is ambiguous between teleological and nonteleological uses. From the fact that a potentiality is the potentiality it is with reference to a specific actualization we can draw no conclusions about teleology. Gotthelf's abbreviated and oft-repeated slogan for his view is that to be teleologically directed is to have an 'irreducible potential *for* form.' But each occurrence of this slogan contains the seeds of its own refutation. If we read the 'for' teleologically then we have neither a reductive account of teleology nor any account at all — *sui generis* teleology of the sort claimed to be ontically grounded in something more familiar or philosophically palatable has crept into the analysans. If we read the 'for' nonteleologically then the account fails to provide a reductive ground for teleological commitment since teleology is something

52 Irreducible potentials may be one in number with some final causes and yet fail to be one in being with final causes. Gotthelf's arguments do not provide support for the strong conclusion that Aristotle considered irreducible potentials for form and teleological directedness one *in being*.

53 See *Metaph* VII 1, 1028a35-6, IX 8, 1049b4-16, 1050b3, 1051a3, XII 6, 1072a9; *DA* II 4, 415a18 and *EN* IX 9, 1170a15-19.

over and above the possession of an irreducible potential (nonteleologically) for form.[54]

I conclude that Gotthelf's interpretation of Aristotle's teleology in terms of irreducible potentials for form is incorrect. Not only does the analysis lack adequate textual support but it also appears implausible given Aristotle's frequent associations of form and final cause and disassociation of final and material cause. Further, the notion of a potential (reducible or not) is of the wrong categorial sort to ontically ground teleology. Irreducible potentials for form may be correlated with an important employment of teleology in Aristotle but we have been given insufficient reason to accept that Aristotle conceived of teleological directedness as one in being with irreducible potentials for form.

3 Conclusion

The thesis that Aristotle's notion of the final cause is the notion of a *sui generis* causal factor enjoys strong direct and indirect textual support, support that is supplemented by dialectical evidence arising from problems with alternative accounts. No attempted reduction receives adequate textual support, and none stands as a philosophically acceptable (and hence charitable) account in its own right.

I conclude that the correct interpretation of Aristotle's ontological commitments vis-à-vis teleology is the *sui generis* interpretation. Such a conclusion, of course, raises a host of problems and questions beyond the scope of this essay. Aristotle may be accused of multiplying entities beyond necessity if he fails to provide strong epistemic grounds for postulating final causes. Further, he may be accused of trading in mystery if there is no informative nonreductive analytic account teleology.[55] Most pressingly, we may fear that Aristotle's ontic commitments have been refuted by the findings of modern science given the widely reported

54 Theodore Scaltsas diagnosed a similar problem for Gotthelf's reductive account (1988, 141). Gotthelf's response (1988, appendix 138) does not address the fundamental issue, in my estimation.

55 Such an account could be modeled on the nonreductive interdefinability of the modal notions necessity and possibility. See Alvin Plantinga (1993, chapter one) for such a nonreductive analytic account.

discovery that we live in a world with room only for 'efficient' causes.[56] Despite these problems, however, the task of determining Aristotle's ontic commitments should come before efforts to deal with the consequences of those commitments.[57]

Department of Philosophy
3211 Providence Drive
University of Alaska, Anchorage
Anchorage, AK 99508
U.S.A.
RichCameron@UAA.Alaska.EDU

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56 I have indicated briefly in notes 3 and 17 why I believe that this criticism deserves more scrutiny than it generally receives. Usurping the title William Hasker gives to the interaction problem in the philosophy of mind, I believe a strong case can be made that this objection 'may well hold the all-time record for overrated objections to major philosophical positions' (1999, 150).

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