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## Article

### On Biological Function: A Critical Examination of Eliminativism

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#### Abstract:

Eliminativism is a peripheral (if not dead) position in the current biological function debate, and it is roughly presented as the thesis that function terms are eliminable in biological discourse. While eliminativism is often assumed inadequate, a detailed examination of eliminativism is lacking in current literature. Accordingly, this article provides a critical examination of eliminativism. This examination consists of three parts: a clarification of three supporting arguments for eliminativism (based on historical literature), a unified account of eliminativism (inspired in particular by Larry Wright 1976), and a discussion of its validity and some of its implications. This article concludes by briefly addressing the persistent presence of function terms in biological discourse.

**Keywords:** Biological Function; Eliminativism; The Descriptive-Prescriptive Distinction; Life

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## 1. Introduction

The biological function debate is now making a comeback. In recent years, one of the leading scholars in the biological function debate Justin Garson has revived old controversies and advanced new accounts in several articles and monographs (2011, 2012, 2016, 2017a, b, 2018, 2019a, b). At the same time, a few other scholars have also made contributions to renewing the biological function debate (Mossio et al 2009; Nanay 2010; Artiga 2011, 2014; Saborido et al 2011; Kraemer 2013; Huneman ed. 2013; Saborido 2014; Artiga and Martínez 2016; Mossio and Saborido 2016; De Prado Salas 2017; Neander 2017; Cusimano and Sterner 2019; Matthewson 2020). While most scholars have tended to sharpen and clarify their own standpoints, it is also fair to claim that, as Garson (2018) does, “many philosophers of biology have embraced function pluralism... the idea that biologists use the term ‘function’ in different ways on different occasions” (p. 1101; see earlier formulations of pluralism also in Godfrey-Smith 1993, Mitchell 1993, and Preston 1998).

The biological function debate dates back to the 1960s and has since then generated a variety of accounts of biological function. Due to the limit of space here, it is impossible to

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give an informative overview of these different accounts (but see Walsh and Ariew 1996; Wouters 2005; Garson 2008, 2016). Yet, the main approaches are of two, the etiological approach (Williams 1966; Ayala 1970; Ruse 1971; Wimsatt 1972; Wright 1973; Millikan 1989; Neander 1991; Griffiths 1993; Godfrey-Smith 1994; Garson 2011, 2012, 2017a) and the system approach (Beckner 1969; Cummins 1975; Prior 1985; Bigelow and Pargetter 1987; Enc and Adams 1992; Amundson and Lauder 1994; Walsh 1996; Schlosser 1998; Davies 2001; Boorse 2002; McLaughlin 2003; Wouters 2003; Mossio et al. 2009).<sup>2</sup> The basic idea of the etiological approach is that the function of a biological trait is to be understood through its etiological history, mainly (but not exclusively) its evolutionary history in relation to natural selection (for this reason, the etiological approach is often termed the evolutionary approach. See Saborido 2014, for a recent example). In contrast to the etiological approach, the system approach is notably ahistorical, and it claims that the function of a biological trait is to be analyzed through its current contribution to the maintenance of a larger system with certain characteristics.

Given the existence of so many different accounts of biological function and the pluralist consensus, it appears difficult to hold the eliminativist position in the current biological function debate. In general, philosophers of biology today treat eliminativism as a peripheral (if not dead) position. In current literature on biological function, it is often difficult to find even a brief reference to eliminativism (but section 2 starts by discussing a rare exception, Garson 2008). The difficulty of seriously examining eliminativism is not diminished by surveying historical literature. While voices of eliminativism are often heard and some philosophers are labelled as eliminativists in historical literature, a detailed account of eliminativism-not to say a critical examination of it-remains unavailable.

It is therefore the intent of the present article to critically examine the eliminativist position. This examination consists of three parts. First, based on historical literature, it clarifies three supporting arguments for eliminativism (section 2). Second, inspired in particular by Larry Wright (1976), it offers a unified account of eliminativism (section 3). Third, it discusses the validity of eliminativism and its implications (section 4). This article concludes by briefly addressing the persistent presence of function terms in biological discourse.

## 2. Three Supporting Arguments for Eliminativism

This section clarifies three supporting arguments for eliminativism, the translatability argument, the matter-of-interest argument, and the metaphor argument. Yet, as mentioned above, it is often difficult to find a reference to eliminativism in current literature. The only exception comes from Garson (2008), a review article on biological function and teleology. In this review Garson depicts eliminativism as follows:

...biological entities do not “really” have functions (or refuse to countenance them in one’s explanations) since they are not typically designed with purposes in mind.

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<sup>2</sup> There is a terminological issue here. Some might object that it is impermissible to place currently popular organizational accounts under the system approach, because, first, current organizational accounts (Mossio et al. 2009; Saborido et al. 2011; Saborido 2014; Mossio and Saborido 2016), in contrast to earlier ones (Schlosser 1998; McLaughlin 2003), claim to have integrated the virtues of both etiological and system approaches; second, they are also interpreted as belonging to the etiological approach (Artiga and Martinez 2016). In this particle, I hope to evade this terminological issue, by following earlier organizational accounts (especially Schlosser 1998) to explicitly place them under the system approach as against the etiological approach; supporters of current organizational accounts, I believe, will not object to this classification, because, in line with the system approach they stress the ahistorical character of their accounts (Mossio and Saborido 2016) and oppose the interpretation of Artiga and Martinez (2016)

Accepting this eliminativist position with respect to the existence of function does not, however, imply that scientists should never ascribe functions to biological entities or that it is illegitimate or counterproductive to do so. They may legitimately do so, so long as they recognize that such usage is metaphorical (i.e., it involves examining biological forms “as if” they were created for a purpose) and that it performs a purely heuristic role in stimulating actual scientific theories. (2008, 528-9)

In this passage, Garson touches upon the metaphor argument (“such usage is metaphorical”) and the matter-of-interest argument (“it performs a purely heuristic role in stimulating actual scientific theories”). However, he appears to miss the perhaps most forceful argument for eliminativism, that is, the translatability argument.

## 2.1. The Translatability Argument

The translatability argument is often expressed in historical literature. Here are several different formulations from John Canfield, Morton Beckner and Ernest Nagel:

Can all functional analyses containing the locution “function” be translated into sentences which contain neither “function” nor any other teleological term? ... Perhaps the standard answer... is that functional analyses can be translated into sentences containing no teleological terms. I believe that this answer is right... (Canfield 1964, 285)

Given any single case of an activity which is describable in teleological language, that case is also describable in non-teleological language. By this I mean that every observable aspect of the activity which in fact serves as the basis for our application of teleological concepts can also be described by means of a conceptual apparatus that is not teleological in character. (Beckner 1969, 162)<sup>3</sup>

If the goal-supporting view of biological functions is correct, functional statements, as well as the presuppositions of functional ascriptions, can also be rendered without using functional concepts. (Nagel 1979a/1977, 314)

The last formulation from Nagel contains a clear argument for eliminativism. Nagel is now regarded as an early representative of the goal-contribution account of biological function (Garson 2008). According to this account, in Nagel’s own words, “a function of item *i* in system *S* and environment *E* is *F*, presupposes... that *S* is goal-directed to some goal *G*, to the realization or maintenance of which *F* contributes” (1979a/1977, 312). Nagel’s argument for eliminativism is easy to follow. Given his goal-contribution account, “a function of item *i*” is simply *F* in relation to certain goal *G*, system *S* and environment *E*; as a result, function terms can be replaced by the latter and are therefore eliminable.

Nagel’s argument applies easily and perhaps a bit strikingly to any other account of biological function. It is useful to refer to two latest examples. Within the etiological approach, the most up-to-date account is Garson’s “general selected effects theory of function”:

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<sup>3</sup> However, Morton Beckner literally holds the view that “eliminability does not mean translatability” (Beckner 1969, 164). Yet, he also confesses that he does not know “how to prove it” (p. 164) and maintains still that function terms “can be eliminated without loss from sciences” (p. 164). Despite the complexity of his general standpoint, this article treats Beckner as an eliminativist who endorses the translatability argument, even though he has perhaps a different conception of translatability in mind.

GSE: the function of a trait consists in that activity which historically contributed to its differential reproduction or its differential retention within a biological population. (2012, 460; also see 2016, 2017a)

In contrast, Mossio et al (2009) provide the latest account of biological function within the system (they might call “organization”) approach:

A trait T has a function if and only if: C1: T contributes to the maintenance of the organization O of S; C2: T is produced and maintained under some constraints exerted by O; C3: S is organizationally differentiated. (p. 828)

These two accounts are both unnecessarily complicated, and the scholars are also tedious in their elucidations of key concepts and their responses to possible criticisms (Garson 2016; 2017a; Saborido et al. 2011; Mossio and Saborido 2016). Yet the intent of the present article is not to discuss these elucidations and responses. The point is that their accounts support the translatability argument well. In Garson (2012)’s case, the function of a trait, according to his account, is simply identical to “that activity which historically contributed to its differential reproduction or its differential retention within a biological population” (p. 460). So, functional statements about the trait can be replaced by statements describing the respective activity. Similarly, in Mossio et al (2009)’s case, the function of a trait T is identical to its contribution in related conditions (C1, C2, C3). As a result, functional statements about T can be replaced by statements about its contribution in those conditions. In both cases, therefore, functional terms are eliminable.

More generally speaking, it is easy to see that the possibility of such eliminative translations is inherent in all accounts of biological function, which essentially share the same logical structure, as Peter Schwartz has summarized:

[In the biological function debate] philosophers offer short lists of necessary and sufficient conditions for the application of the [functional] concept-where the conditions involve only acceptable physical or biological notions-and claim that the set of conditions captures the import of function statements. (2004, 136)

Clearly, if philosophers offer accounts of biological function as such to capture “the import of function statements”, then it is not mistaken to replace functional concepts and statements with those “lists of necessary and sufficient conditions” involving “only acceptable physical or biological notions”. In other words, if the meanings of function terms are exhaustively captured by philosophical accounts, they can simply be replaced by respective biological terms in those accounts, with no loss of meanings. As a matter of fact, all accounts of biological function appear to have presupposed the translatability argument, which necessarily entails eliminativism.

The translatability argument for eliminativism appears simple, if not trivial. Yet, as the case of Garson’s review article (2008) attests, philosophers are in general unaware of it, and they have made no attempt to reject it. Some might wonder why this is the case. While a detailed discussion is only possible in section 4, here it is enough to give a brief illustration. In my view, the main reason is that the current biological function debate is exclusively concerned with a descriptive question, that is, how to capture actual biological usage? As a result, the proposed accounts or translations, often very sophisticated, are intended to describe how biologists actually use function terms. But eliminativism, as a matter of fact, deals with a different question of a prescriptive nature, that is, how could actual biological usage be? And the eliminativist answer is that biologists could (not must) do without function

terms. Having different questions in mind, eliminativism does not contradict any existent account of biological function at all.

## 2.2. The Matter-of-Interest Argument

Garson in his review article (2008) already alludes to the matter-of-interest argument, when he characterizes eliminativism as relying on the idea that “it [the term function] performs a purely heuristic role in stimulating actual scientific theories” (p. 529). Here are some more explicit formulations of the idea in historical literature from E. W. Prior, J. Bigelow and R. Pargetter, and Kenneth Schaffner:

... The ascription of a function is both theory and interest relative—the function of a particular organ will be that of its effects which features in our best account of some interesting (higher-level) capacity of the organism in question. (Prior 1985, 324)

A variant on this eliminativist view adds an account of why the attributions of function seem to serve a useful purpose in everyday and scientific discourse... an eliminativist can interpret talk of “functions” as being merely the specification of effects one happens to be interested in. Which effects are deemed to relate to “functions” of a character, will depend not on the nature of the character itself, but our interests. (Bigelow and Pargetter 1987, 183)

Such [functional] language has important heuristic roles in focusing our attention on entities that satisfy the secondary sense of function and that it is important for us to know more about practical and theoretical aspects of research program development. (Schaffner 1993, 390)

The matter-of-interest argument can be presented as follows. Function terms play a role in helping biologists stipulate some portions of biological knowledge, determined by their research interest. It follows that, function terms are extra to biological knowledge and are therefore eliminable.

It should be noted that the matter-of-interest argument enlists more philosophers who are not explicit eliminativists into the eliminativist camp. For instance, J. Bigelow and R. Pargetter (1987) surprisingly include Cummins (1975) as an eliminativist. Garson (2014), in a response to Schyfter (2015), terms this type of eliminativists conventionalists, and summons, other than Cummins (1975), Hardcastle (1999) and Craver (2013).<sup>4</sup> Cummins’ formulation is not so explicit, but here are what Hardcastle and Craver claim:

Most functional explanations gloss over the details, cover relatively few items, and are simply correlations discovered between the parameters defined in theoretical models of phenomena picked out by the historical interests of the discipline... functions are simply what T is doing in o, relative to a domain of inquiry. (Hardcastle 1999, 40)

Functions, on this view, are roles within mechanisms, defined ultimately in terms of a topping-off point selected for its relevance to observer interests and perspectives. (Craver 2013, 142)

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<sup>4</sup> Garson also labels Davies (2001) as a conventionalist of this type, but my reading of Davies (2001) indicates no evidence for Garson’s claim, and what Davies explicitly declares is that “our explanatory interests may be important in the discovery of systemic functions, but our interests are neither necessary nor sufficient for the existence of such functions” (pp. 8-9).

Since these philosophers appear to accept the premise of the matter-of-interest argument, and if the matter-of-interest argument is sound, they are necessarily eliminativists.

Taken at its face value, however, the matter-of-interest argument is more difficult to accept than the translatability argument. Its premise assumes that function terms are extra to biological knowledge and their use is solely determined by the arbitrary interests of biologists. This implies that function terms lack resultantly literal meanings in biological discourse. But clearly, this consequence is unacceptable because it is incompatible with function pluralism, i.e., the existence of a variety of accounts of biological function, which simply presupposes that function terms have literal meanings.

Nevertheless, for proponents of eliminativism, it is not obvious that the matter-of-interest argument necessarily contradicts pluralism, if a slightly different reading of this argument is adopted. Indeed, the matter-of-interest argument can be understood as suggesting that the pluralism stems from different research interests of biologists. Garson presents pluralism as “the idea that biologists use the term ‘function’ in different ways on different occasions” (2018), and this formulation of pluralism sits well with the matter-of-interest argument. To put it more explicitly, an account of biological function can be read as having captured a possible research interest of a biologist, and it is this research interest of the biologist that determines his/her choice of a particular account. Moreover, it is clear that research interests of biologists are not necessarily arbitrary, and function terms can indeed be used by them, in a fairly regular and stable manner. This is well attested by the existence of accounts of biological function, which are simply regular and stable translations.

Finally, it is still possible to claim that function terms lack literal meanings in biological discourse. When those against the matter-of-interest argument claim that function terms do have literal meanings, they intend that the meanings of function terms are contained in the translated results. Yet, when a careful proponent of the matter-of-interest argument claims that function terms lack literal meanings, he/she can mean that function terms express nothing more than the translated results. Understood as such, function terms are indeed extra to biological knowledge, and the matter-of-interest argument runs close to the translatability argument: since respective biological terms in the translated results have already expressed these literal meanings, function terms are at least unnecessary and appear still eliminable.

### 2.3. The Metaphor Argument

Garson (2008) also touches on the metaphor argument, when he characterizes eliminativism as endorsing that “such usage is metaphorical” (p. 529). The metaphor argument claims that, since function terms are mere metaphors and lack resultantly literal meanings in biological discourse, they are eliminable. The metaphor argument is apparently more difficult to accept than the matter-of-interest argument, since it relies on an even stronger premise that function terms in biological discourse are mere metaphors. To elaborate, this premise is supported by two further assertions: the use of function terms implies the existence of intentions (or mental purposes); yet biological entities are not typically associated with these. As a result, the presence of function terms in biological discourse at best indicates that biological entities are often treated as if they were associated with intentions, and for this function terms are mere metaphors that allude to intentions.

It is therefore clear that the metaphor argument relies on a particular account of function terms, that is, the intentional account. The intentional account suggests that function terms must be understood through the existence of intentions. Indeed, if the intentional account is to be read also as a translation proposal, it simply presupposes that translated results must include terms denoting intentions. Nevertheless, this presupposition is not welcome by philosophers of biology and is almost universally repudiated in the

biological function debate. Moreover, it does not accord with present biological usage, to capture which non-intentional accounts of function terms are clearly more adequate. Overall, this presupposition is too strong to be reasonable, at least from the descriptive point of view.

However, even though the intentional account often fails to capture actual biological usage, it is less problematic if viewed as issuing a mere prescription. Given this prescription, it is adequate to judge that function terms in biological discourse amount at best to metaphors and lack resultantly literal meanings. Here, perhaps a more interesting question is, is there any fatal consequence of issuing such a prescription? Admittedly, this prescription goes radically against actual biological usage today; yet, it seems quite compatible with an important consequence of the translatability argument. Indeed, the translatability argument entails a hypothetical scenario in which all function terms in biological discourse were translated and replaced thereafter by conventional biological terms. In that scenario, function terms would be absent. And, in my view, that absence accords well with the prescriptive intentional account.

### 3. A Unified Account of Eliminativism

Section 2 has presented three supporting arguments for eliminativism in historical literature. As I have shown, the matter-of-interest argument and the metaphor argument, although problematic taken at face values, could find support from the translatability argument. Indeed, the connections between the three arguments are more than that. This section offers a unified account of eliminativism, by taking in the insights of all three arguments. The unified account is inspired in particular by Larry Wright (1976).

It is helpful to start with the matter-of-interest argument. Section 2 has shown that the matter-of-interest argument is compatible with actual biological usage, and that the current pluralist consensus can be read as resulting from different research interests of biologists, which can be stabilized and expressed through various different accounts of biological function. However, the matter-of-interest argument has more implications on biological usage, and one of them is that, if function terms are read as indicating research interests of biologists, then it is inevitable that the use of them exhibits a creative appearance. In other words, by using function terms, biologists with new research interests can of course refer to new biological knowledge. As a result, actual biological usage can be updated, and new accounts of function terms are in need. Indeed, philosophers are also free to devise such new accounts, and in that case, these new accounts are simply stipulative recommendations (or prescriptions, to speak in a stronger manner) for new biological usage.

In sum, the matter-of-interest argument indicates that meanings of function terms can change. Very interestingly, the chief supporter of the etiological approach in the early biological function debate, Larry Wright (1976), already discusses such a scenario in detail. For Wright, the original meanings of function terms indicated exclusively “human, conscious, intentional behavior” (p. 12), and given their original meanings, using function terms in any nonhuman case would be “to traffic in dubious metaphor” (p. 12). However, in later passages Wright claims:

A metaphor dies when the metaphorically extended use of a term becomes established more or less independently of the original paradigm. Perhaps because of an unusual demand for the insight or appreciation afforded by the extended use, it will develop a life of its own. A new concept will be formed within its own characteristics, which are related to, but no longer logically so dependent upon the original use of the term. (pp. 19-20)

For Wright, since a new, “metaphorically extended” use of function terms arises, he has a new task of meeting “the requirement of literal translatability” (p. 18), namely, to elucidate the new meanings of function terms, with an updated translation. As a matter of fact, this is the often-ignored background of Wright’s classical etiological account of biological function.<sup>5</sup>

Wright touches unmistakably on both the metaphor argument and the translatability argument. Importantly, he does not see any contradiction between viewing function terms as metaphors and treating them as having literal meanings. Indeed, he understands well that the meanings of function terms are likely to change: the original meanings of function terms indicated exclusively intentions, and they lacked resultantly literal meanings in biological discourse; yet, new meanings later emerge and become standard, and there follows the need of updated accounts.<sup>6</sup>

Now a unified account of eliminativism is ready at hand: in biological discourse function terms have long been present; their original meanings merely refer to intentions, and in that case the use of function terms in biological discourse is at best *metaphorical*; but gradually, through helping biologists stipulate different *research interests*, the use of function terms becomes stabilized (although in pluralistic circumstances) and becomes open to stable translations; so, they evolve to a stage in which they possess non-intentional meanings; as a result, in biological discourse they become more than metaphors; yet, they are still eliminable, since they *can be translated* and thus replaced by conventional biological terms. In this unified account, the metaphor argument, the matter-of-interest argument and the translatability argument are united to support the eliminativist position.

Finally, to further understand this account, a comparison between biology and physics is particularly illuminating (Nagel 1979b/1961, 407-8). Similar to biologists, physicists are also abhorred by intentional accounts of function terms (and teleological terms in general). But the physicist strategy of dealing with them is rather different. Physicists today are almost universally eliminativists and they think that function terms necessarily refer to intentions outside the physical realm and are therefore eliminable. Thus, it is easy to see that, while physics has no issue with the entire elimination of function terms in its own territory, as it considers only intentional accounts of function terms to be legitimate, biology retain function terms by offering new and safe accounts, which are necessarily non-intentional. Both strategies work well. However, to emphasize, function terms can only be saved in biological discourse after their intentional meanings, as Wright rightly emphasizes, have been discarded.<sup>7</sup>

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<sup>5</sup> Nagel also briefly considers this scenario and he observes that “it is a plausible claim that the primary meaning... is stated by the intentional view; and it is not unreasonable to suppose that the prevailing more inclusive sense of the phrase is a ‘metaphorical extension’ of its initial meaning” (Nagel 1979b/1977, 280). Yet, in line with Wright’s basic concern, Nagel also states that the intentional account has “no application in most parts of biology” (p. 280) and “contributes little to the clarification of the concept as it is used in biology” (p. 281).

<sup>6</sup> Here an unavoidable question is, has Wright given a plausible story of the history of the use of function terms (and teleological terms in general)? Some pieces of evidence appear to support this story. For instance, Kant in his time did not even consider any non-intentional accounts of teleological terms (2000/1790); C. J. Ducasse claimed in 1925 that “it follows from this definition of purposiveness that only the acts of entities capable of belief and desire, are capable of being purposive, and therefore that the occurrences of ‘inanimate nature’ cannot be spoken of as purposive without contradiction, unless belief and desire be injected into nature...” (p. 154); and even in Wright’s time, there were still several philosophers who considered only intentional accounts to be legitimate (Taylor 1950; Woodfield 1976; Nissen 1993; 1997). Overall, this question is empirical in nature and goes far beyond the concern of the present article. Here it seems enough to keep in mind that Wright’s story depicts a logically plausible scenario.

<sup>7</sup> Moreover, an awareness of meaning change of function terms indicates the possibility of viewing function terms as anthropomorphic vestiges. Even though function terms in biological discourse have



## 4. A Discussion of Eliminativism

Section 2 has shown that in historical literature there are at least three supporting arguments for eliminativism. Section 3 has offered a unified account of eliminativism by taking in insights from all three arguments. Overall, the translatability argument for eliminativism appears the most forceful. On the one hand, it supports the other two arguments indirectly; on the other hand, it directly engages the current biological function debate and tries to show that eliminativism is a necessary consequence of all existent (non-intentional) accounts of biological function.

As mentioned in 2.1, the translatability argument for eliminativism is simple if not trivial. However, in the current biological function debate, eliminativism is a peripheral position rarely mentioned in literature, and the translatability argument is surprisingly not even touched on in the most recent presentation of the eliminativist position (Garson 2008). Then, some might wonder why philosophers who have offered a variety of accounts of biological function have simply ignored the translatability argument, and the biological function debate has so far failed to address eliminativism. The most important reason, as briefly mentioned in 2.1, lies in an oblivion of the descriptive-prescriptive distinction. But before elaborating the importance of this distinction to eliminativism, it is worth discussing another more obvious reason for the general negative attitude towards eliminativism.

Indeed, often such a negative attitude is simply driven by a particular conception of eliminativism, in which eliminativism is understood as arrogantly dictating that function terms in biological discourse *must* be eliminated. Yet, given the abundance of such terms in biological discourse, eliminativism understood as such goes radically against actual biological usage and appears rather absurd. However, this form of eliminativism is a strawman, more or less designed for a ready rejection. Indeed, as the previous clarification has shown, more serious arguments for eliminativism have never embraced such an absurd conception, and their conception of eliminativism is more moderate. Accordingly, eliminativism can be understood as suggesting that function terms *could* be eliminated.

Here follows the most important reason for which eliminativism in general and the translatability argument in particular are often neglected. Indeed, eliminativism is more concerned with a prescriptive question, that is, what could biological usage be? In contrast, the current biological function debate deals with a descriptive question concerning actual biological usage.<sup>8</sup> Yet, the pluralistic presence of function terms in biological discourse does not entail that they cannot be eliminated at all.<sup>9</sup> The translatability argument shows exactly the contrary. As a matter of fact, Nagel's view of teleological terms (for him, these include both function terms and terms like "goals", "purposes" and "ends") touched on both questions. In Nagel's own words, given the fact that "biologists do use it [teleology], and say

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non-intentional meanings today, they still allude to, as Wright observes, an anthropomorphic past in which only intentional accounts of function terms were treated as legitimate. Indeed, it might even be possible to suggest that the presence of function terms in current biological discourse represents an anthropomorphic tendency that has been made safe, although only by re-defining function terms. This suspicion is recently expressed in a largely neglected article by Björn Brunnander (2011a). For him, function terms "have too much of a biologically unfortunate pre-theoretical (i.e., mentalistic) load for them to be successfully implemented as technical biological tools" (p. 388).

<sup>8</sup> This echoes the distinction between descriptive semantics and normative/pure semantics made by Rudolf Carnap (1942/1948, 11-15). Also see Brunnander (2011b).

<sup>9</sup> While this descriptive question is certainly interesting in itself, it is more like a socio-linguistic question concerning linguistic habits of biologists rather than a genuinely biological question about living entities. Note that this is not to dismiss the importance of the biological function debate, but to make its contribution clearer.

they are giving a teleological explanation” (Nagel 1979b/1961, 402), he offers accounts of biological teleology to capture actual biological usage; at the same time, Nagel is convinced that eliminativism still holds, because he is aware of the translatability argument: “if the goal-supporting view of biological functions is correct, functional statements, as well as the presuppositions of functional ascriptions, can also be rendered without using functional concepts (Nagel 1979a/1977, 314)”.<sup>10</sup>

Keeping the descriptive-prescriptive distinction in mind, it is easy to see that eliminativism is more difficult to reject than many think. One major objection to eliminativism assumes that function terms have literal meanings and play certain cognitive roles in biological discourse, then goes on arguing that function terms cannot be eliminated. However, this objection cannot shake the translatability argument, since the latter stresses that those literal meanings can already be exhaustively expressed by conventional biological terms in the translated results and those cognitive roles can accordingly be played well. The essential point is that function terms are not *necessary* to express those literal meanings and play those cognitive roles. As a matter of fact, it is possible to offer a variety of pragmatic reasons (to benefit biological exchange, biologists are unlikely to change their linguistic habits, etc.) for preserving function terms in biological discourse, but all these fail to undermine eliminativism. A good eliminativist (like Nagel) has no issues with, and perhaps even welcomes them. In a nutshell, out of pragmatic concerns, eliminativism in its proper form could find it acceptable not to eliminate function terms in biological discourse.

Therefore, in an important sense eliminativism invites us to go beyond the questions often addressed in the current biological function debate, either what function terms mean in different circumstances or whether they should be preserved for some pragmatic reasons. Indeed, eliminativism raises an important question about the logical status of function terms in biological discourse: while function terms can be acknowledged to have literal meanings and play cognitive roles, they are still different in a way from conventional biological terms. To express biological knowledge, unlike conventional biological terms, function terms are indeed not necessary, and, to speak metaphorically, they are merely “parasitic” on conventional biological terms.<sup>11</sup>

Finally, eliminativism is also capable of offering a “global” overview of the biological function debate. In the hypothetical scenario envisaged by eliminativism, all biological knowledge were expressed by conventional biological terms, without invoking function terms at all. This scenario would also be achieved, according to the translatability argument, if all translations were carried out and all function terms were eliminated. Then, put on the one side biological knowledge expressed in conventional biological terms, function terms on the other. Then, it is easy to see that in the entire biological function debate, biological knowledge itself is maintained as uncontroversial, what philosophers do, in giving a variety

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<sup>10</sup> Peter McLaughlin expresses the same point in his observation that “biologists could in general probably get along fairly well, if they had to, without function terms by substituting either causal role or selective advantage or adaptive value” (McLaughlin 2003, 10).

<sup>11</sup> Indeed, as I will argue in a different article, regarding the logical status of function terms (and teleological terms in general), Kant’s view does not seem outdated: by using function terms, “reason certainly plays a role that is magnificently instructive and purposive in many respects”; yet, function terms provide “no information at all about the origination and the inner possibility of these forms [organisms], although it is that with which theoretical natural science is properly concerned” (Kant 2000/1790, 5: 417). In more familiar Kantian vocabularies, function terms provide at best regulative ideas, and they fail to contribute constitutive principles. Admittedly, this reading of Kant’s regulative-constitutive distinction in biology, although inspired by existent literature, Friedman (1992), Quarfood (2006), Van Dyck (2006), Toepfer (2012), Van Den Berg (2015) and Chen (2019), is unconventional in current Kant scholarship (e.g., Zammito 2006).

of accounts of biological function, is to relate some parts of it to function terms.<sup>12</sup> While some of these accounts might have captured actual biological usage from a descriptive point of view, they have nevertheless suspicious values if a prescriptive standpoint is adopted. As a matter of fact, if a certain account is prescribed, biological usage, that is, how biological knowledge is related to function terms, changes accordingly; yet this change has little influence on biological knowledge itself, which is already exhaustively expressed by conventional biological terms.

## 5. Conclusion

Aiming at a critical examination of eliminativism, this article does three things. First, it clarifies from historical literature three supporting arguments for eliminativism. Second, it offers a unified account of eliminativism. Third, it discusses the validity of eliminativism as well as its implications. A tentative conclusion is that a properly understood eliminativism only claims that function terms could (not must) be eliminated and remains defensible.

Importantly, eliminativism understood as such does not contradict the current pluralist consensus, and it does not deny that, for all kinds of pragmatic reasons, function terms can be preserved in biological discourse. Yet, by maintaining that function terms could be eliminated, it is concerned more with the logical status of function terms; as the translatability argument shows, function terms are not necessary to express biological knowledge, and this task can be well completed by conventional biological terms.

However, eliminativism raises at least one further intriguing question concerning the persistent presence of function terms in biological discourse: given eliminativism as a possible option, why has not the history of biology simply eliminated function terms, and why have not biologists simply discarded function terms? To be sure, there are pragmatic answers to this question; yet, perhaps the key point is to be sought in the almost inevitable tendency to adopt function terms developed in biological discourse. What does this tendency indicate?

One possible answer is that this tendency is anthropomorphic in nature. Footnote 5 has shown that, through eliminativism, it is even possible to view function terms in biological discourse as anthropomorphic vestiges, which are made safe by new definitions. It seems that biologists are quite willing to adopt function terms, despite possible confusions caused by intentional meanings of them. Biologists prefer to use or even invent new non-intentional meanings rather than opt for a direct elimination of function terms. Then, for some hard-core eliminativists, such a social-linguistic habit only attests subjective projections of mind onto life and is a sign of being unable to think through precise concepts. This might be true in some cases; yet, there is a more objective reason, in relation to the simple fact that biology claims to be the science of life. In other words, the almost inevitable tendency to adopt function terms in biological discourse, although anthropomorphic in some circumstances, alludes to an important part of the empirical reality, that is, the reality of life itself.

While a detailed clarification of this point has to wait for a different article, it is possible to give a brief illustration here. To start, it is to be noted that, resonating with eliminativism in the biological function debate, there is also an eliminativist position in the life definition debate. Life eliminativism attempts to eliminate the so-called folk concept of life from biology (Machery 2012; Mariscal and Doolittle 2018); correspondingly, there are also biologists and philosophers who attempt to relate life, like those who relate biological function, to different portions of biological knowledge (Bich and Green 2016; Smith 2016).

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<sup>12</sup> Within the etiological approach, philosophers have placed emphasis on the recent past (e.g., Godfrey-Smith 1994), other types of selection (e.g., Garson 2011, 2012), or the non-selective history in weak etiological theories (e.g., Buller 1998). Within the system approach, philosophers have focused on plasticity (e.g., Enç and Adams 1992), negative feedback (e.g., Faber 1984), reproduction (e.g., Schlosser 1998), and self-maintaining networks (e.g., Mossio et al. 2009).

Then, speaking of their logical statuses, biological function and life appear strikingly similar. While both of them can be acknowledged to have literal meanings and play certain cognitive roles, they are also merely “parasitic” on ordinary biological knowledge in current biology. As a result, some argue that life eliminativism is also a plausible option.

Nevertheless, life eliminativism is implausible for a different reason. As a matter of fact, as long as the distinction between “knowledge about life itself” and “knowledge about living objects, i.e., objects predicatable of life (ordinary biological knowledge)” is made clear, it is always possible to argue that the latter is not necessarily relevant to the former.<sup>13</sup> The pursuance of knowledge about life itself—often dubbed as theories of life—often leads to grand proposals aiming at general applicability to all living things. While these proposals remain largely speculative today, it cannot be denied that there is a possibility, however small it is, of future success.<sup>14</sup> Given such a possibility, it is inadequate to adopt life eliminativism.<sup>15</sup>

Function eliminativism is defensible, but life eliminativism is not. Function terms in biological discourse can be eliminated, but the term life cannot. While they are at the same logical status in current biological discourse, a general theory of life remains possible in the future. Therefore, the persistent presence of eliminable function terms in biological discourse does indicate an ineliminable reality, that is, the reality of life itself.

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<sup>13</sup> By “life itself” is meant the pure concept or phenomenon of life. It is important to distinguish extension and intension of life, or we might say, objects predicatable of life and life itself. What we general call biological knowledge is only knowledge about the former, rather than the latter (Voegelin 1998/1933, 144; Ben-Naim, ms). Moreover, it is safe to say that we possess no theoretical knowledge about life itself, even though in ordinary experience we recognize many things as alive in the world. Carol Cleland and her colleague give a particularly insightful analogy to help understand the status of the life concept today. According to Cleland and Chyba (2002, 2003, 2007) (and also see Cleland’s independent articles, 2006, 2012, 2013, 2019), the current situation in which a general theory of life is lacking is analogous to that in which a general theory of water was unavailable until the molecular theory came up with a theory of H<sub>2</sub>O; and the fact that life can be defined today only in terms of conventional biological properties (inheritance, development, reproduction, etc.) reminds us of the time when water could only be defined through conventional sensible properties (wetness, transparency, odorlessness, etc.).

<sup>14</sup> Examples of such theoretical proposals can be found more often in the works of mathematical biologists, such as Robert Rosen (2005), Stuart Kauffman (1993), and Brian Goodwin (1982). Towards these often-speculative proposals, Cleland and her colleagues adopt a reasonable wait-and-see attitude, which can indeed be expressed through Kantian terminologies: even though life is a mere regulative idea in current biological knowledge, the possibility is open that it will become a constitutive principle in future biology.

<sup>15</sup> The editors of *Nature* in 2007 detect a peculiar phenomenon termed by them “chronic vitalism”: vitalistic or quasi-vitalistic proposals to understanding life have been emerging and disappearing chronically. Indeed, chronic vitalism is good evidence for the claim that, despite great biological progress, the problem of life remains unsolved.

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