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## Do functions explain? Hegel and the organisational view

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*Hegel Bulletin*

*Abstract:* In this paper I return to Hegel's dispute with Kant over the conceptual ordering of external and internal purposiveness to distinguish between two conceptions of teleology at play in the contemporary function debate. I begin by outlining the three main views in the debate (the etiological, causal role and organisational views). I argue that only the organisational view can maintain the capacity of function ascriptions both to explain the presence of a trait and to identify its contribution to a current system, for it is the only view that considers teleology as a natural cause. To establish how teleology can be considered as a natural cause, advocates of the organisational view return to Kant's analysis of internal purposiveness. However, while Kant identifies the requirements that an object must meet to satisfy the demands of teleological judgment, he denies that we can know whether they are truly met. I argue that Hegel's philosophy of nature is better equipped to determine how internal purposiveness can be considered as a natural cause, for it grounds organisation in a form of purposiveness that is more fundamental than a designer's intention.

### I. Introduction

Dipteran insects, commonly known as flies, can be distinguished from other winged insects by the presence of halteres (ancient Greek for 'dumbbells'). In line with their name, halteres are a cumbersome second pair of wings that do not generate lift but actually impair it. The presence of halteres has mystified naturalists since the eighteenth century, when William Derham discovered that the removal of the halteres renders the fly flightless. Noting that the halteres do not generate lift and yet are essential to flight, Derham posed the question, why are they there? After close examination of the flight system, he proclaimed that the halteres are there to 'poise the Body, and to obviate all the Vassillations [of the wings] in Flight' (Derham 1714: 366n). Yet the case was far from closed. Two centuries later, one study described the halteres as 'stimulation organs', claiming that they are there to drive the flight muscles (Buddenbrock 1919). Further studies argued that they exist for the sake of control rather than activation (Fraenkel 1939, Pringle 1948). A recent study argues that the function of the halteres is to 'guide the fly through its environment' (Yarger and Fox 2016: 866).

In Derham's investigation, the word 'function' evokes a similar set of assumptions to 'purpose' or 'end'; it carries teleological – and therefore explanatory – force. Thus understood, assertions that take the form 'the function of photoreceptors in phytoplankton is to regulate their exposure to intense sunlight' are structurally equivalent to explicit teleological formulations such as 'photoreceptors exist *for the sake of* regulating exposure to intense sunlight' or '*the purpose of* photoreceptors is to regulate the phytoplankton's exposure to intense sunlight.' Each formulation

contains an assertion that  $X$  is  $Y$ , where  $Y$  (the effect) is said to explain  $X$  (the cause). In contrast to efficient causes, whereby the cause explains the effect, teleological causes reverse the direction of causality, implying that a future state somehow influences the present. Such causes are native to Derham's physicotheology, in which organisms are studied as the works of a designer. Call this the *artefact analogy*, by which the naturalist reflects on the functionality of a trait in search of a designer's intention. Yet if modern science begins with the rejection of design as a natural cause, what role could function talk play in biology?

There are two well-established views in the literature, both of which claim to naturalise function ascriptions (Sober 1993: 86). The first view – often called the etiological or selected effects view – accepts that the explanatory force of function ascription stems from the artefact analogy. To explain how the teleological implications of design are compatible with natural science, the etiological view denies that a function ascription itself explains the presence of a trait. A function ascription instead *stands in* for an acceptable causal history that explains the trait's presence. Nature has selected traits that, over evolutionary time, were the best fit with an ancestral environment. The second view – often called the causal role or dispositionalist view – rejects the artefact analogy, claiming that it imports non-natural assumptions into biology. Advocates of the causal role view argue that biological functions are distinct from artificial functions: they refer exclusively to the trait's contribution to an existing system. Because function ascriptions make no reference to what a trait is designed for, they do not explain the presence of the trait. They inform us what a trait currently does.

While the etiological and causal role views have dominated the debate for the past half-century, in recent years a third position has gained a foothold, often called the organisational view. On the organisational view, biological functions are said to operate in the context of a closed system, by which an organism can be said to interact with its environment by maintaining its state of organisation. Proponents of this view claim to naturalise teleology by grounding the functionality of traits in the self-maintenance of the organism. Function ascriptions are explanatory, for they tell us how a trait contributes to a self-maintaining system. The organisational view thus has the potential to move the function debate beyond its binary form, for it upholds the explanatory force of function ascriptions *and* identifies the contribution of a trait to an actual system. Yet the organisational view has come under heavy criticism for failing to sufficiently determine the functionality of parts within the bounds of natural science. To determine the proper function of a trait, critics argue, proponents of the organisational view must appeal to value-laden predicates such that a trait *benefits* the system. Because value-laden predicates import artificial presuppositions into natural science, the organisational view is deemed either too liberal or non-naturalistic.

My aim in this paper is to show that this objection fails to grasp the alternative conception of teleological explanation that the organisational view brings to the function debate. In Section II I provide a brief overview of the three views of function ascription. I suggest that the etiological and causal role views both accept that the explanatory force of teleology stems from the design analogy. The organisational view, in contrast, denies that the design analogy is sufficient to determine the explanatory force of teleology. To distinguish between the two conceptions of teleology at play in the debate, I return to Hegel's dispute with Kant over the conceptual ordering of purposiveness. In Section

III I examine Kant's distinction between internal and external purposiveness. While advocates of the organisational view have called on Kant's account of internal purposiveness to identify the requirements that an object must meet to satisfy the demands of teleological judgment, I suggest that Kant ultimately denies that we can know whether such requirements are truly met. In Section IV I argue that Hegel's philosophy of nature identifies how internal purposiveness can be considered as a natural cause, for it grounds organisation in a form of purposiveness that is more fundamental than a designer's intention.

## II. Three views of function talk

I begin with a brief overview of the three views of function talk. To keep my presentation succinct, I restrict my analysis to how each view answers the question, do functions explain?

### *The etiological view*

In one of the defining presentations of the etiological view, Larry Wright claimed that function talk is explanatory: 'Merely saying of something, *X*, that it has a certain function, is to offer an important kind of explanation of *X*' (Wright 1973: 154). To maintain the explanatory force of function ascription within a naturalistic programme of research, Wright (1973: 155) claims that function ascriptions are concerned with 'how the thing with the function *got there*.' 'Why' questions are appropriate starting points in biology, he proposes, for organisms are structurally equivalent with artefacts. The function of a liver or the function of a lever can be defined by reference to the causal history that tells us how it was selected. Ruth Millikan (1984: 17) asserts that if a function positively influenced the trait's selection we can call it the trait's 'proper function'.

The etiological view is based on two assumptions: (1) naturalism entails that scientific explanations are natural explanations (i.e. biological properties can, *in principle*, be explained according to natural properties), and (2) function ascriptions provide teleological explanations.<sup>1</sup> To show how (2) is compatible with (1), advocates of the etiological view deny that function ascriptions have a truth value. As we see in Wright's account, function ascriptions explain the presence of a trait indirectly; they stand in for the causal history that accounts for a trait's being-there. The upshot of the etiological view is thus that function ascriptions are epiphenomenal (see Christensen and Bickhard 2002: 7; Ruse 1982: 304; Lewens 2000: 97). The presence of halteres on the fly, for example, is explained by virtue of selection; halteres have been *selected for* their contribution to fitness.<sup>2</sup> The ascription of a function to the halteres does not stand in for an explanation of the halteres on *this* fly but for the selection of a certain DNA sequence across a species population. The actual operation of a function is simply 'that property of an individual organism which will appear to be maximized when what is really being maximized is gene survival' (Dawkins 1978: 63). The causal process relevant for

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<sup>1</sup> Sober (2000: 86) presents (1) as follows: there is 'no reason why functional concepts cannot characterize systems that are made of matter and nothing else.'

<sup>2</sup> Sober (1984: 100) argues that a theory of function must distinguish between 'selection of' objects, which identifies the *effects* of a selection process, and 'selection for' properties, which describes its *causes*. Proponents of the causal role view, we will see, claim that there is no non-arbitrary way to make such a distinction.

biological explanation occurs on a level below the individual organism. When understood as standing in for a causal claim, 'X was selected for having done Y in the past', the ascription of function to a trait refers to the trait's causal history in a species population, which is as real as the causal history of mountains and seas.

The epiphenomenal status of function ascriptions raises a serious problem for the etiological view. Because it is concerned exclusively with the selection history of a trait, the etiological view disconnects function ascriptions from the contribution of a trait to a currently operating system. This undermines its capacity to illuminate actual biological research, which often begins by asking what a trait does rather than what explains its current existence. More seriously, the epiphenomenal status of function ascriptions leaves the etiological view unable to account for the initial causal role of a trait in its selection history. As Paul Griffiths (1996: 515) argues, a theory of the adaptive origins of a trait is generated by examining the effect of the trait on the organism's ability to survive and reproduce in the context of the environment in which its ancestors first appeared. But this requires a causal analysis of functionality, since the investigation turns on the hypothesis that the function that the trait was performing has not been subject to selection at this point. Function ascriptions thus operate on the basis of causal analyses of ancestral organisms. The investigation assumes that there must be a kind of causal analysis of how a function performs with no prior knowledge of its selected function. If no such analysis were possible, explanation of the function's selection history simply couldn't get started.

#### *The causal role view*

Proponents of the causal role view recognise that the design analogy does too much work on the etiological view. By using the analogy with artefacts to account for the teleological force of function ascriptions, the artefact side of the analogy bears all the explanatory force. In his famous essay 'Functional Analysis', Robert Cummins (1975: 746) acknowledges that, in the case of artefacts, it is legitimate to answer the question 'why is X there?' by giving X's function. This exchange 'rationalizes the action of the agent who put it there by supplying his *reason* for putting it there.' Yet Cummins then argues that 'the use of functional language in this sort of explanation is quite distinct from its explanatory use in science.' The solution he proposes is 'to distinguish teleological explanation from functional explanation' (Cummins 1975: 747). For example, we might say that the function of a spanner that fell into the works is to stall the machine. The function of 'stalling the machine' would not answer the question 'Why is the spanner there?', for the spanner's being in the works is accidental. Rather, it would answer the question, 'What is the spanner's actual role in the system?' Once we leave artefacts and go to natural systems, Cummins (1975: 748) states, we begin thinking less like physicotheologians and more like biologists.

The causal role view states that function ascriptions refer to a trait's causal contribution to a currently functioning system. Claims about a trait's function are not in the business of explaining why it is there but rather with telling us how a function contributes to a system to which it belongs (Craver 2001: 55). Consider again Derham's fly. When we say that the function of the halteres is to guide the fly through its environment we are providing information about how the halteres contribute to an actual system that does not depend on the artefact analogy but that presently operates. With this information

in hand we can then examine *how* the halteres might make such a contribution. In the study conducted by Yarger and Fox (2016), this line of inquiry led to the discovery of intricate nerve bundles that project out of the base of the halteres, capable of processing force information. We wouldn't have known what to look for without a function ascription that refers to the actual role of the halteres. On the causal role view, function ascriptions do not explain the presence of a trait but provide an important heuristic for developing our scientific knowledge (Lewens 2004: 43).

The causal role view avoids the etiological view's overreliance on the artefact analogy and turns our attention to actually functioning systems. However, it faces the problem of underspecification. On the causal role view, the function of the heart is to pump blood only if we are examining the circulatory system. Its function could equally be to produce beating sounds, or to contribute 300g to the body's overall weight, depending on what we choose to examine. Proponents of the causal role view accept underspecification as an acceptable cost in exchange for a consistently naturalistic theory of functions, for it refuses to import the 'background assumptions' smuggled into inquiry by the artefact analogy (Craver 2001: 71). Our intuitive search for a trait's proper function is thus denied.

#### *The organisational view*

In the past few decades, advocates of a third, organisational view have entered the debate, claiming to make good on proper functions by grounding functionality in the causal role played by systems in the evolutionary process (Mossio et. al. 2009; Moreno and Mossio 2015; Montévil & Mossio 2015; Mossio and Saborido 2016; Mossio & Bich 2017). The organisational view advances a realist theory of function ascription by extending the causality studied in biology to include organisation. Organisation is a mode of self-determination whereby the effects of a system's activity 'actively contribute to establish and maintain its own conditions of existence' (Mossio & Bich 2017: 1090). Advocates of the organisational view deny that functions can be reduced to the selection history that grounds genetic change, for the mutation and subsequent translation of genes is dependent on a metabolic system capable of regulating and maintaining the existence of the inside and outside of a living individual (Moreno and Mossio 2015: viii). Advocates of the organisational view claim that the existence of self-maintaining organisation provides a unique 'grounding' for teleological explanation, such that the existence of a trait in an organised system can be explained 'by appealing to some specific effects or consequences of its own activity' (Mossio et. al. 2009: 814).

The organisational view accounts for the constitutive organisation of actual biological systems in terms of the system's activity, which can be characterised by closure and differentiation. The activity of closure is met when the constitutive constraints in a system maintain each other, such that the organism can be said to 'collectively self-constrain, and therefore to self-determine' (Mossio & Bich 2017: 1091; see also Montévil & Mossio 2015: 180). On the basis of closure, functional parts contribute to the maintenance of the constitutive organisation by sustaining a constant exchange of energy and matter with the external environment. Thus, because of closure, the activity of the system is a necessary condition of the system itself. The activity of differentiation is met when the system generates distinct structures that contribute to self-maintenance (Mossio et. al. 2009: 826). While a

hurricane or a candle flame may meet the criteria of closure, only systems characterised by a metabolic process regulate and generate boundaries, and thus directly contribute to the maintenance of the system. Differentiation produces different and localised structures that contribute to the conditions of existence. On the organisational view, it is only by being generated and maintained within and by an organisationally closed and differentiated system that material components can be understood to have functions.

Despite making inroads into the function debate, the organisational view has been criticised for being too liberal (Garson 2017) and for underdetermining function ascriptions (Cusimano & Sterner 2019). In Justin Garson's (2017: 1094) assessment, the organisational view boils down to a single requirement: *X* is a function if *X* contributes to a complex, organised system. On this requirement, he claims, the view fails to respond to Christopher Boorse's (1976) liberality objection, which states that a theory of function is inadequate if it attributes functionality to traits that have a negative effect on the survival of a system. Garson (2017: 1098) considers the example of panic disorder, which meets the complexity requirement of organised systems. In a panic disorder, false beliefs – such as the belief that a certain posture can cause heart attacks – cause avoidance behaviours, which cause more attacks. Because false beliefs contribute to the persistence of the panic disorder, their existence is thus explained by their capacity to cause panic attacks. Garson's charge is that the organisational view attributes functionality to traits that are in fact dysfunctional, and should not be attributed as functions. Its proponents can only avoid the liberality objection, Garson (2017: 1099) contends, by introducing a normative dimension to inquiry, such that for a trait to have a function 'it must benefit the system.' Yet to introduce a normative dimension would take analysis 'far beyond the narrow confines of a naturalistic theory of function', for what 'makes a view naturalistic', Garson (2017: 1099) insists, 'is precisely its appeal to value-neutral predicates.'

Garson's view is uncharitable, for the panic disorder does not meet the differentiation requirement outlined by the organisational view. A panic disorder is not differentiated from the biological conditions in which it operates, meaning that false beliefs do not contribute to the conditions of a self-maintaining system but can in fact undermine them. Whatever intuition Garson appeals to in his readers, which leads them to want a theory that can show that a panic disorder is in fact dysfunctional, presumably stems from the biological level, on which a self-maintaining system must be able to produce true beliefs if it is to secure its conditions of existence. Yet Garson does not inform us why this intuition should be taken seriously in natural science. He merely observes that scientists *do* treat panic disorder as a dysfunction (Garson 2017: 1101). In what follows I argue that the organisational view does not need to appeal to a non-natural level of value to determine how a trait benefits the system of which it is a part. What Garson overlooks is that the organisational view does not simply claim to provide a naturalistic account of function ascription, as do the two main views. More significantly, it claims to provide a naturalistic account of *teleology*, and to ground function ascriptions therein.<sup>3</sup> Teleology on the organisational view does not import non-natural predicates into

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<sup>3</sup> Mossio and Bich (2017: 1090) for instance argue that their 'proposed characterisation of teleology is naturalised.'

biological inquiry, for it is not dependent on the artefact analogy. It concerns a form of value that is conceptually prior to the non-natural value of artefacts.

### III. Kant and internal purposiveness

To distinguish a naturalised form of teleology from the non-natural teleology introduced by the artefact analogy, proponents of the organisational view often call on Kant's distinction between external and internal purposiveness (Montévil & Mossio 2015: 179; Mossio and Bich 2017: 1094). Andreas Weber and Francisco Varela (2002: 99) argue that Kant's account of internal purposiveness outlines 'a third way between a strong teleology and a brute materialism.' David Walsh (2006: 772) claims that Kant's internal purposiveness anticipates recent interest in 'self-organization, the "emergent" properties of organisms, their adaptability, their capacity to regulate their component parts and processes.' Matteo Mossio and Leonardo Bich (2017: 1099) call on Kant's account of internal purposiveness to argue that 'teleology is grounded in a *specific* kind of circular regime', consisting of 'a network of mutually dependent components, each of them exerting a causal influence on the condition of existence of the others, so that the whole network is collectively able to self-maintain.'

Let us consider how Kant's account of purposiveness assists us to understand the naturalised teleology of the organisational view. In *Critique of the Power of Judgment*, Kant distinguishes between external and internal purposiveness (*äußerer und innere Zweckmäßigkeit*) to identify two kinds of object that satisfy the explanatory implications of teleological judgment (*CPJ*: 5:372-373).<sup>4</sup> An artefact satisfies the implications of teleological judgment, for it is the product of a designer. The parts of the system are judged as the means to an external purpose – a concept in the designer's mind – and thus can be understood as the product of efficient causes. A natural purpose (*Naturzweck*), in contrast, satisfies the implications of teleological judgment by virtue of an object's inner constitution. The parts are the means to the self-realisation of the purpose, which means that each part is explicable by reference to a concept of the whole.

Kant identifies two criteria for something to qualify as a natural purpose. First, an item can be judged as purposive if 'its parts (as far as their existence and their form is concerned) are possible only through their relation to the whole' (*CPJ*: 5:373). This criterion is met in both artefacts and natural purposes. To be judged as a *natural* purpose, an item must also meet a further criterion: its parts must be 'combined into a whole by being reciprocally the cause and effect of their form' (*CPJ*: 5:373). This second criterion separates natural purposes from artefacts. A cog, for example, exists *for the sake of* the watch, yet it does not exist *because of* the watch. The watch is not the cause of the cog, and it will not actively seek to regenerate or repair the cog if it is damaged. Rather, the cog exists because of the designer. In the case of a natural purpose, part-whole causality is reciprocal. The halteres exist for the sake of the fly *and* because of the fly. Teleological judgement for Kant is explanatory in the context of

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<sup>4</sup> Abbreviations used:

*CPJ* = Kant, I. 2000. *Critique of the Power of Judgment*. Trans. P. Guyer. Cambridge: Cambridge University Press.

*PN* = Hegel, G. W. F. 1970. *Philosophy of Nature*. Trans. A. V. Miller. Oxford: Oxford University Press.

*SL* = Hegel, G. W. F. 2010. *The Science of Logic*. Trans. and Ed. George Di Giovanni. Cambridge: Cambridge University Press.



both artefacts and natural purposes, for in each case it comprehends the parts ‘under a concept or an idea that must determine a priori everything that is to be contained in it’ (*CPJ*: 5:373). The difference between explanation in the case of artefacts and natural purposes is whether the concept is judged to be exterior or interior to the object.

Kant maintains what I will call an inflationary view of teleology: teleology concerns the causality of a concept that determines a priori the parts. Because his discursive account of cognition entails a conception of judgment that determines objects *under* concepts, the idea of an a priori determining concept appearing in experience is unavailable to human knowledge. Natural purposiveness for Kant is introduced by a reflective form of judgment by which we observe certain items through an analogy with our own self-productivity. Reflective judgments are not objective (i.e. truth-apt), for they do not determine an object under a concept but rather enable us to see an object *through* a concept with which it does not quite fit. Kant states that experience ‘exhibits’ the existence of natural purposes – we know from experience that there are beings that grow, reproduce etc. – yet we cannot determine under a concept an object that determines a priori its parts (*CPJ*: 20:234). The concept of a natural purpose is therefore ‘problematic’, for ‘one does not know whether one is judging about something or nothing’ (*CPJ*: 5:379). This conclusion suggests that Kant’s account of internal purposiveness is closer to the causal role view than the organisational view. It identifies how we are capable of reflecting on the present contribution of a part to the whole without explaining why it is there (see Lewens 2004: 43; Kreines 2005: 272; Breitenbach 2009: 52).

By claiming that a circular regime *in the object* is the ground of teleology, the organisational view goes beyond Kant’s reflective account of teleological judgment. Weber and Varela (2002: 101) account for Kant’s restriction to the limited knowledge of self-organisation at the time: ‘In contrast to Kant, we are no longer dependent only on speculations concerning self-organization in nature.’ In their view, Kant anticipated a robust conception of self-organisation, for he was the first to recognise the unique causal structure of living beings (see also Illetterati 2007: 157-159). Yet Weber and Varela’s presentation is historically misleading. Already in Kant’s lifetime there were numerous scientific investigations of self-organisation, including Casper Friedrich Wolff’s *Die Theorie der Generationen* (1764) and Johann Blumenbach’s *Über den Bildungstrieb* (1789). Kant was not ignorant of such scientific investigations of self-organisation. Rather, he held an inflationary view of teleology. Self-organisation for Kant is a priori determination according to a concept, which is a different kind of cause to nature’s efficient causality. While Kant introduced internal purposiveness as an indispensable concept for natural science, he denied that it plays an explanatory role. The requirements of teleological judgment are so high that discursive cognition like ours cannot be sure that any object in nature truly satisfies them.

#### **IV. Hegel’s philosophy of nature**

Here I want to suggest that Hegel’s philosophy of nature is better equipped to distinguish between the conception of teleology proposed by the organisational view and the artefact analogy, for it demonstrates how inner constitution can be considered as a natural cause. My argument is not that Hegel anticipates the organisational view, or he improves on it in any direct sense. Rather, I argue that

Hegel's logical analysis of organisation is assumed by the causal account of closure and differentiation outlined by the organisational view, and thus can demonstrate how function ascriptions can carry explanatory force without introducing non-natural predicates. Hegel's strategy is to begin with Kant's positive treatment of internal purposiveness, which identifies a form of teleology that is distinct from the causality of design. Yet he then claims that objects that maintain their bounded unity through the activities of irritability, assimilation and reproduction genuinely meet the requirements of teleological judgment, and are hence explicable in teleological terms. For such objects, the concept of the whole is conceptually prior to our search for a form of causality to make sense of their part-whole structure. Unlike Kant, Hegel is not primarily concerned with the underlying material that makes organic life possible. His primary concern is with the logical structure of the organism, which precedes and indeed determines the structure of a causal explanation.

Hegel was clearly impressed by Kant's distinction between internal and external purposiveness. It is one of Kant's 'greatest services to philosophy', for it 'opened up the concept of *life*, the *idea*' (*SL*: 12.157). On this count Weber and Varela are in good company: Hegel saw that in Kant's presentation of internal purposiveness reason is not grasped negatively, through the limitations of discursive intellect, but positively, as a productive and living activity that concretely realises subjective ends. Yet in contrast to Weber and Varela, who turn directly to the organism to discern the processes of self-organisation, Hegel saw that there is still a philosophical problem to be solved before Kant's natural purpose can be understood as a constituent part of nature. His strategy is to begin with Kant's account of internal purposiveness and then to demonstrate from within Kant's assumptions that teleology *can* be grasped objectively. Internal purposiveness for Kant is satisfied only by a whole made up of parts arranged according to a concept. Hegel contends that this demand can be met by identifying a different kind of concept to that assumed by Kant, one that is conceptually prior to the representation of an intellect that realises an idea. This idea of the concept, he enigmatically states, is the 'substance of life' (*SL*: 12.181).

To grasp what Hegel means by this important phrase, let us start with the distinctive method he develops as an alternative to Kant. In *Philosophy of Nature*, Hegel begins with nature as a manifold of spatially and temporally diverse parts in search of various forms of unity. The final section examines the form of unity Hegel terms 'the animal organism', which is examined as the logical outworking of mechanical and chemical forms of unity (*PN*: §350). Hegel does not provide a natural account of organic life in which mechanical and chemical processes gave rise to organisms at a specific time in the past. Neither does he make some kind of non-empirical claim about the emergence of organisation from matter. Rather, he works systematically through the coexistence of qualitatively distinct stages within nature marked by a series of transitions. By the end of the work we find that Organics is the logical basis of Mechanism and Chemism, for the movement to what Hegel calls 'subjectivity' – the form of unity characteristic of the organism – is a logical movement propelled by contradictions that arise between individuals in a previous stage. Hegel's philosophy of nature is thus a logical account of the inner necessity of internal purposiveness. This necessity is not a *telos* in nature that works inevitably toward organisation, but rather a logical relation that arises in a system that can be described as both cause and effect of itself. Hegel's claim is that a logical account of the organism must come

prior to any attempt to provide a natural explanation, for the logical form constrains the kinds of explanation proper to it. To put this in methodological terms, the kind of explanation one employs is not indifferent to the subject of investigation. It must be determined by the form of unity – in Hegel’s terms, the form of activity (*Tätigkeit*) – one investigates.

Hegel’s logical presentation of natural unity demonstrates that conceptual problems regarding purposiveness in nature arise only once we abstract from a more fundamental form of teleology. This rules out from the start a theoretical position in which subjectivity appears *after* nature understood as a prescribed sphere of efficient causation. In contrast to Kant, Hegel’s method entails that the specific nature of the underlying matter is irrelevant to the question of whether something meets the requirements of internal purposiveness. Activity for Hegel is the realisation of subjective ends, and mechanical and chemical activity are presuppositions of subjectivity but do not fully realise it. In the opening paragraph of ‘The Animal Organism’, Hegel states that ‘organic individuality exists as *subjectivity* in so far as the externality proper to shape is *idealized* into members, and the organism in its process outwards preserves inwardly the unity of the self’ (PN: §350; C.f. SL: 12.184). To say that the externality is idealised is to say that the parts are mutually related as moments of a whole. The differentiation of each part is integrated *ideally* into the unity of their common purpose, which is the maintenance of the organism in a state of activity. An organism does not have parts but members whose substance is their function. The members of an organism, Hegel explains, ‘are purely and simply moments of the form, perpetually negating their independence and bringing themselves back into their unity, which is the reality of the concept and is for the concept’ (PN: §350Z). Under the conditions of Mechanism, the parts of the solar system exist independently of each other, for they are related only according to space and time. In contrast, the transition to Organics is marked by the ‘fully achieved unity’ of the animal body (i.e. ‘the concept’), which ‘is present in the body in so far as this is the process of idealization.’ The centre of subjectivity is no longer a global sphere of efficient connections but the organism itself as the teleological activity of self-realisation. The parts realise themselves by maintaining the organism, and the organism realises itself by maintaining the parts. Hegel identifies the most general logical form of organic life in terms of three functions: sensibility, irritability and reproduction (PN: §353). Each function enables a process that constitutes the organism: the shaping process (PN: §354-356), the assimilation process (PN: §357-366) and the species process (PN: §367-376). The parts of a specific organism are understood as further determinations of one of the three functions.

Hegel does not deny that mechanical and chemical explanations can be used within the spatial and temporal boundaries of an organism. Rather, he denies that either Mechanism or Chemism can provide an explanation of the parts as *members*. In a mechanical investigation, the concept is external to the system, and thus the system is not grasped as a living individual. We can examine the halteres as a mechanism for guiding the fly through its environment, and come to grasp the capacity of the nerve bundles that project out of the base of the halteres to process force information in mechanical terms. But this does not explain the halteres as members. A mechanical account brackets out the question of why the halteres are there. To pose the question of why they are there is not to import a non-natural background assumption but rather to make the transition to Organics. The flight-guidance provided by

the halteres is part of a broader system of irritability, assimilation and reproduction, thus contributing to self-preservation. Hegel states the problem in *Science of Logic* as follows:

when a living thing is taken to be a whole consisting of parts, something exposed to the action of mechanical or chemical causes, itself a mechanical or chemical product (whether merely as such or as also determined by some external purpose), then the concept is taken as external to it, the individual itself as something *dead*. (*SL*: 12.183–84)

The living individual – what Hegel means by ‘subjectivity’ – is the mode of being characteristic of a unity that ‘stands in relationship with an inorganic nature, with an outer world’ (*PN*: §350Z). The living individual is subjective to the extent that it is unified by a self-productive physiological process through which it interacts with an environment. Hegel’s point is that life is not made up of an underlying substrate of matter. Rather, *the concept* is the substance of life. The universal can be understood to particularise itself in the form of the organism, for a particular organism is connected to the others of its species under the universal. This is what Hegel terms the species process (*Gattungsprozess*), by which a species is understood as ‘an *implicit*, simple unity with the singularity of the subject whose concrete substance it is’ (*PN*: §367). In contrast to Kant’s presentation of internal purposiveness, in which we reflect on the whole as the cause of an a priori representation, Hegel claims that we can have natural teleology when there is concrete universality, a logical connection between a universal and a particular. An organism is what it is not by virtue of its location in space and time but by virtue of its relation to others of its species. James Kreines (2015: 93) contends that the species process is key to Hegel’s account of functionality, for it shows how the general structure of an organism can in this sense precede its development, not as an idea in a designer’s mind but in the structure shared by the previous generations of a species. A member of an organism can be said to contribute to the survival of a species, even if it never fulfils its function, for the contribution of the member has *already* contributed to the survival of the species.

Here Kreines places too much weight on the species process in determining the functionality of a member. On Kreines’ interpretation, the relation between universal and particular is a historical process of reproduction. Yet the species process for Hegel is not strictly historical. It depends on a prior relation between the organic whole and its parts. This part-whole relation explains not only the membership of a singular organism in a species process, and also the existence of biological functions. The species process is but one of the three general functions characteristic of living beings: no artefact or accidental system can shape itself, assimilate external matter into itself and form a simple, substantive unity. The concept as substance is the relation that grounds teleological explanations. A function ascription explains the presence of a part only in the case of concrete universality, that is, when we can explain this particular part in terms of a relation between the part and the organism of which it is a member. It is *because of* the part-whole relation that we can consider reproduction as a logical relation, which can then provide further determination of a proper function in the context of parts that have not yet performed their function.

Grasping the priority of the part-whole relation in Hegel's account of organic life can assist us to identify how the organisational view can determine the proper function of a trait without appealing to value-laden properties, for it provides conceptual determination for the natural source of teleology defended by the organisational view. According to Hegel, teleology is a natural cause, for the chemical and mechanical causes studied in biology presuppose it. It is thus conceptually prior to the artefact analogy, which is introduced to enable reflection on predefined biological individuals. Once the idea of functional purposiveness is separated from the idea of an a priori representation of the whole, modelled on our own cognitive activity, and is instead understood in terms of the organism's activity, there is a normative dimension to the organism that takes the form of a need. A need for Hegel is an 'activity of deficiency [*Thätigkeit des Mangels*]', an 'inner contradiction' that is possible only for a living being and marks out the most basic form of subjectivity (*PN*: §359). The idea of an inner contradiction signals what Hegel terms the logic of life, in which the idea of life is the most 'concrete' of ideas (*SL*: 12.179). Hegel's provocation is that life bears a distinctive logic, for the need of a living being does not signal a defective moment that must be eliminated, such that the organism can return to a more original and pre-existing unity. A need is an activity that arises from the maintenance of the self, opening a living being to an exterior world with which it interacts (Michellini 2012: 137). 'Only a living existence is aware of *deficiency*', Hegel states, 'for it alone in nature is the *Concept*' (*PN*: §359). By acknowledging that life bears a logical form distinct from and irreducible to the a priori concept of the whole, we can speak of a function benefitting an organism without calling on a non-natural value. This is what Hegel means when he states that the concept of the organism is ideal: it is not subjective (in us) or non-natural (in the mind of a designer). Rather, the differentiation of the parts is integrated into the unity of their common purpose, namely, the maintenance of the organism in a state of functional activity in constant feedback with its exterior (Ferrini 2011: 204).

This is not to say that reproductive history is irrelevant. Hegel's account of organics is indifferent to the survival success of well-adapted traits, for it is not concerned with explaining how a species came to be at a certain moment in history but rather with the distinct logical form of the organism. Nevertheless, it is consistent with recent work in biology regarding the role of the organism in the evolutionary process, for it demonstrates how the inner constitution of the organism effects its responsiveness to environmental changes, which is denied by Kant's heuristic account of the part-whole relation. In this sense the organisational view demonstrates how Hegel's logic can provide a conceptual framework with which to integrate the two kinds of unity studied in biology – natural selection and developmental processes – which both contribute to evolution. While genetic variation and selective pressures operate on a population through efficient causes (the unity of the biological sphere), the organisational closure of a biological individual is a form of interaction with an environment (the unity of the organism). By claiming that the former is possible only on the condition of the latter, the organisational view opens a much wider range of traits that might be targeted by natural selection than either the etiological or causal role view, including phenotypic plasticity, niche construction, developmental bias and non-genetic traits such as learning and habit. The living being negotiates its needs in the context of a constraining environment by assimilating that environment into itself and by expressing itself in its environment in such a way that biases its future chance of survival.

Research programs that adopt the etiological or causal role view are not so well equipped to include the developmental features of organic structures that interact with selective pressures, for they conceive of inner constitution as an effect of the process of natural selection, not as a cause. Provided that we accept the limitations of the artefact analogy, the search for design can assist our discrimination of targeted traits. Yet to claim that such traits were selected exclusively by ecological pressures is to obscure the structural role played by organisms in the evolutionary process.

## V. Conclusion

My aim in this paper was not to argue that Hegel discovered a theory of function unknown to biology, or to make some non-empirical claim to biological facts. It was rather to show that Hegel's concept of the animal organism demonstrates how the kinds of unity studied by the organisational view are natural, and therefore play a causal role in the evolutionary process. The question 'Why is *X* there?' only presupposes a non-natural order of design if we assume a break between subjectivity and the domain studied by science, such that the domain of the natural sciences exists as a pre-established sphere and the mind is somehow separate from it. Hegel's logic demonstrates why the artefact analogy inevitably leads to problems of causal priority: it abstracts one form of unity from another that is, in fact, more fundamental. The etiological and causal role views consider teleology only in terms of the artefact analogy, and from there set out to explain why functions do not pose a threat to natural science. The organisational view, in contrast, shares with Hegel the view that closure and differentiation are the activities of an individual that transforms a subjective purpose into something objective and concrete. Function ascriptions such as 'the function of halteres is to guide the fly through its environment' are explanatory, for they account for the activity of an organism according to its concept. Flight guidance contributes to the maintenance of the fly, meaning that the halteres are a constitutive member of the fly's capacity to respond to stimuli, seek and secure sustenance and to successfully reproduce. This explanation is not exhaustive, and neither does it compete with a causal history. It opens a line of research into a trait's causal role in the evolutionary process and what role it currently plays. As biologists give increasing attention to the effect of developmental, organisational and other internal factors in natural selection, such a framework is as indispensable today as it was in Hegel's time.

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