From Biological Functions to Natural Goodness

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ABSTRACT. Neo-Aristotelian ethical naturalism aims to place moral virtue in the natural world by showing that moral goodness is an instance of natural goodness—a kind of goodness supposedly also found in the biological realm of plants and non-human animals. One of the central issues facing neo-Aristotelian naturalists concerns their commitment to a kind of function ascription based on the concept of the flourishing of an organism that seems to have no place in modern biology. In this paper, I offer a novel defense of this functional commitment by appealing to the organizational account of biological function. I argue that the flourishing-based concept of function that forms the basis of the neo-Aristotelian account of natural goodness is explanatorily indispensable to biology, and therefore essential to the understanding of living things.

1 Introduction

The concept of a function in biology and the natural sciences is generally taken to be irrelevant to moral philosophy. Recently, however, there has been interest in an Aristotelian approach to ethics, which appeals to the 'natural good' of living organisms to argue that moral goodness is an instance of natural goodness (Foot 2001; Hursthouse 1999). This *neo-Aristotelian naturalism* offers to place values in the natural world by showing that moral virtue in humans is akin to the deep root of an oak tree. In the same way that deep roots are good in an oak insofar as they enable it to flourish as an oak, moral virtue is good in a human insofar as it enables them to flourish as a human. As it turns out, this commits neo-Aristotelian naturalists to a kind of function ascription that is based on the concept of *the flourishing of an organism*.

An important objection to neo-Aristotelian naturalism is directed toward this underlying, flourishing-based concept of function. Critics argue that such a concept has no place in biology (Fitzpatrick 2000; Lewens 2010; Odenbaugh 2017), and that replacing it with a concept of function that *does* have a place in biology leads to implausible implications for morality (Millgram 2009; Andreou 2006; Woodcock 2006). In this paper, I offer a novel defense of neo-Aristotelian naturalism that takes this objection seriously in a way that previous responses to the

objection have not. Neo-Aristotelians typically dismiss the objection by claiming that the concept of function in biology is simply not relevant to assessing their view. They argue that their function ascriptions are based on a *different* concept of function that is not intended to capture the biologists' talk of functions (Foot 2001; Hacker-Wright 2009a; Lott 2012a). To defend their concept of function, neo-Aristotelians appeal to Thompson's (2008) work on representations of life. They argue that their concept of function is implicit in a distinctive, pre-scientific form of judgment that we ordinarily use in relation to living things. However, this response relies on our ordinary, common-sense representations of living things, which may or may not hold up in light of scientific research. In contrast, this paper aims to offer a different response to the objection—one that takes the scientific account of living things seriously. I will argue that there is a kind of function ascription in biology that is best understood as presupposing the concept of the flourishing of an organism. And I will suggest that this kind of function ascription instantiates the broader concept of function that underwrites the neo-Aristotelian account of natural goodness.

The paper aims to improve on the existing literature on neo-Aristotelian naturalism in two ways. First, both sides of the debate have generally assumed that the only respectable account of functional explanation in biology is the *etiological* account, according to which the function of a trait is given by its historical role in natural selection. I argue that the etiological account of function does not capture all cases of functional explanation in biology. I suggest that a more recent alternative—namely, the *organizational* account—brings out another important concept of function in biology, which affords different prospects for assessing the claims of neo-Aristotelian naturalism.

Second, I explain how an argument for neo-Aristotelian naturalism can draw from the explanatory concepts of biology without giving an undue place to biology in substantive moral reasoning. Authors engaging in this debate have largely assumed that if natural goodness is understood in terms of a concept of function that is used in biology, it must follow that biology can give us the norms of natural goodness, which supposedly include the norms of virtue and reason in the case of human beings. Such a result would, of course, be problematic for neo-Aristotelian naturalism. As many critics have remarked, the implication that knowledge of moral virtue can come from biology would likely result in intuitively implausible first-order claims about moral virtue (Millgram 2009; Andreou 2006; Woodcock 2006). Moreover, it would imply

that we need to radically revise our ordinary methods of moral reasoning, since these methods do not normally consist of deriving moral reasons from biology. However, I argue that although organizational function ascriptions in biology instantiate the concept of function underlying the neo-Aristotelian account of natural goodness, the science of biology is not in a place to give us the full extension of this concept of function. In a nutshell, this is because the organizational concept of function presupposes the concept of the flourishing of an organism. Ascribing organizational functions requires a conception of flourishing or living *well* for the organism, a full account of which falls outside the scope of biology. Thus, I argue that the explanatory role of organizational function ascriptions in biology can support the neo-Aristotelian concept of function without implying that biology can give us a substantive account of moral virtue

2 Natural Goodness and Flourishing-Based Functions

In a nutshell, neo-Aristotelian naturalism is an attempt to place moral virtue in the natural world by showing that it's an instance of *natural goodness*—a kind of goodness supposedly already present in nature and in the biological realm of plants and non-human animals. The idea is that, rather than predicating a special kind of 'non-natural' property, moral judgments share a conceptual structure and status with familiar judgments of goodness and defect in plants and animals. A paradigmatic account of natural goodness is given by Foot (2001). On this account, natural goodness is an evaluation of parts and features of living things in view of their nature as living and according to their form of life. The goodness of a part or aspect of an organism is determined by its role in enabling the organism to realize the characteristic flourishing of its life-form. Deep and sturdy roots are naturally good in an oak insofar as they enable it to flourish *qua* oak. By the same token, moral virtue is good in human beings insofar as it enables them to flourish *qua* human.

Foot's account of natural goodness relies on Thompson's work on representations of life. According to Thompson (2008), there is a distinctive form of thought used in relation to the domain of life that can underwrite evaluations of natural goodness and defect. This form of thought is manifested in the kind of generic statements that we typically encounter in a nature documentary or a field guide—statements such as "bobcats breed in the spring" or "oak trees have deep and sturdy roots". Thompson calls these *natural-historical judgments*. He argues that these judgments articulate the characteristic features and activities of the form of life, or the *life-*

form, to which individual living things belong. On his account, natural-historical judgments have a distinctive form of generality that is neither universal nor statistical. The general description expressed in these judgments can be true even if there are instances of the life-form that do not possess the characteristic features and activities described. And when a particular organism does not match a true natural-historical judgment about its life-form we can infer that there is something *defective* about the organism. Thus, natural-historical judgments can underwrite evaluative inferences to natural goodness and defect. Given the truth of a natural-historical judgment like "oaks have sturdy roots," for instance, we can infer that an oak without sturdy roots is naturally defective and an oak with sturdy roots is, to that extent, naturally good.

Notably, this peculiar logical feature of natural-historical judgments is not merely because these judgments are generics, or have what Thompson calls 'non-Fregean generality' (2008: 77). Not every form of generic statement supports inference to evaluative judgments.[1] On Thompson's account, natural-historical judgments are a specific subclass of generics that are "teleologically articulable" (2008: 79). They can be connected with each other in teleological relations, such that we can say, e.g., that "male peacocks have a brightly colored tail *in order to* attract mates". The set of natural-historical judgments that capture the characteristic features and activities of a life-form are teleologically interrelated. Together, these judgments form a special unity or a system, which gives a conception of what it is for bearers of that life-form to flourish. The neo-Aristotelian notion of *flourishing*, then, is the life-form-specific notion of an organism's doing well by being a good instance of its life-form, as characterized by natural-historical judgments. It's this notion of flourishing that licences inference to evaluative judgments. It's because a male peacock's brightly-coloured tail plays a part in the flourishing of peacocks by attracting mates that failure to have such a tail amounts to a defect.[2] Thus, evaluations of natural goodness evaluate parts and aspects of living organisms based on their *function* in enabling the organism to flourish according to its life-form.

The aim of the neo-Aristotelian project is to extend evaluations of natural goodness to the case of human beings and argue that our judgments of goodness and badness in humans—including judgments of moral evaluation—instantiate the same kind of 'natural' evaluation. What flourishing consists in differs from one kind of living thing to another. On the neo-

[1] A good example, discussed by Leslie (2008), is the statement "mosquitoes carry the West Nile virus".

[2] See also Foot (2001: 30-32) on the teleological dimension of natural-historical judgments.

Aristotelian view, *human* flourishing is characterized by the capacity to recognize, respond to, and act in light of reasons, where moral virtues constitute exercising this capacity *well*. Thus, on the neo-Aristotelian account, moral evaluation of human character and action is the same kind of flourishing-based evaluation as the natural evaluation of an oak's roots or a peacock's tail.

Foot presents her view as "a naturalistic theory of ethics" (2001: 5), and contrasts it with Moore's non-naturalism, various forms of non-cognitivism, and Kantianism. This presentation is a theme across different versions of the neo-Aristotelian view. Hursthouse similarly characterizes her view as a form of ethical naturalism. On her formulation, the neo-Aristotelian project is an attempt to ground ethics in considerations of human nature, where human beings are understood to be "part of the natural, biological order of living things" (1999: 205). As Annas (2005) has remarked, what is naturalistic about Foot and Hursthouse's account of ethics is the *continuity* that it draws between us humans and other living things. It's an account that "puts us in our biological place" by showing that our ways of evaluating ourselves morally and otherwise are continuous with "evaluative patterns to be found in the lives of animals and plants" (2005: 17). We can trace this continuity most clearly in Foot's claim that moral evaluations "share a basic logical structure and status" with evaluations of plants and animals (2001: 27). The idea is that moral evaluation in human beings is of the same kind as evaluations of natural goodness in non-human living things, and if the latter belongs to the natural world, so too does the former.[3]

We saw that evaluations of natural goodness are determined based on the function or the role an aspect of the organism serves in enabling it to flourish. Because of this, neo-Aristotelian naturalism is committed to the ascription of flourishing-based functions to the parts and features of living things. This is the functional commitment that is the target of the objection from biological functions, to which I now turn.

[3] It's worth noting that despite the way the view has sometimes been interpreted by critics (e.g., Millgram 2009; Andreou 2006; Woodcock 2006; and Odenbaugh 2015), neo-Aristotelian naturalism does not aim to offer a derivation of the norms of moral virtue from independently recognizable biological facts. The view claims to ground moral virtue in considerations of human nature. But although *human* is understood to be a life-form and part of the natural order, it is not claimed to be knowable 'from outside' or through an empirical science like biology (see Thompson (2004: 72) against "biologistic complaints" and Lott (2012b: 418-421) against "the two-stage argument"). Thus, it is *not* a promise of neo-Aristotelian naturalism to offer a straightforward method of deriving substantive moral claims from biology. There is no commitment to the idea that the epistemology of morality or human flourishing is empirical or scientific. As I will explain in section 6, this is due to the fact that unlike many other forms of ethical naturalism, neo-Aristotelians do not construe the natural domain in epistemic terms or in relation to natural science. Instead, they start from the idea that the domain of non-human life is uncontroversially natural, and argue that the domain of morality is continuous with this natural domain.

3 The Objection from Biological Functions

The objection from biological functions is directed toward the commitment of neo-Aristotelian naturalism to flourishing-based functions. Critics who raise this objection argue that neo-Aristotelian function ascriptions have no place in biology, and replacing them with the function ascriptions that *do* have a place in biology leads to an implausible account of moral virtue (Fitzpatrick 2000; Lewens 2010; Odenbaugh 2017; Millgram 2009; Andreou 2006; Woodcock 2006). A detailed version of this objection is offered by Fitzpatrick (2000), who gives an evolutionary account of biological function in terms of gene replication, and argues that contrary to what neo-Aristotelians claim, biological functions have nothing to do with an organism's welfare or flourishing.[4]

Fitzpatrick argues that we need to see living things as products of natural selection in order to understand their functional aspects. He thus appeals to a Gene Selectionist view of natural selection, which he adopts from philosophers of biology like Dawkins (1983), and Sterelny and Kitcher (1988), to develop his evolutionary account of biological function. According to this view, natural selection is the result of genes increasing their frequency in the gene pool by exerting phenotypic effects in organisms. Fitzpatrick thus argues that the ultimate function that natural selection has devised for organisms and their parts and features is to increase the frequency of their genes. On his account of biological function, the biological function of a trait is the non-accidental role that it plays in promoting the "ultimate biological end" of replication of its genes (2000: 103-104). We can see, however, that given this account, biological functions do not line up with the neo-Aristotelian ascriptions of function, since they do not always promote the organism's welfare or flourishing.

Fitzpatrick gives many examples of traits that have a biological function but nonetheless do not seem to promote the organism's welfare. One illustrative example is the case of violent fights in elephant seals. Male elephant seals fight with each other in competition for exclusive control of the harem, and female seals refuse to mate with anyone except the dominant male. Fitzpatrick argues that the violent fights among male elephant seals have a biological function. Looking at

[4] Fitzpatrick uses "welfare" interchangeably with "flourishing", which on the neo-Aristotelian view is the life-form-specific notion of an organism's doing well by being a good instance of its kind. The notion of welfare at issue, then, is not to be interpreted as the subjective notion of well-being in the sense of interest-satisfaction, which plausibly is restricted to sentient organisms.

evolutionary history reveals that the genes that tend to produce this violent behavior have come to dominate the gene pool by out-propagating rival alleles, because male seals that engage in such fights tend to out-reproduce their peers. However, although this behavior is in line with evolutionary functioning, it often results in the seals' injury and sometimes even death, which does not seem to be in line with the seals' welfare in any plausible sense.[5] As Fitzpatrick illustrates with this example and many others, there is no reason to think that what contributes to gene replication always promotes the organism's welfare or flourishing. This is why, on Fitzpatrick's account, ascribing functions based on contribution to flourishing would be wrong.

In response to this objection, neo-Aristotelians deny that their function ascriptions have anything to do with the concept of function in biology. They argue that their account of natural goodness is based on a *different* concept of function that is not intended to capture the biologists' talk of functions (Lott 2012a; Hacker-Wright 2009a). This response, however, raises a concern about the neo-Aristotelians' central claim that moral evaluations are continuous with evaluative patterns found in the lives of non-human animals and plants. As we saw earlier, what makes neo-Aristotelian naturalism a form of ethical naturalism is that it presents moral evaluation as an instance of natural goodness—a kind of evaluation claimed to be based on the very nature of plants and animals as living things. The flourishing-based concept of function is at the core of evaluations of natural goodness, which is why it is crucial for neo-Aristotelians to show that this concept of function is indispensable to the understanding of living things. If it turns out that the flourishing-based concept of function is merely accidental to the understanding of living things, there would be no reason to think that evaluations made on the basis of this concept really are based on the nature of living things. Thus, simply presenting the neo-Aristotelian concept of function as *different* from the concept of function in biology is not enough to adequately respond to the objection from biological functions. Biology is a special science concerned with the systematic and rigorous study of the domain of life. If the neo-Aristotelian concept of function

[5] As Lott (2012a) points out in his response to Fitzpatrick, it doesn't necessarily follow from the fact that elephant seal fights involve pain or injury that they cannot be conducive to welfare in the sense of flourishing—especially because reproduction is an aspect of the seals' flourishing that is promoted by the fights. But Fitzpatrick's general point is that biological function is determined independently of the organism's welfare or flourishing. So unless we define flourishing in ultimately genetic terms, there will be cases where biological functions do not promote flourishing. For a more compelling case, see his discussion of the battle over sex ratio between the queen and sterile female workers in ant colonies—a behavior that has an evolutionary function without even increasing the reproductive output of the individual or the colony (2000: 74-77).

has no place in biology, one can legitimately question whether this concept is essential to the understanding of living things.

Neo-Aristotelians have defended their concept of function by appealing to Thompson's account of representations of life. On Thompson's account, the form of thought exhibited in natural-historical judgments is exclusively used in relation to living things and captures what is involved in representing something *as living.* Hacker-Wright (2009) and Lott (2012a) have thus argued that the natural-historical form of thought, along with its implications regarding natural goodness and flourishing-based function, is necessary for understanding living things because it's necessary for identifying them as living.

However, this argument relies on the representation of life in generic, everyday descriptions of living things rather than state-of-the-art science. We make natural-historical judgments in our ordinary thinking about the domain of life. Even if these judgments exhibit a distinctive form of thought that is exclusively used in relation to living things, it doesn't follow that the underlying form of thought accurately captures the *nature* of living things. We may find this form of thought useful in common-sense reasoning about plants and animal, but there is still a question as to whether it provides the best conceptual framework for understanding their nature as living things. Science often dispenses with our folk understanding of things by offering theories that are superior and explain the relevant phenomena better.[6] A folk view might help to get a useful grasp on things, but it often loses ground to modern science when we seek a sound understanding of the world and the nature of the things it contains. This is why the neo-Aristotelians' argument from the representation of life in the folk view is not sufficient to show that their concept of function is *essential* to understanding living things.

That said, if it turns out that the natural-historical form of thought is not only employed in folk representations of life but also explanatorily indispensable to modern biology, then the fact that it implicitly commits us to the flourishing-based concept of function would be telling. It

[6] This is clear in the case of modern physics, which has replaced our naïve conception of the physical world. Note, for instance, that an extensive literature on our intuitive explanations of motion suggests that they are fundamentally different from Newtonian explanations (Nersessian and Resnick 1989; McCloskey 1983). We seem to commonly apply a model resembling Aristotelian physics, according to which continuous motion requires the sustained force of an internal or external cause, while the state of rest doesn't require any causal explanation. But Newtonian physics maintains that a moving object continues to move until acted upon by some external force, and contradicts the commonsense intuition by suggesting that motion is a state and only changes of state (e.g., accelerated motion) require explanation.

would suggest that this concept of function is indeed necessary for understanding living things and accurately represents their nature. In fact, Hacker-Wright and Lott have both suggested as much, claiming that even a science like evolutionary biology would have to presuppose the natural-historical form of thought (Hacker-Wright 2009a: 316; Lott 2012a: 375). However, for them, this is simply a *consequence* of Thompson's argument that natural-historical judgments are necessary for representing living things. They do not provide any additional, independent arguments for this claim by looking at biology to pinpoint the role of this form of thought within the scientific account.

My contention is that, rather than merely tracing the neo-Aristotelian concept of function in pre-scientific judgments, we can show its role in biology by paying attention to a kind of functional explanation that has been overlooked in discussions of neo-Aristotelian naturalism. The objection from biological functions is made based on the assumption that the only respectable account of functional explanation in biology is the evolutionary, *etiological* account, according to which the function of a trait is given by its historical role in natural selection.[7] But I argue that the etiological account of function does not capture all cases of functional explanation in biology. As we will see in the next section, a more recent account of biological function—namely the organizational account—brings into view another important concept of function in biology, which is much more friendly to the claims of neo-Aristotelian naturalism.

4 Biological Functions Revisited

The classic philosophical accounts of biological function fall into two main approaches. The first one is the *dispositional* approach (Cummins 1975; Adams 1979), according to which functions are determined by the current causal contribution of the function-bearer to a goal or capacity of a larger system. This approach is often put aside on the charge of being too broad and under-specified. On the one hand, it seems to allow for an arbitrary, subjective attribution of functions depending on which capacities of a system interest us. On the other hand, it doesn't capture the

[7] Fitzpatrick's account of function, for instance, is essentially an etiological account. Despite having important differences with standard etiological theories (see Fitzpatrick 2000: 234-246), his account is etiological in that he takes gene replication to be the ultimate biological end which determines functions, and defends this choice by appealing to the role of gene replication in explaining natural selection. Odenbaugh's (2017) version of the objection from biological functions is another example, which explicitly appeals to Godfrey-Smith's (1994) etiological theory of function.

explanatory force of function ascriptions—the idea that the function of a trait explains something about the trait such as why it exists or does what it does. A related criticism of the dispositional approach is that it struggles to make sense of *mal*function, and that it fails to differentiate between functioning and mere usefulness. The problem is that the dispositional account defines the function of a trait based on its actual contribution. So when a trait makes no contribution to a goal or capacity of the system, it's hard to see how the account can detect a malfunction instead of simply not ascribing a function. And when a trait does make such a contribution, there seems to be no way to differentiate between a functional and a merely accidental such contribution.[8]

The second approach is the *etiological* view (Wright 1973; Millikan 1989; Neander 1991, Godfrey-Smith 1994), which appeals to the causal history of a trait to overcome the excessive breadth of the dispositional account. On the etiological account, the function of a trait is the contribution for which it has been evolved by natural selection. In other words, it is the contribution of the trait that historically explains its current presence or prevalence. To use the classic example of the heart, the function of a human heart is to pump blood, because pumping blood is what historically has contributed to the natural selection of humans with a heart, and thus explains the current presence of human hearts. In this way, the etiological account overcomes the main problems of the dispositional account. It specifies natural selection as the proper goal relative to which functions are determined. And it captures the explanatory force of function ascriptions in terms of the explanation of a trait by its natural-selection evolutionary history. Furthermore, since it allows the function of a trait to come apart from its current contribution, it has no problem making sense of malfunction or drawing the distinction between functioning and mere usefulness.

However, the etiological account has also faced a lot of criticism. One of the main objections against this account is that it is too narrow to accommodate all instances of functional talk in biology. It defines functions merely based on the past contribution of a trait to natural selection, and makes the current contribution of a trait irrelevant to determining its functions. Although past contribution to natural selection is the relevant explanatory factor in evolutionary

[8] That said, introducing the type/token distinction enables dispositional theorists to draw the relevant distinctions. A token trait can *malfunction* when it doesn't do what other tokens of its type do, and it can *accidentally* contribute to the goal of the system when its contribution is not the same as the contribution of normal tokens of its type. There are obviously questions about how types can be individuated, or how often tokens of the type have to contribute to a goal or capacity to ground a function. But these are part of the general problem of under-specification with the dispositional account and do not necessarily amount to a distinct problem for the view.

biology, there are areas of biology with different explanatory needs. As many philosophers of biology have argued, in areas of biology such as physiology, functional anatomy, and neuroscience—where evolutionary explanation is not the main concern—function ascriptions are primarily related to the current effects of traits rather than their evolutionary past (Walsh and Ariew 2010; Roe and Murphy 2011; and Kraemer 2014). Moreover, even within evolutionary biology, the etiological account might not be adequate for capturing the concept of function in certain more recent research programs. As Krohs (2011) has argued, for instance, the etiological account relies on the theoretical framework of gene deterministic adaptationism. This framework, however, has been rigorously criticized for focusing on natural selection as the sole or primary evolutionary mechanism and ignoring the role of developmental and epigenetic factors in evolutionary change. Present day evolutionary biology features new research programs such as EvoDevo and Eco-EvoDevo, which seem to ascribe functions based on different criteria and regardless of whether a trait has an adaptive origins.[9]

To address the shortcomings of the dispositional and the etiological views, an alternative account of biological function has recently been proposed. This is the *system-theoretic* or *organizational* account of function, which identifies functions based on what contributes to the maintenance of a system's organization (Schlosser 1998; McLaughlin 2001; Christensen and Bickhard 2002; Weber 2005; Mossio et al. 2009; Moreno and Mossio 2015)[10]. Interestingly, the organizational approach has emerged out of various attempts to give a scientific account of the nature of life (Kauffman 1993; Barandiaran, Di Paolo, and Rohdel 2009; Di Paolo 2005).[11] Most earlier theories of function try to give a unified account that captures not only biological functions, but also other kinds of function such as artifactual or intentional functions. But the organizational account is particularly aimed at the distinctive use of function ascriptions in relation to biological systems, which are characterized as self-organizing and self-maintaining autonomous systems. A *self-maintaining system* maintains itself by producing at least some of the necessary conditions for its own existence. It consists of parts and processes that contribute to

[9] See Krohs 2011: 129-131 for a discussion of the critique of adaptationism and why the etiological account is inadequate to capture functional ascriptions in post-adaptationist evolutionary biology.

[10] I follow Garson (2016; 2017) in grouping this somewhat diverse cluster of theories under the general heading of the organizational approach.

[11] See Nicholson (2014: 8-10) for an account of how a revived interest in the nature of life as a genuine scientific problem has led to the organizational approach to understanding biological functions.

keeping its systemic organization intact and at the same time need to be constantly regenerated and repaired by the organization.[12] Living things are clearly self-maintaining systems that maintain themselves via the contribution of their vital organs and operations. On the organizational account of function, it is this self-maintaining character of living things that underwrites function ascription. Although different versions of the organizational account flesh out the details in different ways, the general idea is that a part or trait in a self-maintaining system acquires a function by contributing to the working of the system and thereby contributing to its own persistence within the system. Thus, the organizational function of a trait *T* in a self-maintaining system *S* is, roughly, the contribution of *T* to the self-maintenance of *S*.

Consider the example of the heart again. The beating of the heart circulates blood, which carries nutrients to the cells and eliminates waste. In doing so, it helps to repair and regenerate the cells of the body, including the cells that make up the heart itself. Thus, the heart contributes to the maintenance of the whole organism, which in turn contributes to the persistence of the heart within the organism. On the organizational account, this is what grounds the fact that the heart has the function of circulating blood. It is not the contribution of heart tokens to the *inter*generational reproduction of their type—as the etiological view would have it—but rather their contribution to their own *intra*generational persistence as tokens that determines their function.

An influential defence of several aspects of the organizational approach is offered in McLaughlin's (2001) account of functional explanation.[13] McLaughlin argues that we can capture the explanatory force of function ascriptions without appealing to natural selection. On his view, contrary to what the advocates of the etiological approach typically assume, the historical process of natural selection is not the only mechanism that explains why a functional trait exists and does what it does. There is also the feedback mechanism constitutive of a self-

[12] Different advocates of the organizational approach use different terminology to refer to self-maintaining systems. Here I follow the terminology adopted by Mossio et al. (2009), which I find to be the most appropriate label. But, as it will become clear in the next section, I do not embrace certain other aspects of Mossio et al.'s (2009) version of organizational account.

[13] Although McLaughlin doesn't use the terminology I have adopted here, his account of function fits very well within the general framework that I am calling the organizational approach.

maintaining system, which runs within the individual organism.[14] In fact, the explanatory scope of this feedback mechanism extends beyond that of natural selection. Natural selection can only explain how the effects of a trait token contribute to the nature of *future tokens* of the same type. In contrast, the constitutive organization of a self-maintaining system can explain how the effect of a trait token can contribute to the nature of *that very token* (2001: 162-164). A self-maintaining system preserves its identity and integrity by constantly regenerating and repairing itself via a cycle of mutual dependence relationships between the whole system and its parts. This means that the contribution that any part makes to maintaining the system explains the presence of that part itself.

We can now see how the organizational account addresses the main issues faced by the two classical approaches. Not only does it capture the explanatory force of functions, it overcomes the problem of under-specification for the dispositional account by identifying a specific goal relative to which the functions are determined. What underwrites ascribing organizational functions is a self-maintaining system's capacity for self-maintenance, which—according to a growing literature on the subject—is a constitutive feature of living systems essential to their nature as living things (Varela, Maturana, and Uribe 1974; Rosen 1991; Gánti 2003; Nicholson 2013). So the ascription of organizational functions is not arbitrary or merely based on the capacities of a system that interest us, but rather specifically the effect of a trait that explains its nature as part of a self-maintaining system.[15] Moreover, unlike the etiological account, the organizational account has no problem capturing the relevance of the current contribution of a trait, since it defines functions based on contribution to the self-maintenance of the current system. It is not committed to the theoretical framework of adaptationism, and does not restrict functional traits to evolutionary adaptations. As such, it offers a complementary account of

[14] Using a different terminology, McLaughlin refers to self-maintaining systems as "self-reproducing systems." What he means by "self-reproduction" though is the constant re-production and regeneration of the *same* token of the system, which I believe is less ambiguously captured by "self-maintenance" (see McLaughlin 2001: 211).

[15] It may seem as though by defining functions based on the current contribution of a trait, the organizational account faces the same problems as the dispositional account with respect to capturing malfunctions or making the function/accident distinction. In the next section, I will argue that this is in fact a problem for a certain reductive interpretation of the organizational account. But the version of the organizational account that I will defend does not face this problem, as it presupposes a conception of flourishing of the organism that can be the basis for making the relevant distinctions.

function that is suitable for post-adaptationist evolutionary biology as well as areas of biology not directly focused on evolutionary explanation.[16]

While I have not offered a conclusive defense of the organizational account in this paper, the preceding review should suffice to motivate the idea that it offers a promising account of an important concept of function in biology. To be clear, it is not my intention to claim that the organizational account exhausts the talk of functions in biology, or that it should *replace* the etiological account of biological function. My claim is rather that it captures *a* concept of function in that plays an important role in the scientific study of life, and is—to that extent—necessary for understanding the nature of living things.[17]

5 Organizational Functions as Flourishing-Based Functions

The task now is to see if the organizational account does any better than the etiological account as a basis for evaluations of natural goodness. Initially, it may seem that understanding natural goodness in terms of the organizational concept of function yields equally problematic results. The problem with understanding natural goodness in terms of the etiological concept of function was that etiological functions are determined based on the contribution a trait makes to natural selection, which can be at odds with the flourishing of an organism. At first glance, the concept of function underlying the organizational account may not seem different in this regard. Organizational functions are determined based on contribution to self-maintenance, and it may seem that what contributes to self-maintenance can be similarly at odds with the flourishing of an organism. Particularly in the human case, where the neo-Aristotelian conception of flourishing is tied to moral virtue, it's not clear that what contributes to self-maintenance would always line up with flourishing. It may turn out, for instance, that under certain conditions, what best serves a human's survival would be violence, deception, and selfishness—character traits that are clearly at odds with the neo-Aristotelian conception of human flourishing.

[16] Nunes-Neto, Moreno, and El-Hani (2014) argue, for instance, that the organizational approach offers a suitable account of function ascriptions in ecology.

[17] It's worth noting that some proponents of the organizational approach do aim to offer an exhaustive account covering all instances of function ascription in biology. As Garson (2017: 1094) has noted, one way to do this would be framing the account as a disjunctive theory, defining functions in terms of the contribution to either the intragenerational persistence or the intergenerational multiplication of the system. For my purposes, however, it doesn't matter if the account is exhaustive or merely covers one indispensable concept of function in biology.

However, we will see that this concern is based on a misconception of self-maintenance as merely consisting of the persistence of a certain kind of causal dynamic. I will argue that, despite the best efforts of many organizational theorists, the notion of self-maintenance required for organizational function ascription cannot be causally reduced. On my account, this notion presupposes a conception of the *welfare* of the self-maintaining system, which cannot be characterized in purely causal terms. Thus, unlike etiological functions—which can be simply determined based on causal facts about natural-selection history—organizational functions cannot be determined without a prior grasp of what constitutes welfare for the organism. And it's not at all obvious that given the right conception of human welfare, the organizational functions that are instantiated in human beings can conflict with moral virtue.

Many advocates of the organizational approach have tried to delineate the criteria for organizational function ascription in purely causal terms. However, as I argue below, a merely causal characterization of the account leads to an overgeneralization problem. Consider the organizational account offered by Mossio et al. (2009) and Moreno and Mossio (2015), which is the most fully developed instance of this reductive approach. On this account, organizational functions are defined based on a trait's causal contribution to the maintenance of a self-maintaining system, where a self-maintaining system is characterized in terms of two causal conditions: *organizational closure* and *organizational differentiation.* Organizational *closure* is a circular causal relation between some higher-level macroscopic pattern or structure and the lower-level microscopic dynamics and reactions within the system. This circular causality makes the activity of the system a necessary (although not sufficient) condition for the continuous existence of the system itself. Organizational *differentiation* involves realizing organizational closure in a particularly complex way. An organizationally differentiated system generates different and localizable patterns and structures each making a distinct contribution to the whole organization.[18] According to Mossio et al. (2009), biological systems are organizationally closed and differentiated systems, and that is precisely why they are subject to functional analysis.

However, we can see that this account extends function ascriptions to domains where functional discourse is not warranted. As Garson (2017) has recently argued, there are structures

[18] The condition of organizational closure turns out to be a ubiquitous property in the physical world, manifested in many non-living systems such as hurricanes and candle flames. Mossio et al. introduce the second condition to avoid ascribing organizational functions to non-living systems where the relevant concept of function does not apply (2009: 826).

that meet the conditions of organizational closure and differentiation, and yet do not underwrite the relevant kind of function ascription. Garson offers the example of panic disorder. He argues that panic attacks, which result from catastrophizing misinterpretations of bodily sensations, involve many mechanisms that set the stage for their own recurrence. These are psychological states and behavioral dispositions that are caused by the disorder and that each make distinct contributions to its persistence.[19] Nonetheless, it would be a mistake to ascribe organizational functions to these mechanisms in virtue of their contribution to the persistence of panic disorder. As Garson points out, normal medical practice almost universally characterizes panic disorder as involving cognitive or biological *dys*functions (e.g., Ludewig et al. 2005).[20]

The overgeneralization problem results from the attempt to ground organizational functions in merely causal criteria, which turn out to be instantiated in non-functional domains as well.[21] This is why philosophers of biology like Bedau (1992) and McLaughlin (2001) have defended a *value-based* approach to understanding functions. The reason we don't ascribe functions to aspects of a panic disorder is not a lack of differentiation or complexity of organization, but rather that no good comes from the behavior of such systems. Bedau effectively argues that to avoid overgeneralization, any account of function needs to implicitly or explicitly include a value criterion, which minimally requires that the function involves a *good* consequence for someone or something. McLaughlin similarly advocates a value-based, 'welfare' approach, according to which function ascription implies the existence of a system that has a good or welfare, and so can benefit from the functions. More specifically in the context of organizational functions, McLaughlin argues that the beneficiary is the self-maintaining system itself, of which the functional trait is a part. He thus incorporates a welfare criterion in his

[19] For instance, a single attack makes the person worried about having another and thus more vigilant to future bodily sensations. The person tends to avoid the particular situation that brought on the attack, which results in having fewer chances for disconfirming false beliefs about the experience, and so on. (See Garson 2017: 1096-1098 for a detailed account.)

[20] Of course, scientists *can* choose to use functional analysis to study panic disorder if a certain feature of the phenomenon such as the tendency of the attacks to perpetuate themselves happens to interest them. As I mentioned earlier, the broad dispositional concept of function can be used to ascribe a function to any part of system that contributes to some interesting capacity of the system. But the organizational concept of function is intended to capture a different, explanatory use of function ascription that is distinctive of living systems, and this specific concept of function clearly does not apply in the case of panic disorders.

[21] The problem is not specific to the particular criteria delineated by Mossio et al. (2009). As Garson argues, another prominent reductive version of the organizational account (Schlosser 1998; Weber 2005), which focuses on complexity instead of differentiation, falls prey to the same objection.

conception of a self-maintaining system. On his account, a self-maintaining system has a welfare of its own, and benefits from its own self-maintenance (2001: 109-204).

It might be objected that this reference to welfare disqualifies the organizational account from being a scientifically respectable account of function. However, despite the prevalence of the idea that we must somehow sanitize functions by removing any reference to value, it's not clear why such a reference is necessarily unacceptable. If we cannot account for functional explanations in biology without such a reference, then commitment to an irreducible notion of value seems inevitable. This is exactly what Bedau and McLaughlin have argued. In order to properly account for functional explanation, we need to presuppose the existence of beneficiaries with a welfare of their own. To put it in McLaughlin's terms, the commitment to the idea that biological systems have a welfare is "the metaphysical price" of embracing functional explanations in biology. And while philosophers may analyze and clarify this metaphysical cost, it's ultimately up to empirical scientists to decide whether we ought to "pay the bill." Philosophers have tried to avoid the supposedly offensive reference to value by giving a stipulative definition of function, e.g., in terms of organizational closure and differentiation. But it's not clear what can be gained from such a definition if it doesn't capture the biologists' concept. Unless biologists explicitly accept a value-neutral theoretical definition of organizational functions and adhere to it in the face of putative counterexamples, they are committed to the notion of a self-maintaining system as a system with a welfare of its own (McLaughlin 2001: 212).

Thus, to avoid the overgeneralization problem, the organizational account needs a conception of the welfare of the system that cannot be reduced to causal dynamics. This element of welfare in the organizational account means that character traits like violence and deception cannot be ascribed an organizational function unless they contribute to human welfare, which, in all likelihood, they do not.

One might object that the notion of welfare required for ascribing organizational functions is a minimal, strictly biological notion of welfare that has nothing to do with flourishing in the neo-Aristotelian sense. 'Biological welfare' seems to consist in something very specific, namely the system's self-maintenance in the sense of maintaining its constitutive organization. So although we need to presuppose *that* a biological system benefits from the organizational functioning of its part, we might be able to give a causal account of *what* the system's benefit

consists in: the system's continued existence. And if this is the case, there seems to be no reason to think that organizational functions in human beings have to be consistent with moral virtue. So, again, character traits like violence and deception can turn out to contribute to biological welfare, which would mean that organizational functions are not a suitable basis for a neo-Aristotelian account of natural goodness.

However, a closer look will reveal that what we need to presuppose in organizational function ascription is not just *that* the system has a welfare, but also a substantive conception of *what* this welfare consists in. We saw earlier that a purely causal account of organizational functions in terms of criteria like closure and differentiation leads to overgeneralization. To avoid this problem, we need to add a welfare condition to the account, which requires that the system encompassing the functional traits has a welfare and benefits from the functions. But just as the fact that the system has a welfare cannot be deduced from a purely causal description, what constitutes welfare for the system cannot be deduced from causal criteria either. The notion of welfare that is presupposed in organizational function ascription is in fact tied to the self-maintenance of the system. But looking at the organizational concept of *malfunction* reveals that, even when we limit the domain of discourse to systems that truly have a welfare, we cannot characterize the welfare of these systems in terms of purely causal criteria. As I argue below, the mere fact that a beneficiary system is preserved by a cycle of organizational closure is not sufficient for it to be doing well, and *how* it maintains itself matters.

First, note that the possibility of organizational *mal*function means that a functional trait's contribution to the system's current cycle of organizational closure is not sufficient for its *well*-functioning. This implies that the mere persistence of a cycle of organizational closure is not sufficient for the system to be doing well. If all that was required for welfare was maintaining organizational closure, then any trait that contributed to organizational closure would be well-functioning, while any trait that didn't contribute to organizational closure would not have a function at all.[22] But this implication is unacceptable. Surely a heart can malfunction even when it continues to circulate blood, e.g., when it beats irregularly. So to capture the possibility of malfunction, the organizational account needs a conception of welfare that goes beyond the mere maintenance of a causal organization. This conception of welfare has to allow for the system's

[22] This is because on the organizational account, functionality requires making a contribution to the maintenance of the organization.

constitutive organization to be maintained *well* or *poorly*, such that welfare consists in the system's maintaining itself *well*.

It might be thought that what it is for an organism to maintain itself well can be understood causally in terms of the effectiveness or stability of maintaining the organization. A malfunctioning heart may not result in a breakdown of the organization, but it probably makes maintaining the organization less efficient or increases the risk of such a breakdown. This idea is explored in Saborido and Moreno's (2015) account of organizational malfunction, according to which a malfunctional trait diminishes the overall *range of viability* of the system.[23] However, defining malfunction in terms of its effect on the system's range of viability requires identifying a benchmark for the range of viability that is expected of the system. In order to see if the activity of a trait *reduces* the range of viability, we need a prior grasp of the range of circumstances in which the system is supposed to be viable. But it's not clear how this benchmark can be identified based on merely causal criteria. The system's range of viability at an earlier time isn't necessarily a good benchmark, because the system may have been malfunctioning from the beginning. The reference point cannot be an *ideal* system with an infinite range of viability either, since no organism can be expected to be viable under all possible circumstances. Even when every part of the system is functioning properly, the range of circumstances in which the system can maintain itself will be limited. For instance, a perfectly healthy human is not expected to be able to breathe under water like the fish do. A sloth is not expected to be able to run as fast as a deer, and so on. Thus, a system's having a range of viability that is narrower than it would have been if its traits were working differently doesn't necessarily mean that there is any malfunction.[24]

[23] On this account, for each self-maintaining system, there are several specific instances of organizational closure—or *regimes of self-maintenance*—that it may adopt. The functional traits and organs operate with a specific range of activity in each of these regimes. And switching between these different regimes by way of a regulatory subsystem enables the system to maintain its viability in the face of internal and external change. A functional trait isn't necessarily indispensable for the organism's life, because not every functional trait contributes to all possible regimes of self-maintenance. When a component of the system breaks down, the regulatory subsystem can compensate by shifting to a different regime that doesn't require the contribution of that component. But the system's overall range of viability might be reduced as a result, because the alternative regime might not be viable in as many circumstances. This, on Saborido and Moreno's account, is when a malfunction occurs.

[24] It may be thought that the benchmark should be the maximum range of viability that could result from the working of each trait given the constraints posed by the material structure of the rest of the system. But several parts of the system could be malfunctioning at the same time, and the current structure of the rest of the system could

Moreover, the issue is not merely identifying a threshold for the minimum required degree of viability for the organism to count as doing well. Having a higher overall degree of viability does not always mean that the organism is maintaining itself better. In fact, if the higher degree of viability comes at the cost of loss of certain abilities, the organism may very well be doing worse overall. An interesting example can be found in Laron Syndrome, an autosomal recessive disorder that is characterized by an insensitivity to growth hormone resulting in dwarfism and obesity. Although individuals with Laron Syndrome are prone to a number of neurological and metabolic problems, studies suggest that they not only have a normal life span, but also a significantly reduced risk of cancer and type 2 diabetes (Shevah and Laron 2007; Guevara-Aguirre et al. 2011; Bartke, Sun, and Longo 2013; Laron et al. 2017). It's precisely the insensitivity to growth hormone that offers protection from major age-related diseases, which arguably makes a positive contribution to viability. Nonetheless, it is not considered a well-functioning of the receptor proteins to resist binding to growth hormone and protect body from aging. The receptor's inability to bind to growth hormone is unequivocally treated as a pathological condition and a malfunction. This example shows that viability is not the only consideration that is relevant in determining whether a trait is functioning well or poorly. What it is for the organism to maintain itself *well* seems to go beyond achieving a high degree of viability. Other considerations having to do with what the organism is supposed to be able to do seem to put constraints on what counts as a *good* manner of achieving viability for a given kind of organism. This helps to see why the relevant notion of welfare would not be reducible in terms of the abstract idea of effectiveness or stability of maintaining an organization.

Absent a successful reductive account, I propose that organizational function ascription presupposes a substantive conception of what it is for the organism to maintain itself well, which in turn presupposes a conception of what it is for the organism to do well in general. Organizational functions are self-maintaining functions. They specifically track the contribution of traits to the self-maintenance of the organism. But what constitutes self-maintenance for an organism depends on what constitutes doing well for the kind of organism that it is. I propose that the neo-Aristotelian notion of *flourishing* captures this kind-specific conception of doing well. Thus, I suggest that self-maintenance should be understood as an aspect of the organism's

already be defective. This means for any constraint posed by the material structure of the system, it's underdetermined whether it is a legitimate constraint or one that involves a malfunction.

flourishing, and in the context of other aspects of flourishing such as development, reproduction, and in the human case, rational agency. The example of Laron Syndrome demonstrates how these other aspects of flourishing can put constraints on what is an acceptable manner of self-maintenance for the organism. It's because the resistance of growth hormone receptors in individuals with Laron Syndrome hinders other aspects of their flourishing such as growth and development that its positive effect on viability does not amount to better organizational functioning. Similarly, even if character traits such as violence or deception increase viability, it doesn't immediately follow that they properly contribute to self-maintenance or are well-functioning character traits. Organizational functions depend on what constitutes flourishing for the organism, which essentially makes them instances of flourishing-based functions. So, organizational functions in human beings cannot be determined without a prior grasp of human flourishing. And if, as neo-Aristotelians tell us, human flourishing requires a life of virtue, no character trait that conflicts with such a life would be well-functioning on the organizational account.

6 From Organizational Functions to Natural Goodness

We saw that the objection from biological functions appeals to the etiological account of function to challenge the commitment of neo-Aristotelian naturalism to flourishing-based functions. More specifically, the objection challenges the idea that the flourishing-based concept of function is *necessary* for understanding living things, which in turn undermines the thesis that flourishing-based evaluations of natural goodness apply to living things on account of their nature. However, I argued in section 4 that the organizational account captures a class of biological functions distinct from etiological functions that have been overlooked in the conversation about neo-Aristotelian naturalism. Then, in section 5, I argued that organizational functions are best understood as instances of flourishing-based functions. Now we can see how neo-Aristotelians can respond to the objection from biological functions by appealing to the organizational concept of function in biology. To the extent that organizational functions are part of a full scientific account of living things, the flourishing-based concept of function is necessary for understanding living things. This means that the neo-Aristotelian evaluations of natural goodness are based on a concept of function that is essential for grasping the nature of living things.

I have thus offered a novel response to the objection from biological functions by arguing that the flourishing-based concept of function is not only used in folk representations of life but also explanatorily indispensable to modern biology. In a way, this is what neo-Aristotelians have been claiming all along. As we saw earlier, Hacker-Wright and Lott claim that even the science of biology has to presuppose neo-Aristotelian function ascriptions. But for Hacker-Wright and Lott, this is an *a priori* claim made independently of the actual content or explanatory needs of empirical biological science. Hacker-Wright calls the neo-Aristotelian view of function "a logical theory" and distinguishes it from "empirical" theories of living things. He claims that this logical theory of function is not supposed to be explanatory, but rather plays a different theoretical role in identifying organisms as such (2009: 316). Because of this, Hacker-Wright believes that Foot and Thompson are actually right not to consult the concept of function in contemporary biological science. On my view, however, drawing a distinction between logical and empirical theories of function and isolating the former from our scientific understanding of living things would be a mistake. The everyday, common-sense representations of living things in natural-historical judgments are not any less empirical than representations of living things in biology. And we shouldn't assume that the concept of function implicit in these judgments cannot be subject to further empirical investigation based on science. What I have argued here is that we can in fact locate the neo-Aristotelian concept of function in a class of functional explanations in biology.

It may be objected that if natural goodness is understood in terms of a concept of function that is used in biology, then biologists would be in a position to study evaluations of natural goodness, including the norms of virtue and reason. The implication that knowledge of moral virtue can come from biology would be problematic. On one hand, as several critics have pointed out, it would likely result in intuitively implausible first-order claims about what moral virtue consists in (Millgram 2009; Andreou 2006; Woodcock 2006). On the other hand, the idea that we can derive moral conclusions from strictly biological premises would imply that we need to radically revise our ordinary modes of reasoning about morality. Note that we do not typically consider biological premises to be in a privileged position to justify moral claims. Doing so, in Thompson's words, would be to "turn ethics into a sub-discipline of biology", and to "deny what

is legitimately called the 'autonomy of ethics'" (2004: 62).[25] If this autonomy of moral reasoning from biology is worth preserving, then it might seem that the only way to accept that biology can study evaluations of natural goodness would be to suggest that biologists need prior knowledge of moral virtue before engaging in biological inquiry. But this would be an even less palatable implication.

However, the idea that the concept of function underlying evaluations of natural goodness has a place in biology does not imply that biology can offer knowledge of moral virtue. Just because a concept plays an explanatory role in a domain of inquiry, it doesn't follow that this domain of inquiry can give us the full extension of the concept. I have argued that the organizational functions ascribed in biology are instances of flourishing-based functions. But this is not to say that flourishing can be understood solely based on organizational functioning. Organizational functions are merely a *subclass* of flourishing-based functions. They are the subclass of flourishing-based functions that trace contribution to self-maintenance, which is only one aspect of an organism's flourishing. There are other aspects of the flourishing of an organism that go beyond self-maintenance, and so are not captured by organizational functions. On Foot's account, for instance, in the case of plants and non-human animals, flourishing consists of self-maintenance, development, and reproduction (2001: 33). On Hursthouse's account, the list is actually longer for some non-human animals, and at the very least includes enjoyment and freedom from pain as well (1999: 200). The flourishing of an organism thus goes beyond self-maintenance, and involves other dimensions, depending of the kind of organism in question. Flourishing-based functions specify *how* each of these different aspects of flourishing are achieved in the life of a kind of organism—e.g., how organisms of a given kind find nutrition, grow, reproduce themselves, and so on. While any of these functions can be the basis of an evaluation of natural goodness, only the ones concerning self-maintenance fall under organizational functions. Thus, although organizational functions can be the basis of evaluations

[25] What Thompson is concerned with here is only what we may call *epistemic* autonomy, and more specifically, epistemic autonomy of ethics from the domain of biology. This is, roughly, the thesis that biological evidence is not relevant to the epistemic justification of "pure", or "non-mixed", ethical claims. (See Maguire 2017 for a discussion of different types of autonomy that might be attributed to the ethical domain.) Although some forms of ethical naturalism might deny the epistemic autonomy of ethics from other domains, neo-Aristotelian naturalists have frequently presented their view as compatible with the epistemic autonomy of ethics from biology. They have explicitly rejected the interpretation of their view as deriving substantive norms of virtue from biology, and have said again and again that they do not attempt to give a revisionist, 'biologistic' account of moral reasoning and deliberation (see Thompson 2004: 72; Lott 2012b: 418-421).

of natural goodness, not all evaluations of natural goodness are based on organizational functions.

In the case of human beings, of course, flourishing is even more complex. As Foot points out, the elements that make up good human lives are not only more diverse, but also highly interdependent. For example, the good of reproduction in human beings is related to other goods such as the love and ambition of parents for their children, the special role of grandparents, and many other considerations that do not apply in the case of non-human organisms. As a result of this interdependence, other elements of a good human life can line up such that abandoning a good like having children is not necessarily a defective choice for a human being. The demands of work to be done, for instance, might give a person a reason to forgo family life altogether (Foot 2001: 42). What makes the human case yet more complex is that human life is characterized by practical reason, i.e., the capacity to recognize, respond to, and act in light of reasons. In other words, there is an aspect of human flourishing—manifested in human action and character—that cannot be understood without a grasp of practical reason. Because of this, some neo-Aristotelians have argued, in my view rather effectively, that an understanding of human flourishing *cannot* come from biology or any other empirical science.

Lott (2012b) argues that knowledge of human flourishing cannot come from empirical science, because a proper understanding of the dimension of practical reason in human life can only come from *acquiring* practical wisdom and ultimately moral virtue. Plausibly, a sound grasp of human practical reason involves substantive judgments regarding what makes a human action rationally justified and what counts as a good reason for action, which in turn requires a proper sensitivity to considerations about various human ends and values. In Lott's view, to the extent that moral virtues characterize sound human practical reason, this is exactly the kind of sensitivity that distinguishes the virtuous person from the non-virtuous. Only the virtuous person can have a full understanding of what she ought to do in any given situation, and this understanding comes through her disposition toward virtuous actions and away from vicious ones. This is why, on Lott's account, understanding the practical dimension of human flourishing falls outside the scope of empirical science. It is an understanding that is possessed by someone "not *qua* scientist but *qua* practically wise person" (409). In a similar vein, Hacker-Wright (2009b; 2013) argues that fully understanding human flourishing requires a normatively-laden interpretation of our own form of life that cannot be obtained from a biological account of the

species *Homo sapiens*. That is because we can only make such a *rational* self-interpretation in view of our personhood and our nature as practically reasoning creatures.

At this point, the claim that the neo-Aristotelian view is a form of naturalism might seem puzzling. If our conception of human flourishing is formed through practical reason and cannot come from empirical science, in what sense is it natural? If, on the other hand, ethical naturalism does not require an account of morality that is grounded in empirical science, why did we have to examine the concept of function in biology to begin with? To answer these questions, we first have to note that there is something rather distinctive about the way neo-Aristotelians argue for ethical naturalism. Other forms of ethical naturalism such as Cornell realism (Boyd 1988; Brink 1986; Sturgeon 1985; Railton 1986) construe the natural domain as the domain of natural science, and aim to give an account of morality in terms of facts and properties that fall within the scope of natural science. In contrast, neo-Aristotelian naturalism does not understand the natural domain in epistemic terms or in relation to natural science. Instead, it starts from the idea that the domain of non-human life is uncontroversially natural, and purports to show that the domain of morality is continuous with this natural domain. Thus, neo-Aristotelians argue that flourishing-based evaluations of human action and character are natural because they belong to the broader evaluative patterns that are found in the lives of animals and plants. There is no commitment to the idea that the epistemology of human flourishing is empirical or scientific. It's only the form of evaluation that is claimed to be continuous across the human and non-human domain. Now, my suggestion that we need to examine the concept of function in biology should be understood in the context of assessing this specific claim about the continuity of the form of evaluation. The appeal to the concept of function in biology is *not* due to an epistemological commitment to acquiring knowledge of human form through biology or any other empirical science. The objective is not to assess a substantive account of human flourishing by consulting empirical science. It's rather the claim to continuity, and particularly its implications regarding *non*-human living things, that I have set out to defend by examining the explanatory concepts of biology. As I pointed out earlier in the paper, when it comes to understanding the domain of non-human life, the science of biology does have a privileged position over folk views due to its rigorous and systematic study of the subject. This is why the neo-Aristotelians' ascription of flourishing-based functions to the parts and aspects of plants and animals should be assessed by consulting biology. What the explanatory role of organizational functions in biology tells us is

that the flourishing-based concept of function has a respectable place in our understanding of non-human life. That said, a full account of flourishing for any given kind of organism would go beyond the narrow scope of organizational functions. And we have seen that in the case of human beings, certain aspects of human flourishing fall outside the scope of empirical science altogether.[26]

Lastly, it might be objected that although the argument of the paper does not undermine the autonomy of our moral reasoning from biology, it implies something implausible about biology itself, namely that biologists need a prior knowledge of moral virtue in order to ascribe biological functions correctly. Even though organizational functions specifically concern self-maintenance, as long as they are instances of flourishing-based functions, identifying them correctly requires making assumptions about other aspects of flourishing, which can put constraints on what it is for the organism to maintain itself well. We saw in the last section, for instance, that in the case of Laron Syndrome the positive effect of the resistance of growth hormone receptors on viability does not amount to organizational well-functioning, due to its other, negative effects on growth and development. So it might seem that in the human case, the dimension of flourishing that concerns practical reason and moral virtue can similarly put constraints on organizational functions.

However, it should be noted that although there is a certain degree of interdependence among the different aspects of an organism's flourishing, there is also a good degree of independence. Grasping what it is for the organism to maintain itself well does not require a *complete* understanding of other aspects of the organism's flourishing. Depending on what part of an organization is being studied, only certain aspects of flourishing would be relevant, and in most cases only certain general facts need to be presupposed about those aspects. Obviously, a manner of self-maintenance cannot count as maintaining oneself well if it makes it impossible for the organism to realize other aspects of its flourishing. Biologists need to know if a manner of self-maintenance is *inconsistent* with other aspects of the organism's flourishing. But this only presupposes a partial knowledge of those other aspects, particularly knowledge of whether and how they are affected by what the organism does to maintain itself. A physiological study of

[26] It's worth noting that my argument here does not amount to a defense of other forms of ethical naturalism such as Cornel realism, not only because these views don't rely on the same premise about the nature of living things, but also because they typically involve a commitment to the idea that the epistemology of human flourishing is empirical or scientific.

human bodily functions, for instance, does not require much of a grasp of substantive norms of practical reason. And to the extent that it does, it's only in terms of general requirements such as the capacity for consciousness or memory. If a branch of empirical science engages in a study of organizational functions of human emotions and other psychological dispositions, such a study might need to make further assumptions about what is needed for the proper functioning of our practical reason. But this is not an implausible suggestion. A psychological disposition that hinders the higher functioning of our practical reason cannot be ascribed an organizational function, even if it has a positive effect on viability. If it turns out, for instance, that the capacity for empathy is essential to moral development, a psychopath's lack of empathy cannot be viewed as proper organizational functioning, regardless of how it affects the individual's viability. And it's not implausible to claim that a study of psychopathology needs to be attuned to what philosophers have to say about moral development. Thus, my argument for the role of the concept of flourishing in biology does not involve unpalatable commitments regarding the relation between ethics and empirical science.

To summarize, I have argued that the concept of function underlying evaluations of natural goodness is indispensable to biology, and is therefore necessary for understanding living things. This result in turn supports the thesis that natural goodness is an evaluation of living things based on their *nature* as living things, which is an essential part of the neo-Aristotelian account of moral virtue in terms of human nature. Of course, my argument does not amount to a defense of any particular substantive conception of human flourishing or moral virtue. As we saw earlier, organizational function ascriptions in biology only involve limited commitments regarding the flourishing of an organism, and aspects of human flourishing related to moral virtue largely fall outside such commitments. But the idea is not to provide a vindication of substantive accounts of moral virtue by appealing to biology. It's rather the neo-Aristotelian *metaethical* characterization of moral virtue as continuous with the domain of life that I have tried to defend. The central claim of neo-Aristotelian naturalism is that moral evaluations "share a basic logical structure and status" with evaluations of plants and non-human animals (Foot 2001: 27). Moral virtue is claimed to be good in a human being in the same way that deep roots are good in an oak, in that both evaluations are based on the organism's nature and characteristic flourishing. The objection from biological functions challenges this claim by denying that we can make flourishing-based evaluations of oaks and other non-humans in view of their nature as living things. This is what I

have tried to respond to by revealing the role of flourishing-based function ascriptions in biology. As we have seen, organizational function ascriptions presuppose a notion of *doing well* for the organism that accords with the neo-Aristotelian concept of flourishing and flourishing-based evaluation. Thus, there is an evaluation of living things based on their characteristic flourishing that has the same conceptual structure as evaluations of human beings, including evaluations of human action and character. In Foot's words, "there is no change in the meaning of 'good' between the word as it appears in 'good roots' and as it appears in 'good dispositions of the human will'"(2001: 39).

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