The Value of Teleology in Biological Explanation

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ABSTRACT

In the study of living things, there is a general suspicion of teleology as a legitimate mode of explanation. In its place, materialist accounts have been put forth and used by biologists to explain life processes through purely efficient-causal materialist means. Materialist Robert Boyle levels two major critiques at teleology: that it is gratuitous and obscurantist. In this view, teleology is seen as explanatorily unnecessary and potentially discouraging of investigations into the essential parts of a material entity. Materialism, conversely, is seen as simple, perspicuous, and universalizable. Through a Neo-Aristotelian lens, philosophers Martha Nussbaum and Michael Thompson challenge the view that materialist explanation is sufficient and that teleological explanation is gratuitous and obscure through clarifying the notion of the life-form, or the logos. Teleology is championed as a method of biological explanation that, rather than making accounts of living beings unclear or needlessly complex, makes them perspicuous and simple without sacrificing intellectual rigor or depth of analysis. Materialist accounts, rather than replace teleology, should accompany them in explanations of vital processes.
Introduction

The topic to come under my lens today is one question concerning the philosophy of living things; how can we understand the activity of living things? I will be conducting this survey in regards to two prominent schools of thought: materialism, the dominant view, and neo-Aristotelian teleology, a view I would like to champion. There are a number of misconceptions about what the teleological view of life truly entails, for instance that it posits occult forces that cannot be empirically verified. There is also the critique that a teleological view of life is simply unnecessary to understand it and that a materialist reductionist account of organic activity is sufficient.

What makes an explanation properly scientific or philosophically rich? Is the reductionist impulse always the right one? The materialist reductionist way of explaining life, as we will see, requires much irrelevant data in order to explain the activities of life it wants to explain, is hardly generalizable, and its explanation is far less simple than a teleological account. Does it not miss out on (or, as Michael Thompson will show us, presuppose) an understanding of the teleological life process itself? To elaborate my neo-Aristotelian teleological view, I will first begin with an explanation of Aristotle’s views on the soul before engaging with the writings of two neo-Aristotelian thinkers alive today, Martha Nussbaum and Michael Thompson.

The Materialist Position

To describe the materialist position on the definition of life, I will use two accounts: a properly philosophical early modern materialist account of nature by Robert Boyle and a weakly philosophical account of what it means to be alive given by biologists as portrayed by Michael Thompson.
I will begin with Michael Thompson’s account of reductionist materialism in *Life and Action*. This materialist philosophy is not purveyed by professional philosophers, but by biologists. I will re-quote Thompson quoting the beginning of an elementary biology textbook written by biologist Helena Curtis on what it means to be alive:

What do we mean when we speak of “the evolution of life” or “life on other planets” or “when life begins”? Actually, there is no simple definition. Life does not exist in the abstract; there is no “life”, only living things. We recognize a system as being alive when it has certain properties that are more common among animate objects than inanimate ones.

My point for now is not to refute this conception of life or to explore Thompson’s counterarguments, but to try to unpack this account in more philosophical language.

First, there is no unifying phenomenon that is life as such, only certain things, or systems, which are alive. Being “alive” becomes an adjective modifying “system” the same way that “liquid” or “purple” can describe a system, instead of a qualitative distinction of one type of system for another, such as the distinction between closed and open systems. What Curtis is implicitly saying is that life is of the same qualitative kind as dead matter. However, Curtis’s account of what material conditions such a system must have to be alive is not clearly spelled out: “certain properties that are more common among animate objects than inanimate ones” (Thompson 34). We philosophers might ask, which properties? Thompson will do this later.

In any case, the core claim of this materialist position is that life is merely a type of matter, that is, there is no philosophical work to be done on distinguishing life from non-life. Describing something as living is just like describing it as blue, or electrically charged, or liquid. But this materialist position is only the downstream offspring of a more serious and rigorously
argued materialism argued in early modernity. For an account of this position, I will turn to
Robert Boyle.

Robert Boyle’s project is to advance a mechanistic theory of the universe as an
alternative to Aristotelian science, and Aristotelian chemistry in particular. He claims the
universe is made up of two principles: matter and motion, both of which were created at the
beginning of time¹. Boyle writes

“The philosophy I plead for reaches but to things purely corporeal; and distinguishing
between the first origin of things and the subsequent course of nature, teaches that God
indeed gave motion to matter...and established those rules of motion, and that order
amongst things corporeal, which we call the laws of nature”.

These universal “laws of nature” (111) are principles that everywhere govern the behavior of
parts of matter in relation to one another. In sum, at the dawn of the universe matter and the
principles of motion were created simultaneously. The two are metaphysically different entities,
contra Aristotle who posits motion as immanent to matter, and all material bodies proceed
according to the same laws of motion in all places regardless of size.

Boyle names the essential units of matter “corpuscles”, which he defines as the smallest
parts of matter conceivable, so small as to be individually invisible. Today, we would call these
corpuscles “atoms” or perhaps “quarks”. This is a monist material ontology that uses
Newtonian-style laws of nature in order to explain material behavior. Whatever we happen to
observe within the material world is a result of universal laws of motion governing material
bodies, and every material body is a homogeneous configuration of corpuscles. Appeal to agents
beyond corpuscles is unnecessary in Boyle’s philosophy, for it is precisely the configuration of

¹ Boyle claims this was God’s doing, but his theism need not concern us.
corpuscles in certain forms that results in all of the particular bodies that we empirically observe.

Boyle explains this in depth as follows:

“Now, since a single particle of matter, by virtue of only two mechanical properties that belong to it, may be diversified so many ways; what a vast number of variations may we suppose capable of being produced by the compositions and recompositions of myriads of single invisible corpuscles” (114)

Since matter is divisible up until the corpuscular unit, Boyle claims therefore that any body can be accounted for through appeal to combinations of corpuscles.

Within bodies themselves, and as bodies interact with other bodies, the laws of motion are at work, reconfiguring corpuscles in relation to one another, to produce behavior. The behavior of these bodies need not be explained by inner principles of substance, but to external physical laws that govern the invisibly small corpuscles interacting with one another and the corpuscles of other bodies with which they come in contact.

This philosophy, he claims, is clear, intelligible\(^2\), and extensive (113), meaning that it can apply to any example conceivable. Indeed, if the laws of motion are the same everywhere, and corpuscles make up everything material within the universe, then the corpuscular philosophy can explain any material phenomena. In addition, one need only appeal to two explanatory principles, the presence of matter and the laws of motion to which it is subject, in order to understand material phenomena. These two principles, according to Boyle, are irreducibly simple; “There cannot be any physical principles more simple than matter and motion” (113). Thus appeal to more complex forms of matter or a plurality of substantial natures is unnecessary.

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\(^2\) Boyle writes “But, as to the corpuscular philosophy, men so do easily understand one another’s meaning, when they talk of local motion, rest, magnitude, shape, order, situation and contexture of material substances, and these principles afford...clear accounts of those things” (112)
All of creation can be described in terms of the configuration of corpuscles. Thus the material scientist, instead of having several questions on her mind, can simply aim to study the fundamental corpuscular configuration of a given body in order to understand how it behaves.

Boyle claims Aristotelian science\(^3\) is vague and reductive. Instead of explaining phenomena in universal principles with generalizable applications, Aristotelian science means to explain them in terms of several distinct substances and their behaviors. According to Boyle, no attempt is made to uncover why Aristotelian substances behave in the way they do. Such behaviors are simply an immanent part of their nature, and any further inquiry is absurd. In Aristotelian science, a handful of substances such as sulfur, lead, gold, and mercury exist indivisibly and cannot be reduced into smaller parts. These substances simply have inner natures by which they behave, and that is the end of it. Moreover, their behaviors are due to innate principles within their natures themselves. No principle external to the substances themselves is necessary to explain their behavior.

Boyle’s critique of this philosophy is that it is obscure and its practitioners resemble “painters more than philosophers; and only show their skill in making men fancy that they see...structures, that appear solid and magnificent and extensive; when the whole piece is superficial, artificially made up of colors, and comprised within a frame” (112). In other words, Aristotelian philosophy is not sufficiently penetrative in its analysis because it focuses on the workings of the object taken holistically prior to an analysis of its parts. Aristotelian philosophy cannot answer questions of why sulfur does what it does without simply restating the fundamental properties of sulfur. This approach leaves us, Boyle claims, with an understanding of the natural world that requires taking the properties of fundamental substances for granted.

\(^3\) We should remember here that when Boyle refers to Aristotelian science he is specifically referring to Aristotelian physics.
He likens the Aristotelian mode of explanation to explaining that a watch functions the way it does because the watch-maker made it so (116). The student of watch-making would be well within her rights to ask how the watch-maker made it so, that is, to understand its principles in terms of smaller parts.

This in no way invalidates forms of explanation that appeal to the natures of minerals and such, but the central claim is that such forms of explanation are derivative of fundamental corpuscular principles. Boyle claims:

“Nor do I deny that in explaining several phenomena of such bodies, it may be of use to a naturalist to know and consider that as sulphur, for instance, abounds in the body proposed, it may be, thence, probably argued that the qualities usually attending that principle, when predominant, may be also upon its account found in the body that so largely partakes of it.” (118)

However, the properties of (say) sulfur depend not on how sulfur is qua substance, but how sulfur is qua the configuration of corpuscles. Sulfur’s smelliness, flammability, and yellow color can be accounted for by the arrangement of its fundamental particles, the corpuscles.

The point of my paper is not to oppose Boyle’s philosophy per se. As advances in quantum mechanics and general relativity have shown, reality is far more complicated than the activity of matter operating according to laws of nature. However, the behavior of bodies at our level of existence follows (more or less) Newtonian principles, and so the metaphysics of Newtonian materialism is often used as a heuristic for how things are at our level. I do not actually believe in the existence of Boyle’s corpuscles, for 20th century physics shows us that atoms are heterogeneous in their composition. The fundamental physical constitution of reality is not monist, but pluralist. But the phenomenon that Boyle is fundamentally discussing is simply
matter in motion according to universal laws at the level of constructions of atoms, which is an apt description of how material bodies at our level behave.

His philosophy is relevant to my concerns because living bodies are material bodies. For if corpuscular philosophy can explain any body more clearly than substantial modes of explanation, then it follows that it can explain living bodies with as much clarity and simplicity as well. Boyle praises the consistency and universal applicability of his theory below as follows, “in time unprejudiced persons will think [the corpuscular philosophy] sufficiently recommended, by its being consistent with itself and applicable to so many phenomena of nature” (123). We are given no reason to suspect that Boyle wants to exclude living beings from this form of analysis.

If Boyle has a theory that can account for all dimensions of all living bodies, then teleology seems to be gratuitous. For while descriptions of an animal’s nature qua animal, such as the lion’s “proud heart” are not incorrect, according to Boyle they are unnecessary because they can be accounted for in terms of matter in motion. For Boylian materialism, the lion’s “proud heart” is a result of the activity of corpuscles (for us, chemical and electrical signals) occurring within the lion’s brain and endocrine system.

**The Aristotelian Position**

According to Aristotle, the soul is the nature of the organism. Aristotle claims that nature is the principle of motion and rest imminent to substances. Nature is spoken of in two senses: the matter of things and their form. Matter is composed of the elemental substances (earth, water, air, and fire), all of which have imminent principles of rest and motion that govern their behavior (Physics, 192b20). The form of something is the particular way the matter has been
organized, which is a type of “actuality” (specifically first actuality) since the form of something is the way it has been actualized. Form typically refers to shape, but, as we shall see, it can refer to a thing’s function as well. Concerning life, form is the defining aspect\(^4\) of its essence.

Some natural bodies are potentially alive, but not yet so by virtue of their form (De Anima, 412a20). These are natural bodies which have matter appropriate to life (carbon, nitrogen, hydrogen, etc.) but have not been organized in such a way that the power of life can awaken within them. If a divine hand reorganized the matter of these bodies appropriately, they would “come to life” and this organization would be one manifestation of the soul of the organism. Whenever matter appropriate to living bodies is organized into a form appropriate to living bodies, life will occur; the form is what can be spoken of as soul, but it must be the form of certain kinds of matter. However, when referring to living things, form is not chiefly spoken of in terms of shape but in terms of a function or power that the living thing (or one of its organs, tissues, etc.) can perform. The powers of which I speak are vital functions, processes of life necessary and proper to the organism in question, such as nutrition and locomotion. A living thing need not be expressing all of its powers constantly in order for it to be alive (De Anima, 412a24). The soul of an organism exists in first actuality because the organism does not express all of its powers all of the time.

Matter which is capable of performing a vital function is considered “organized”, meaning that it has the capacity to perform one of the aforementioned vital powers (De Anima, 412a28). Each part of the organism must be organized, from the smallest cell to the largest of the organs. Smaller organized parts form larger organized wholes, which are part of still larger

\(^4\) This is not form is the abstract but form realized through appropriate matter.
organized wholes. The living body is the cohesive unity of all of these parts that can fulfill the vital powers proper to its being.

The soul is very much the “function” of an organism, both in the sense of how the organism functions and for what it functions (De Anima, 415b11). For instance, Aristotle says that if an eye were an animal, its soul would be seeing because its function is to see (De Anima, 412b18). The soul is not only that state of being which allows the fulfillment of vital functions but is also the telos, the end function to which the organism is disposed. In the same way that organized parts form organized wholes, some functions are parts of larger functions, such as how chewing is a function that is part of the nutritive process. All of the organism’s functions taken collectively are part of an overall meta-function which the end state towards which the organism necessarily tends. In common parlance, this would be the completion of an organism’s life cycle, such as the caterpillar becoming the butterfly and then reproducing before passing on.

One of the projects of Neo-Aristotelian philosophy of life is to revive Aristotle’s idea that organisms carry out life processes for the sake of something, and so one can explain vital activity in terms of that “something”. However, thinkers such as Boyle would decry this attempt on the grounds that it advances the same mystifying and superficial strategies of explanation that failed so horribly in Aristotelian chemistry. The duration of this paper will be devoted to showing how Aristotelian explanations for life need not fall victim to the same pitfalls as those of chemical phenomena and that Boylian materialism by itself is insufficient to do the job. We will first turn to Martha Nussbaum’s critique of materialism before elaborating the neo-Aristotelian philosophy of Michael Thompson.

Martha Nussbaum on the Merits of Teleological Explanation
Martha Nussbaum’s essay in her translation of Aristotle’s *De Motu Animalium* on teleological explanation takes the form of a dialogue in which Democritus challenges Aristotle on his conception of teleology as explanatorily necessary to understand life. His challenge is the materialist one, the claim is that a scientist only needs to appeal to efficient-causal explanations involving physico-chemical processes within the organism in order to understand what it fundamentally is. This view, as I have said earlier, implicitly involves a reductionist impulse to simplify all explanation to one ontological level, in this case matter. The materialist reduces the organism to mere matter. As Nussbaum’s Democritus says, “what there really is the atoms and the void” (Nussbaum 66). In this view, the teleological form of explanation is gratuitous.

Nussbaum’s Aristotle responds by questioning whether material reductionism is the only legitimate mode of scientific inquiry. As he says, “Your challenge, Democritus, illustrates very nicely what I have so often objected to in Pre-Socratic science: its assumption that the only really ‘Scientific’ study is the study of matter” (Nussbaum 67). He references a geometric example Democritus presented in which a brass disk with a radius $2r$ is unable to fit through a circular hole with radius $r$ on account of the positioning of the disk’s atoms. Democritus claimed that his materialist efficient-causal explanation adequately accounts for the phenomenon, and Aristotle in fact does not disagree. However, Aristotle’s pluralist challenge to Democritus is that an account of the phenomenon only in terms of matter leaves us with a one-sided and limited understanding of what is really going on (Nussbaum 69). Aristotle explains the phenomenon in terms of form; the brass disk was too large to fit inside the circular hole. He then gives us three reasons why this explanation is superior in this case; his example is *simple, general*, and only involves

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5 “Efficient-causal” refers to one thing being the direct cause of another in strictly linear time. Newton’s law $F = ma$ is an efficient-causal stating that in order for a mass to change its acceleration a force must be exercised upon it. The force is the efficient cause of the change in acceleration.
relevant data. It is simple and involves only relevant data because it invokes only geometrical principles and general because this geometrical account can be applied to all solid disks, not only brass ones. Matter remains still part of the explanation, but only insofar as it is “that in which the form was appropriately realized” (Nussbaum 70). A disk of gooey butter might be able to pass through the hole but only insofar as it changed from a disk to compact mush.

However, there is some validity to the materialistic reductionism that Democritus champions because for inanimate objects mat matter is the relevant explanatory factor as to what the thing is and form is accidental. The shape of a rock does not affect its fundamental properties at all. However, what defines an organism is precisely its form. This is not form merely in terms of shape or size (Nussbaum 71), but in terms of vital function as explained above, or, if one likes, in terms of life-form. An organism X is only an organism X insofar as it retains the ability to perpetuate itself temporally by virtue of its vital powers. As I have stated earlier, these vital powers are realized in tool-like forms. Robert Cummins, though unsympathetic towards teleology, notes insightfully that a human being with a synthetic heart remains a human. It is not maintenance of matter that defines an organism’s life, but that of function, since an organism exchanges matter with the environment all the time during, for instance, respiration.

Nussbaum’s Aristotle claims the following, “In the case of living things, we must refer to a functional organization the individual shares with the species” (Nussbaum 71). This functional organization is the set of vital capacities that I enumerated in my discussion of Aristotle’s conception of soul that I will call “life-form” for the rest of the paper. As with the geometric

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6 The one exception to this is tools, which are designed by living beings to perform a function. In order to define what is a hammer, less important is its being made of metal than that it can drive nails into wood.

7 See my further discussion of Thompson for a superior account.
example, accounting for an organism’s activities in terms of life-form is explanatorily simpler and more parsimonious than a solely material efficient-cause explanation.

Consider the following example which Nussbaum gives: a lion attacking a sheep. The efficient-causal purely material mode of explanation necessarily involves so much irrelevant data: the effects of the hot sun on the lion’s back, the conditions of the ground beneath its feet, and so on. An account of this lion in terms of life-form claims that the lion pursued the sheep because of its unimpeded appetite. The latter is far simpler and far more generalizable than the former. It predicts that the lion would perform a similar action if it were hungry, whereas a materialist efficient-causal explanation necessarily must take into account all of the matter of the lion and all of the matter and energy it is in contact with in order to explain lion behavior. Does the lion’s mane inform his hunger? I think not.

Consider another example, one that does not rely on psychological notions or even the idea of an “act” in order to prove the relative parsimony of teleology: the growth of a plant. In order to explain the growth of a plant from a teleological perspective, the scientist can limit her explanation of the plant’s growth to the activity organs such as the roots and leaves and how they interact with other non-growth organs. The materialist must take into account the entire matter of the plant all of the time to explain growth, including organs such as flower buds that have nothing to do with growth. Without viewing the plant teleologically, one cannot dismiss the possibility that the flower buds, among other useless organs, are part of the growth process, and so the materialist must take into account everything that happens to them and their contributions to the overall plant when drafting an explanation of its growth. For the teleologist, these concerns can be safely dismissed as irrelevant data, but the materialist is not so lucky.
Nussbaum on Self-Maintenance and the Logos

Self-maintenance is the mark of life (Nussbaum 76). However, this is not the self-maintenance merely of the shape or even overall body plan of the organism. This account falls apart quickly under close empirical scrutiny. Plants change shape as they grow and any organism that undergoes metamorphosis experiences a radical restructuring of its body plan, both in terms of physical shape as well as functions performed by that body. However, even if these examples did not exist, there are others that trouble the notion that the purpose of an organism is only to maintain its bodily-functional form. For instance, eusocial insects form enormous colonies without which any of the individual animals would die. Bee life is incomplete without the hive, and ant life is incomplete without the anthill. Moreover, many ants and bees die either in service of their colony or as a direct part of their life cycles, such as the male honeybee, which dies after mating. We might be tempted to say that the goal of organisms is to ensure the survival of their species, but this conception does not work for organisms that regularly butcher members of their own species as part of their life-form, such as male lions who kill their predecessor’s offspring upon taking control of a pride. The point is that life-form cannot be reduced to any type of self-sustenance, including species-wide sustenance, but must refer to an entire life cycle.

Nussbaum’s Aristotle claims there must be a final state towards which the organism’s behavior leads and in light of which it can be understood which he calls the logos (Nussbaum 78). Animal behavior, on this account, cannot be explained without reference to the attainment

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8 The overall life-form of the caterpillar is the same as that of the butterfly since the two are fundamentally the same creature, but this example shows that the soul cannot refer to solely the bodily powers of an organism but must reference a “life cycle” to give a full explanation since caterpillars and butterflies behave differently and have different capacities.

9 My sections on Thompson will cover this in greater detail shortly.
of the *logos*. Nussbaum’s Aristotle claims “the teleological account that begins with the creature’s *logos* is superior in generality and predictive value [to an efficient-causal account]” (Nussbaum 79). He claims that an organism’s behavior depends on its *logos* and that, as circumstances change, the behavior, and the efficient-causal principles that engender it, changes along with them in conformity with the *logos*. A materialist efficient-causal model of an organism’s behavior is not explanatorily invalid for describing particular instances of behavior, but it can never unify these circumstances under an overall principle for prediction and understanding organisms. Doing this is impossible because, as Nussbaum explains, the relationship between the empirical changes in matter and the empirical behavior observed are not stable or constant (Nussbaum 88); one vital function can be engendered by multiple material physiological changes in the animal depending on the circumstances.

For example, a plant’s circulatory functions require different physiological processes depending on its external environment. If a plant finds itself in dry weather, it cannot use as much water in order to distribute its nutrients, and so needs to compensate accordingly, whereas a plant in a wetter climate does not need to make this compensation. The vital function performed is exactly the same, but it is realized by different substrata. An example that leans into the psychological aspects of organized life might be that same lion chasing down a sheep on cold versus hot weather. In hot weather, the lion will need to pant in order to stabilize its temperature before it can give chase, whereas in cold weather its body needs to burn more calories in order to maintain the homeostasis necessary for the muscular activities necessary for it to begin hunting. Again, in this case the same vital function is engendered by different physical substrata depending on the circumstances.
Michael Thompson’s Critique of Materialism

Thompson begins by going through Helena Curtis’s and other biologists’ definitions of life and shows them all to presuppose an idea of “life processes”. For instance, when Curtis claims that life is defined by “certain processes more common in animate objects than inanimate ones” (Thompson 34) Thompson encourages to ask, which processes? As Thompson writes, “baldness, bad manners, and home ownership are ‘more common in animate objects than inanimate ones’” (34) but this is clearly not the essence of what it means to be a living thing. Empirical commonality of certain processes or features in objects of type A is not the same as certain processes or features being essential for an object to be considered type A.

Next comes the stimulus-response account of what it means to be alive, which is that living things are different from nonliving ones because the former respond to environmental stimuli while the latter do not. Here we might ask, how do we differentiate a response to a stimulus from a simple chemico-physical reaction, such as a candle melting while it burns (Thompson 40)? Thompson shows us that stimulus-responses are characteristically different from passive responses because organisms are “prepared” for the former. Both asphalt and cherry buds will become warm at the touch of spring sunlight, but only the cherry bud has thermosensitive structures that trigger it to open into the characteristic blossom. In contrast, a hydrogen bomb will vaporize asphalt and cherry bud alike. This is the “passive response”, and the cherry bud fares no better than the asphalt. The cherry bud has internal processes of metabolism, a set of physico-chemical systems for converting sunlight into energy that occur (given the absence of conditions that directly impede this) independent of physico-chemical factors outside the metabolism process. For the cherry bud, we know “what happens next”
(Thompson 41) in the life-process\(^\text{10}\). The cherry bud’s life-form proceeds in a certain direction regularly so long as certain environmental criteria are met, which are often fairly loose ones such as the presence of sunlight, oxygen, water, the right temperature range, and so on. Even if the cherry bud never blossoms at all, blossoming was imminent to the cherry bud’s nature all along. If a cherry bud does not blossom, we have every right to begin investigating “what went wrong” in its life cycle. In contrast, what befalls the asphalt is whatever the environment inflicts upon it. The “preparedness” of the cherry bud for spring sunlight is conditioned by its life-type, the principle that tends towards the bud’s \textit{logos} to become a blossom and reproduce.

Responsiveness to sunlight is a necessary condition for the cherry bud to fulfill its life-form.

One particularly interesting biological-materialist account of life is the argument that life forms are “highly organized” (Thompson 34) which is little more than a tautology since, as we have already noted, the essence of the soul is organization. This is not to say that all organized things are ensouled, but that all ensouled things are organized. What the biologist-materialists are saying, then, implies some arbitrary X-factor that differentiates alive organized things from inanimate organized things. An Aristotelian response is quick and surgical. Soul requires both matter and form. So, the types of organization that betray the presence of life are ones with appropriate matter in certain forms. Which forms are these? Life-forms, of course. Or rather, as we will see, bodies constructed by and servicing life-forms. Rather than taking us out of the teleological woods, the organizational account of life pulls us deeper in. We cannot determine which organized things are ensouled without reference to the idea of the life-form that is prior to particular empirically organized objects.

\(^{10}\) In this respect, all organisms exhibit a type of agency, even if plants and fungi cannot perform actions properly speaking.
As for the idea that sufficient complexity defines a life-form, this is only an empirical-contingent account of life forms. Perhaps it is true that all life-forms are extraordinarily complex, but this is just an observable characteristic that life-forms happen to exhibit, like the fact that books contain paper. The concept “hyper-complex nonliving object” is a thinkable entity; it makes sense. One can imagine such an object theoretically speaking. This proves that complexity is at best a necessary but not sufficient condition for identifying life.

Thompson then discusses the idea that life may be characterized by homeostasis and reproduction, but again, he establishes that these accounts are unsatisfactory. Reproduction as an account of living things can only grant us that “living things create other living things”. The creation of things of the same ontological status as the creator is an insufficient criterion because there are material objects or phenomena that create material phenomena in turn (Thompson 50). He also refutes the idea of homeostasis defining life with the example of metamorphosis (Thompson 51). In metamorphosis, an animal’s bodily form and thereby its functions change; a caterpillar transforms from a wriggling leaf-eater into a flying nectar-drinker. Indeed, such a conception of homeostasis presupposes the concept of soul, or in Thompson’s language a life-form, to be maintained. In Aristotelian terms, the power of the organs (and the organism as a whole) to function according to its telos (Thompson 52), which, properly speaking, is the logos, since the telos of a caterpillar’s leaf-eating is not to become a bigger caterpillar, but to gather enough energy for the caterpillar to metamorphose into a butterfly. The life-form is not merely a set of functions present here and now, but an entire life-cycle that culminates in the organism’s logos. Any conception of life must deal with the issue of temporality.

The hard materialist described above does not have an explanatorily complete account of how to explain the activity of living things without reference to the implicit idea of a life-form.
It seems that any attempt to explain living things in terms of characteristics independent of the life-form fall into the trap of presupposing it in their explanation. This means that, even for the materialist, the life-form is a real entity. It may not be real the same way that material objects are real, but it is real the same way any temporal process is real.

Michael Thompson’s Neo-Aristotelian Philosophy of Life

Michael Thompson’s program is to reevaluate ethical theory’s fundamental categories to make room for that of life. His claim is that living things are a logically different class of entity than inanimate objects and that, in ethical discourse, they must be represented differently. For him, this takes the form of the “natural-historical judgment” (Thompson 64) which is formulated “the organism X is/does Y” in which “the organism” refers not to any particular organism but to the organism’s life-type as such. One example of a natural-historical judgment comes from a nature documentary that claims “the female bobcat gives birth to two to four cubs” (Thompson 63). This is not a matter of empirical tendency or regularity, as Martha Nussbaum’s conception of logos proves, but a metaphysical matter. The female bobcat, insofar as it cleaves to its life-form, is a creature part of whose essence is to give birth to two to four cubs. This does not mean that a bobcat that gives birth to one or five cubs is not a bobcat proper. This judgment claims that part of the trans-empirical bobcat life-form is to produce a litter of this size.

The number of cubs to which a female bobcat gives birth does not determine the bobcat’s qualification for being a bobcat. Rather, it is in terms of natural-historical logical formations that one can judge whether a certain bobcat litter size is “typical” for a properly functioning bobcat, typical in the sense not of empirical commonality but in adherence to the life-form. For instance, it is conceivable that biologists come upon a bobcat species that only produces one cub per litter.
due to environmental factors that impede reproduction. Such factors mean that the bobcats in this population are not properly fulfilling their logos. If the biologists do not consider the overall life-form of the bobcat as such, they might conclude that part of the life-form of the species of bobcat they have found is to produce only one cub per litter. However, this conclusion would still be incorrect even though there are no empirical examples to the contrary.

Since we cannot appeal to empirical regularity in order to determine the nature of a living thing, Michael Thompson claims we need to consider what he dubs a “wider context” (Thompson 53) in terms of which we can judge particular members of a species. The “wider context” which is the life-form of the organism, that is, its telos, its organization, its eventuation into fulfilling a logos. This idea of life-form does not require the empirical existence of a flourishing and genetically diverse population, nor does it even require the empirical existence of multiple individuals. Rather, the life-form is a logically prior idea to that of individual organisms, even if philosophy and science have proceeded in studying life by making empirical observations of particular individual organisms followed by conceptual speculation on life-form as a general category.

The core of the “wider context” idea is that the processes in which a life-form is engaging at any particular moment cannot be fully accounted for via an efficient-causal “frame-by-frame” analysis alone. Thompson’s example is that of a type of fish that takes smaller fish into its mouth but, instead of metabolizing its victims, it converts them into a foul spray to be stored in the mouth region and sprayed at enemies for self-defence (55). An observer would look at the fish and conclude that it ate the smaller one, but it did not because it never metabolized it. The point of the “eating” activity was for self-defense, not nourishment. One cannot understand why the fish did what it did, or more crucially, what the fish is even doing in the first place, without
an understanding of a broader life-plan, that is, reasons that are present not here and now but that can emerge in the future. These future reasons are part of the wider context of which Thompson speaks. They are the particulars of the life-form, that is, the logos towards which the organism is slowly approaching.

It is impossible to discern these “future reasons” without a notion of life-form that is prior to the individual organism’s empirical existence and behaviors. The life-form in question is the cycle that contributes towards the realization of the logos, an end-state, presumably of mature adulthood. But this idea requires that we know what this mature adulthood is. To use a prior example, the first person to observe a caterpillar may have thought that its goal of leaf-eating was to grow into an adult, wriggling caterpillar, but we know that its actual purpose was to gather enough energy and nutrients to metamorphose into a butterfly. Without understanding the life-form of the caterpillar, its behavior is unaccountable, or, at best, science will come up with an incorrect account. Finding the meaning of the tasks organisms undertake requires a reference to a life-form in order to be accurate and faithful to reality, that is, in order to be “scientific”. This conception is also required to explain whether or not an individual or a population is healthy. In fact, the idea of health presupposes a set of vital functions that the organism is performing properly, or at least “well”. One cannot judge health on the bases of pleasure and pain alone, as any addiction psychologist or nutritionist can confirm.

Biological science, and even philosophical speculative biology, proceeds starting with empirical observation of organisms and how they behave and grow. But this does not mean that the idea of the life-form is conceptually derivative of the concept of the individual organism. The life-form is not an empirical “average” of how organisms who share it live because, as Darwin teaches us, most organisms never live long enough to realize their logos. In order to
determine what an organism *is* in the first place, or why it behaves, we require reference to its life-form. Thus, even though the individual organism is empirically prior in observation and the life-form of particular organisms is determined based on such empirical observation, the life-form is *explanatorily prior* in determining what an empirical organism *is doing* in the first place. This is why biology cannot understand a type of organism without knowing its *logos*. Scientists can never understand caterpillars until they understand butterflies.

**The Merits of Teleology as a Mode of Explanation**

Robert Boyle claims above that his materialist philosophy is clear, simple, and extensive. For explaining the behavior of inanimate objects, this is surely the case, but for explaining the activity of living things it encounters a number of problems. Teleological explanations of life activity succeed in all of the ways that Boyle thought his materialist philosophy had succeeded. First, teleological principles of living things are extensive because, as Nussbaum and Thompson have shown, all living things have a telos to which they tend. This is hardly controversial. Matters regarding simplicity and extensiveness are more complicated.

Boyle makes the case that materialist explanations for bodies are simple insofar as they only refer to one explanatory principle. In order to understand any material phenomenon all one needs to do is determine how the corpuscles are structured and identify what role the laws of physics have to play, such as at what speed is the body moving, how hot it is, and so on. This works perfectly well for inanimate bodies because there is no “wider context” of which to speak in reference to inanimate bodies. There is no telos towards which they tend in themselves and thus no need to consider whether or not today’s behavior has a peculiar role to play in tomorrow’s. With inanimate objects it is, as Dr. Danielle Macbeth has said in one of her
lectures, “one damn thing after another”. There is no form of agency that the inanimate objects exercise and no end-state for which the current behavior of a given inanimate body tends. A rock rolling down a hill tends towards nothing in itself, and should it crash into another rock it may split in half. There is no internal causal principle that necessitates that the rock roll down a hill or be split in half, it could just as easily be eroded by wind and rain, mined for the extraction of some ore, or be made into a sculpture. The norms and principles governing the rock are wholly external to it.

But to understand life activity, a materialist explanation is not clear at all. Consider the lion again. In order to explain the lion’s behavior of attacking the sheep, a materialist explanation must take into account all of the matter present in the system and how it changes according to the natural laws, including all of the physico-chemical changes occurring within the lion before the moment in which he strikes. For the Boylian materialist, the lion is a body in motion, and so all of the matter involved in that body must be involved in the explanation, even data that we know is irrelevant to the situation, such as the temperature of the lion’s mane and the amount of mud on its paws.

The materialist requires all of these elements in the explanation, but the teleologist does not. The teleologist instead recognizes that the lion has certain vital functions which it is able to realize due to the form of its material organization, and that one of these is catching prey in order to nourish itself. Through a materialist analysis of the lion’s digestive structures we can come to the conclusion that the lion eats flesh, but only analysis of the parts of the lion relevant to regulating motivation to hunt and digestion are explanatorily pertinent. The lion would attack the sheep if it were in cold weather or warm, whether the ground is muddy or not. In cases in which the lion does not attack the sheep because of these factors are cases in which one vital
function outweighs the priority of another. If it is too cold, the lion will freeze to death, and so the vital function of self-maintenance takes precedence over that of nourishment. It is not the case that the cold as such instigates an efficient-causal phenomenon in the lion that determines his activity independent of his vital functions.

Any efficient-causal explanation needs to make reference to a vital function or else it will involve irrelevant data, thereby making the account more convoluted and confusing than it needs be. Teleology, meanwhile, understands the lion in terms of a handful of crucial vital functions and the organs that realize these functions. Because teleology has a “view from above” that permits the philosophical introduction of ideas such as unified systems of organization, the scientist investigating the behavior of the lion has philosophical license to isolate certain organs as performing certain vital activities. Thus, when explaining lion behavior, the scientist can immediately rule out much irrelevant data regarding the lion’s material composition and focus on the activity of the organs which are involved in realizing that behavior. At this point an efficient-causal materialist analysis is relevant in explaining what comes next. If the lion stumbles while chasing the sheep, perhaps it is because its muscles lack a certain essential nutrient, or one of its bones is broken, or because the lion slipped on mud. Material-efficient models are not irrelevant, but they are cumbersome, convoluted, and unwieldy without teleological principles to guide them.

Boyle claims that his materialist model is clear because it involves only one explanatory principle that is easily studied and understood. If one understands the laws of nature and the positions of the relevant corpuscles, one can predict their behavior with ease. Unlike the Aristotelian chymists who came before him, Boyle does not need to appeal to a plurality of fundamental substances, and Boyle has no temptation to hand-wave explanations of why the
matter in question does what it does. For the chymist, explanation stops at the level of sulfur’s behavior, but with Boyle’s philosophy we can consider the activity of its atoms, protons, electrons, and internal chemical bonds as well. Rather than obscure the true nature of sulfur behind the mask of erudition, as did the chymists, Boyle can present with clarity and elegance why sulfur behaves the way that it does.

In order to explain the activity of living things, teleological explanations should never stop at the declaration that creature Y does X because that is part of its logos. That would be to engage in the hand-waving that Boyle detested so much. Proper teleological explanation does not stifle scientific conversation, it opens it up. With Aristotle’s understanding of life, the activity of living things and the material changes they undergo become far clearer. Even if we are ignorant of certain material principles in organisms, we can still explain their activity in reference to the logos. For instance, if we are incapable of identifying a chemical Z that makes a plant Y perform X unique function, we can still situate function X within the overall schema of the plant’s life-form. Even if we lack ignorance of the precise material constituents involved, as long as we can identify systems or organs that perform vital functions, we can achieve an understanding of these phenomena in their relation to the organism.

**What Teleology Can and Cannot Explain**

The explanatory power of teleology, however, does not mean it can explain absolutely everything about an organism. As Robert Cummins explains in his article on functionalism, teleology cannot explain the presence of vestigial or redundant organs (Cummins 743). For instance, certain vestigial organs, such as the human appendix, are directly detrimental to the realization of the logos. Their presence cannot be explained in terms of an end to be achieved
since they have no part to play in that end. Science must therefore reach outside teleology in order to explain vestigial body parts, such as a through survey of an organism’s evolutionary lineage or embryogenetic process.

Of course, this point does not mean that teleology has no role to play in making sense of vestigial organs. Perhaps the human being is born with an appendix, but the human being still has a *logos* to which it is reaching in the first place. The appendix’s formation in embryogenesis can be seen as a slight inhibitor of the *logos*, but it does not negate the validity of the *logos* as an explanatory principle of the human’s overall life-form. In fact, the only reason we are epistemologically able to identify the appendix as a vestigial organ in the first place is in reference to a particular *logos*. Rather than invalidating the validity of teleological explanations, vestigial organs presuppose the *logos* to begin with, for vestigial organs are defined as those which are useless for the organism.

Teleology, moreover, cannot explain the presence of particular materials in realizing the vital function in question, but this is not actually a sign of its weakness, but its strength. Let us consider the process of circulation. Different phyla of animals realize circulation using different metals within their hemoglobin. Teleology can predict that the material required to realize the circulatory process is material that is fit for the distribution of nutrients throughout the organism’s body. This must mean, for instance, that it is fluid and that it can store nutrients for some amount of time before they are properly distributed. However, which precise types of fluids or molecules used in this process is not something teleology can predict by itself. Crustaceans use copper in their hemoglobin while mammals use iron. These metals are suitable for the activity of circulation, but teleology cannot explain why mammals use iron and why crustaceans use copper except insofar as these materials are proper for “realizing the form”. It is
up to other types of scientific accounts to explain why particular phyla use particular metals in their circulation. In the original example with Democritus, Nussbaum’s Aristotle mentions that the matter is explanatorily unimportant except insofar as it is matter appropriate to realizing the form. Explanations of why certain types of matter are appropriate for realizing certain vital systems are to be furnished through material means.

This is actually a point in teleology’s favor, because it shows that one and the same vital process can be realized via different matter and, perhaps more crucially, different material forms. Again, the form of the soul is not shape so much as it is proper organization for the functioning of an organism’s capacities. For instance, chordates distribute nutrients throughout the body via tubes which contain blood, whereas insects have no such tubes. This example shows that materialist accounts of circulation do not make sense without the recognition that circulation is occurring in the first place, which requires reference to a life-process and thereby a life-form, the precise claim made by teleology. Thompson’s example of the pseudo-shark shows that what distinguishing nutrients from non-nutrients in an organism requires reference to a vital process.

We can also consider how organisms of different kingdoms have modes of circulation that are analogous in function (distribution of nutrients) but different materially as well as different in shape. The form realized by circulation in each organism is precisely the same function. Circulation is realized not in matter nor physical form, as a materialist account would have us believe, but in efficacy of a function within a living being that has a particular logos.

The Human Problem

Perhaps the reader is wondering at this point where this account of life puts human beings. It seems counterintuitive to think that human activity has to cleave tightly to a preset
logos, especially since few would disagree that there are many different ways of living a flourishing human life. Throughout this paper I have deliberately avoided mention of the third of Aristotle’s fundamental life-faculties: rationality, the faculty that as far as we know is unique to human beings. One reason for this is purely rhetorical because teleological accounts of rational behavior are not especially controversial and do not put much pressure on a materialist view of life processes in general. The other is that rationality as a vital power opens up the rational animal to novel and diverse possibilities for living in ways that the other two do not.

The logos of a human being has a similar structure as that of other living beings; we need to take in nutrients, we use locomotion to get what we want, we have an appetite for certain things rather than others, and so on. But here rationality crucially figures as part of the human life-form, especially as the faculty of choice. A rational view of life allows for reflection on the former two vital processes, an activity of which animals and plants are incapable. This means that while the function of rationality is crucial to human nature, the precise way it is exercised is not important. Our powers of rationality are a crucial part of our logos, but this does not exclude varieties of ways of living out a rational life. A profession as a carpenter is no less appropriate to a human being than working in the academy, for both involve use of human rationality. Within Aristotle’s account there is much room for lateral variety.

Moreover, rationality remains mysterious even within Aristotle’s own writings. He seems unable to make sense of it to the same degree that he can for the other two life faculties. Aristotle’s hylomorphic stance, which works for nutrition and perception, breaks down when considering rationality because “that in the soul which is called thought...is, before it thinks, not actually any real thing...it cannot for this reason be considered as blended with the body” (De

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11 For instance, the idea of “intention” is explicitly teleological.
Anima, 429a24). Perhaps the classical Aristotelian approach is sufficient only for nutrition, perception, and their subcategories. When considering rational animals, perhaps there is more at work.

Conclusion

I hope the above pages have convinced the reader of the poverty of hard materialism and the indispensability of teleology when explaining the activities of living beings. The goal of this paper is not to close off biological thought to materialist explanations when they are appropriate, but to expand the biological discourse by laying out the legitimate role of teleology within the discipline. Without teleological notions of living things, our understanding thereof becomes woefully impoverished. For instance, Boyle’s great predecessor, Rene Descartes, asserted in his Meditations that animals must be zombies incapable of feeling anything because, since they do not have the faculty of mind, they must be no different from other matter. As Michael Thompson has demonstrated, living beings must be considered a different logical type of entity than inanimate objects in order for judgments about them to be valid. The natural-historical judgment is simply incoherent for inanimate objects because there is no overarching type unifying certain members with others without the use of manmade intellectual schema. Living beings, meanwhile, exist as members of a species with certain means of flourishing or failing that are independent of intellectual classification. A bobcat just is a bobcat, and it does things appropriate to bobcat life. When it comes to living things, a cigar really is just a cigar.
Bibliography


