



Are life forms real? Aristotelian naturalism and biological science

Jennifer Ryan Lockhart¹ · Micah Lott²

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Abstract

Aristotelian naturalism (AN) holds that the norms governing the human will are special instances of a broader type of normativity that is also found in other living things: natural goodness and natural defect. Both critics and defenders of AN have tended to focus on the thorny issues that are specific to human beings. But some philosophers claim that AN faces other difficulties, arguing that its broader conception of natural normativity is incompatible with current biological science. This paper has three aims. First, we consider a distinctive and nuanced critique of AN's general understanding of natural normativity put forward by Tim Lewens. Second, after giving a defense of AN, we explore and evaluate Lewens' proposed alternative view—Kantian projectivism about life forms. We present a problem for Kantian projectivism and suggest reasons for thinking that AN is, after all, the superior position. Finally, we clarify and explain how AN's claims about life forms and our knowledge of them, relate to empirical observation and to contemporary biological science.

Keywords Aristotelian naturalism · Biology · Ethical naturalism · Function · Biological normativity · Kantian projectivism

✉ Jennifer Ryan Lockhart
jrl0027@auburn.edu
Micah Lott
micah.lott@bc.edu

¹ Auburn University, 6080 Haley Center, Auburn, AL 36849, USA

² Boston College, Gasson Hall, 140 Commonwealth Avenue, Chestnut Hill, MA 02467, USA

It might always be possible that in, e.g., an animal body, many parts could be conceived as consequences of merely mechanical laws (such as skin, hair, and bones). Yet the cause that provides the appropriate material, modifies it, forms it, and deposits it in its appropriate place must always be judged teleologically, so that everything in it must be considered as organized, and everything is also, in a certain relation to the thing itself, an organ in turn.

Immanuel Kant
*Critique of the Teleological Power of Judgment*¹

In learning of the various cellular processes unearthed and described in biochemistry—photosynthesis, for example or the Krebs cycle, or the replication of DNA—one is inclined to think, It’s all getting boiled down to chemistry and physics, isn’t it? and in some sense of ‘boiling down’ this is of course true and very desirable. But it is interesting that if the only categories we have to apply are those of chemistry and physics, there is an obvious sense in which *no such succession of goings-on will add up to a single process...* Physics and chemistry, adequately developed, can tell you what happens next in any of these circumstances—in *any* circumstance—but it seems that they cannot attach any sense to a question, “What happens next?” *sans phrase*. The biochemical treatise thus appears to make explicit play with a special determination of the abstract conception of a process, one distinct from any expressed in physics or in chemistry proper.

Michael Thompson
*Life and Action*²

1 Life form judgments and natural norms

Aristotelian naturalism (AN) holds that the norms governing the human will are special instances of a broader type of normativity that is also found in other living things: natural goodness and natural defect. That is, AN seeks to situate human action and character, including the moral virtues and vices, within a broader context of normativity that applies to living beings in general. This is why Philippa Foot says early on in *Natural Goodness* that *life* will be at the center of her discussion and later argues that “the same structure of judgment is to be found as we move first from plants and animals to human beings, and then from the evaluation of human characteristics and operations in general to the special subject of goodness of the will” (Foot, 2001, p. 38). AN is committed, therefore, not only to claims about moral goodness in human beings, but also to a more general account of the natural normativity that is intrinsic to the biological realm.

This broad sense of “normativity” does not, without further specification, speak to ethical evaluation or to claims about what anyone ought to do. Judgments in botany and veterinary medicine, for example, bear the stamp of this natural normativity. We can

¹ Kant (2000, p. 249 (5:377)).

² Thompson (2008, pp. 41–42).

judge that a redwood's roots are *diseased*, that a zebra's heart is functioning *well*, or that a capuchin monkey is *missing* a leg. Such judgments about health and flourishing, or the lack thereof, imply some notion of how organisms of these kinds *ought to be*. ("This poor monkey only has one leg. He ought to have two, of course.") AN attempts to throw light on this *ought* by explicating a "grammar of goodness" that is part of our understanding of living things as such. At the heart of this grammar is the concept of a life form, together with a special form of thought—call it *life form thought*, or *life form judgment*—that, according to AN, we inevitably employ in describing living things.³

Both critics and defenders of AN have tended to focus on the thorny issues that are specific to human beings. But some philosophers claim that AN faces other difficulties, arguing that its broader conception of natural normativity is incompatible with current biological science.⁴ And indeed, there is something rather quaint about the judgments that proponents of AN appeal to in explaining natural normativity—e.g., "bees need stings"; "sturdy roots are good in oak trees." Is this really the stuff of a *scientific* approach to living things? More importantly, how could biologists ever empirically ground judgments about life forms, judgments that are supposedly made in a "timeless present" and that possess a non-statistical form of generality—e.g., "the dodo has two wings"?

Recently, Tim Lewens has put forward a nuanced critique of AN's general understanding of natural normativity. Lewens offers two main lines of criticism. First, there is a problem of *underdetermination*. Life forms are described in natural-historical judgments, and "it is unclear what makes it the case that some natural historical judgments are true, while competing ones are false" (Lewens, 2020, p. 487). Second, even if we grant AN's central claim that we must *think* of organisms as instances of life forms, this does not show that there really *are* such life forms. On the contrary, Lewens suggests that Aristotelian realism about life forms is less attractive than a competitor view, "Kantian projectivism," which can account for AN's central claim while avoiding the problem of underdetermination.

This paper has three main objectives. First, we offer a response to Lewens on behalf of AN. We begin by presenting what we'll call *the transcendental argument about life forms*, taken from the work of Michael Thompson. The conclusion of the transcendental argument is that an (implicit) appeal to life forms is a condition of the possibility of recognizing anything as living. After explaining the transcendental argument, we turn to the problem of underdetermination. We distinguish four ways to interpret Lewens' challenge and we argue that, on any construal of the objection, AN is able to meet it.

Second, after giving our defense of AN, we explore and evaluate Lewens' proposed alternative view—Kantian projectivism about life forms. We highlight some ambiguities in Lewens' presentation of Kantian projectivism, and we consider some ways the view might be advanced further. We also develop a problem for Kantian projectivism and suggest reasons for thinking that AN is, after all, the superior position.

³ On the grammar of goodness, see Foot (2001), Hacker-Wright (2021), Hursthouse (2018), Lott (2018).

⁴ See Fitzpatrick (2000).

Our third objective, pursued in the next section and at several other places throughout the paper, is to clarify how AN's claims about life forms, and our knowledge of them, relate to: (a) empirical observation, (b) scientific biology and (c) some well-known debates in the philosophy of biology. With regard to this last point, our goal is not to settle these debates, but to indicate ways that AN might contribute to them, by better situating AN on the map of available options in the philosophy of biology.

2 The transcendental argument about life forms

In this section, we have two main aims. First, we introduce Thompson's transcendental argument about life forms and the related notion of natural-historical judgment. Second, we explain how AN's claims about life forms relate to empirical observation, scientific biology and debates about function in the philosophy of biology.

Thompson's discussion of life forms has a negative and a positive aspect. The negative claim is that it is not possible to give a "real definition" of life—i.e., a set of necessary and sufficient conditions for what counts as living that do not themselves already appeal, implicitly or explicitly, to ideas about life for their correct interpretation and application. Ways of characterizing life such as that which "grows and develops" will fall afoul of cases of living things that die early and fail to develop, as well as piles of trash that, while clearly not alive, can also be said to "grow and develop." It is not that these characterizations of life are incorrect or completely unilluminating. Rather, the point is that if they are correct, their application must already appeal to a more determinate interpretation that itself presupposes biological forms of description and explanation. That is, they will be part of a broad circle of concepts that are important but that need to be defined in interdependent ways that are all life-involving. As Thompson puts it: "These concepts, the vital categories, together form a sort of solid block, and we run into a kind of circle in attempting to elucidate any of them" (Thompson, 2008, p. 47).

Thompson also has a positive understanding of what is missing from attempts to understand life in reductive ways. The transcendental argument aims to show that appealing to life forms is a condition of the possibility of recognizing anything as living. Here's the argument:

1. In order to represent any individual thing as living, we must represent it as the subject of some vital processes—e.g., as digesting, photosynthesizing, hunting, reproducing, etc. This is because to be alive *just is* to be the subject of such vital (i.e., biological) processes. If we could not represent anything before us as a vital process of one kind or another, then we could have no basis for supposing that we were dealing with a biological entity.⁵

⁵ To avoid confusion, it should be noted that a "vital process" is simply another way of talking about a *biological* process. The idea of "vital process" that figures in the first step of the argument is not given as an analysis of, or alternative to, another more familiar idea of biological process. This is important for the transcendental character of the argument and for avoiding any whiff of vicious circularity that might seem to surround the argument. We start from the fact that we represent (i.e., recognize) some things *as living*, and essential to this is representing (recognizing) them *as doing* things in distinctive ways, as undergoing distinctive *processes*. Put another way: If we did not recognize something as *doing* or *undergoing* activities

2. In order to represent anything as a vital process, we must interpret it within the wider context of the *kind* of living thing in which the process is occurring. That is, we must view the individual in light of an (implicit) conception of the life form to which the individual belongs. The basic reason for this is that in isolation from the wider context provided by the life form, there is nothing to fix the proper description of what is happening *qua* vital process. In particular, an isolated description of a process in physical–chemical terms will not determine what is going on *qua* vital process. This can be seen from the twin facts that: (a) different physical–chemical happenings can amount to the same type of vital process when occurring in different life forms and (b) the same physical–chemical happenings can amount to different vital processes when occurring in different life forms, as when mitosis is a process of reproduction in amoebas but a process of self-maintenance in horses.
3. Thus, in order to represent any individual thing as living, we must view it as a *kind* of living thing—i.e., we must think of it as a member of some life form.

According to AN, our conception of a life form can be articulated in a distinctive type of judgment, which Thompson calls “natural-historical judgments.” Such judgments have some canonical forms: “The S is/has/does F” or “S’s are/have/do F.” Examples include judgments like: “the nine-banded armadillo has four legs” or “female mayflies lay their eggs in water.” An ordered system of natural-historical judgments—a Thompsonian “natural history”—describes the function of different parts and activities in the life of the species. At the core of natural-historical description is the notion of an *unfolding process*, which is a unity of phases that is defined in terms of a goal or end-point. Here is an example of one such phrase in a larger process that adds up to digestion in human beings: “The pancreas secretes digestive enzymes into the duodenum that break down protein, fats and carbohydrates.”⁶ Such a process is subject to potential interruption (perhaps in *this* duodenum the proteins, fats and carbohydrates never get broken down). Concerning such a process, it makes sense to ask, “What happens next?”, where that question is not asking for a statistical generality about what often or usually happens, but rather asking about the next phase of the *uninterrupted* process. A Thompsonian natural history brings such processes together as parts of a larger whole—the life cycle of given kind of organism. Thus for any kind of living thing, a natural history gives an answer to a certain sense of the question “how do they live?” As Thompson says, a natural history provides “one’s interpretation or understanding of the life form shared by the members of that class” (Thompson, 2008, p. 73).

In her chapter “Natural Norms,” Foot notes that there are true life form judgments that don’t describe anything of functional significance in the life of the organism. Her example is, “The blue tit has a round blue patch on its head” (Foot, 2001, p. 30). Foot argues that what matters, at least so far as natural goodness goes, are only those

Footnote 5 continued

or processes of the relevant sort, we could not recognize it *as living*. In the first step of the argument, no special claim is yet being made about the proper way to characterize or analyze those activities or processes, other than to note that they can be captured by some range of action-descriptions (verbs) that we also recognize as part of vital (biological) description.

⁶ <https://my.clevelandclinic.org/health/body/21743-pancreas>.

natural-historical judgments that concern parts and processes with functional significance—i.e., that which *plays a part in the life* of the organism. And she spells out this idea as follows:

[I]n plants and non-human animals these things all have to do, directly or indirectly, with self-maintenance, as by defence and the obtaining of nourishment, or with the reproduction of the individual, as by the building of nests. This is ‘the life’ characteristic of the kind of animal with which the categoricals here have to do. What ‘plays a part’ in this life is that which is causally and teleologically related to it, as putting out roots is related to obtaining nourishment, and attracting insects is related to reproduction in plants... What is crucial to all teleological propositions is the expectation of an answer to the question ‘What part does it play in the life cycle of the species S?’ In other words, ‘What is its function?’ or ‘What good does it do?’” (Foot, 2001, p. 31)⁷

Importantly, natural-historical judgments are not statistical summaries of what is true of most, or many, members of a life form. Hence, they are not falsified by the existence of individuals for whom they fail to hold. For example, “the nine-banded armadillo has four legs” is not disproved by the fact that this nine-banded armadillo has only three legs, or even the fact that most nine-banded armadillos currently have three legs (through, e.g., widespread injury or disease). On the contrary, natural-historical judgments provide criteria for evaluating excellence and defect in individual members of the life form. From the truth of “the nine-banded armadillo has four legs,” together with the fact that this armadillo has three legs, it follows that this armadillo is missing a leg. In bringing together (a) the natural-historical representation of a life form and (b) facts about individual bearers of that form, we arrive at what Foot calls evaluations of natural goodness and defect.

The transcendental argument makes a claim about the form that our judgment must take if we are to apprehend anything as living. Nothing about this form of judgment—which we are calling *life form thought*—is meant to provide evidence for particular biological claims, whether claims about an individual organism (e.g., *this* armadillo) or claims about how to characterize a life form itself (e.g., what is true of “the nine-banded armadillo”). Crucially, such judgments can be made correctly only in light of our observations of organisms. Consider, by analogy, the Kantian claim that employing the category of substance is a necessary condition on the possibility of experience. The transcendental nature of such an argument and of the category of *substance* itself would not impugn the idea that the way in which we know what

⁷ Granting Foot’s point, there is a question of how to understand truths like “the blue tit has a round blue patch on its head.” Are these a *subset* of natural-historical judgments about blue tits, so that a natural-history of the blue tit includes both functionally relevant and non-functionally relevant descriptions? Or should we say rather that such truths don’t actually belong to the natural-history of blue tits (i.e., are not natural-historical judgments in the relevant sense), since a Thompsonian natural-history, properly understood, tells us about *the life* of the organism in just the sense that interests Foot—i.e., a natural-history includes only those truths that *play a part* in an organism’s characteristic mode of self-maintenance and reproduction and thus the blue-patch is not part of the natural-historical description of blue tits? We suspect the second option is the better one, but probably not much depends on this. In any case, whenever we discuss natural-historical judgments in this paper, we have in mind those that are functionally significant.

substances there are and what they are like is precisely *through experience*, which this category makes possible.⁸

What does this imply about the relationship between AN and biological science? On one interpretation, AN intends to offer a parallel, independent approach to organisms from the approach found in scientific biology. On this view, AN describes our “folk” understanding of living things, the one expressed in everyday conversations and nature documentary voiceovers. This understanding contrasts with science, which understands living things in more technical ways and aims to provide deeper, causal explanations of organisms in terms of their underlying biological processes and biochemical mechanisms. And these approaches—the folk and the scientific—are not in competition with one another. Each is valid in its own sphere and for its own purposes.

Lewens interprets Foot and Thompson along similar lines.⁹ Speaking about proponents of AN, he says that “the notions of function, species and related terms that characterise their approach are not the same as the concepts of ‘function’ and ‘species’ that appear in the technical biological articles” (Lewens, 2020, p. 481) And later Lewens writes that, “the objects of Thompson and Foot’s analyses are not technical, scientific notions” (Lewens, 2020, p. 483) and “the notions of function, species and so forth that Foot and Thompson draw on are not meant to be connected in any close way with technical biological concepts” (Lewens, 2020, p. 484).

Now, Lewens offers this as a sympathetic interpretation of Foot and Thompson, not (yet) as a critique of their view. Even so, this cannot be the right way to view the relation between AN and contemporary biological science. For Aristotelian naturalists aspire to something more ambitious. They claim that life form judgments are essential, either explicitly or implicitly, to *all* our thought about living things *as such*. Thus, far from giving an alternative “folk” approach to that of biological science, AN purports to reveal the form of thinking that biologists must employ if they are to so much as have a topic for investigation.¹⁰ On the one hand, this *form* of judgment is not derivable from our observations of the biological world. Rather, it is the condition for the possibility of any such observations—whether the observations of laypersons or expert scientists. On the other hand, our observations *themselves* and the knowledge that derives from them, are plainly empirical.

In fact, there is good reason to think that the notions of “function, species and so forth” that interest Foot and Thompson are common in contemporary biology, and

⁸ For a detailed discussion of the epistemology of life form judgments, see Thompson’s “Apprehending Human Form” (2004). Thompson’s aim there is to dispute what he labels the “empiricist propositions.” For our purposes, it’s important to note that Thompson’s argument against the empiricist propositions turns on their failure to apply to *human beings*, on account of the fact that we have first personal, non-observational knowledge of our own life form. The concept of a *life form* is, he claims, not empirical but is “more akin to such logical or quasi-logical notions as *object, property, relation, fact, or process*” (Thompson 2004, p. 63). But particular life form concepts, e.g., mammal or umbrella jelly, are empirical concepts acquired by experience. Before we come to the case of the *human*, Thompson comments about the acquisition of imagined knowledge of umbrella jellies, “you did all this filling-in or colouring-in—which was both factual and evaluative, temporal and atemporal, general and particular—*entirely on the basis of observation*” (ibid.: 56, italics original).

⁹ Lewens is far from alone in this. For example, Wild (2020) comments: “Aristotelian naturalism is satisfied when evolutionary biology does not raise any objections against it... and when it can pursue a *naïve and commonplace notion of biology*” (emphasis added).

¹⁰ For this interpretation of AN’s aspirations, see Lott (2012) and Woodford (2016).

that life form thinking is ubiquitous even in technical, scientific biological research. To see this, consider the following passage from a recent article, chosen more or less at random, from the journal *Cell*. We take this article to be a typical example of contemporary biological science.

The spectrin-based membrane skeleton, a filamentous network distributed underneath and parallel to the cell membrane, is widely present in different cell types of metazoan species. In contrast to the canonical cytoskeleton, which is a 3D network of filamentous actin (F-actin), membrane skeleton is a specialized 2D network consisting of spectrin fibers. The membrane skeleton was first discovered in erythrocytes. It is also well studied in neurons and plays critical roles in the formation of axon initial segments and nodes of Ranvier, which are important for the initiation and rapid propagation of action potential. It provides mechanical support to the membrane and mediates the communication between cytoskeletal components and the membrane. Through tethering membrane proteins, the membrane skeleton also controls the clustering and distribution of membrane proteins and regulates cellular responses to various signal. The membrane skeleton is a polygonal 2D lattice structure in mammalian erythrocytes, but in axons and dendrites of neurons, it is organized as a quasi-1D periodic lattice. The basic organizational unit of membrane skeleton is a short F-actin at every lattice point, which acts as a hub to connect spectrin fibers from neighboring lattice points. This actin-based spectrin-docking complex is named the spectrin-actin junctional complex...

Up to date, the fine structure of the junctional complex is still absent and high-resolution structural information is only available for several individual domains or partial complexes of truncated forms of certain factors. This gap of knowledge has limited our understanding of the exact roles of these skeleton proteins in their erythrocytic and neuronal functions. In this study, we report the cryo-EM analysis of the spectrin-actin junctional complex isolated from porcine red blood cells. Our data reveal the general principle in the organization of the junctional complex and membrane skeleton and provide a framework to understand the function and dynamics of the membrane skeleton.¹¹

Here we have a nice example of life form thought in action. Li et al. begin by characterizing the functions of the spectrin-based membrane and its parts (“plays critical roles,” “controls the clustering,” “acts as a hub,” etc.). The authors then note a gap in our understanding of those functions, rooted in a lack of precise information about the membrane’s structure. Their goal is to understand those functions better, and in particular to understand how the distinctive shape and organization of the membrane enables its roles (to “provide a framework to understand the function and dynamics of the membrane skeleton”). They gain this better understanding of structure and function through observation (cryo-electron microscopy) of particular domestic pig cells.

Of course the researchers’ expanded knowledge of the spectrin-based membranes comes through observation. The transcendental argument makes a claim about how

¹¹ Li et al. (2023, pp. 1912–1913).

these observations are possible: When these researchers examine these particular membranes in these particular pig cells, they are drawing on a background conception of the life form to which these membranes belong. That conception is essential for grasping, via cryo-EM, what is going on *here-and-now* with these membranes from these cells.

The question guiding this research, we suggest, is a specific instance of the more general question, “how do they live?” And the kind of knowledge this research generates is *of the same sort* as the knowledge given in a Thompsonian natural-history. This is clear throughout the article, and especially in the introduction and discussion sections. What the article aims to provide is not a mere statistical summary of what is true of most spectrin-based membranes in porcine red blood cells. Rather it gives a characterization of what those membranes are like, what they do, in the sense of their *characteristic shape and proper function*. That is why, if a disease were to result in the malformation and malfunctioning of the spectrin-based membrane in 99% of the domestic pig population, that would not give the authors reason to revise or retract their article.

Consider another example that highlights the way that biologists make observations that are non-statistical in nature. Oberhauser and Solensky write, in their discussion of the monarch butterfly, “Larvae molt (shed their skin) as they grow, and the stages between larval molts are called instars. All monarchs go through five separate larval instars” (Oberhauser & Solensky, 2004, p. 4). Oberhauser and Solensky do not find it at all odd to note following this that, “Monarch eggs and larvae have a slim chance of reaching adulthood; several previous studies documented mortality rates of over 90% during the egg and larval stages” (Oberhauser & Solensky, 2004, p. 4). If the claim about the different phases larval development were merely a statistical one, it would be false. The claim is one about the full and proper development of the monarch, not about the percentage of eggs that complete this developmental process.

Still, one might wonder, is it possible that biologists have a different concept a function from the ones that figures in natural-historical judgments? Perhaps the authors of the *Cell* article talk about what “plays a part” but they mean something different from what AN means? We see no reason to think this. On the contrary, by all appearances, these scientists (and countless others) are employing more or less the same concept of function that Foot outlines and that matters for natural historical judgment—i.e., the *role played* by a given part or process, in relation to other parts and processes, within the overall life of organisms of a certain kind. More generally, it is not as if there is some other “scientific” notion of function, or biological teleology, that biologists have in mind, and that differs from what AN is talking about. As Justin Gerson says,

When I ask biologists what functions are, I often get a similar response: ‘A trait’s function is just what it does.’ Sometimes these biologists seem perplexed, and even mildly annoyed, to be asked a question like that. Hearts pump blood. That is what they do, so that is their function. Zebra’s stripes deter flies. That is what *they* do, so that is their function. The tsetse flies’ labellar teeth puncture skin: *T. brucei*’s blycoprotein coat tricks the host’s immune system. Functions are simply doings (Garson, 2019, p. 10).

To this, AN adds that the relevant sense of “doings” needs to be spelled out in terms of playing a part in an organism’s characteristic modes of self-maintenance and

reproduction. But, as we have been arguing, this is an idea that (at least many) practicing biologists already seem to accept as *structuring* their research, not as irrelevant to it.

Here's the upshot: It is a mistake to interpret AN as offering a “folk” approach to organisms that is an *alternative* to the approach to living things found in contemporary scientific biology. And it is a mistake to think that there is some gulf between the AN approach to living things, and their functional parts and processes, and the approach to living things found in “the technical biological articles.” And thus passages like the following one, from the beginning of Lewens' essay, are seriously misleading:

Thompson and Foot deny that claims about species natures can be reduced to a set of more basic claims stated in the technical language of the biological sciences. To describe the nature of the domestic dog, they say, is not to describe what is statistically common among individuals of the biological species *Canis familiaris*. Nor is it to say something about the biological functions of the traits of these individuals, where ‘biological function’ is understood in terms of facts about contributions to reproductive fitness, or to past regimes of natural selection. (Lewens, 2020, p. 480)

The problem with this passage is its implied contrast between (a) claims about species natures and (b) the technical language of the biological sciences. As the article from *Cell* illustrates, it's a wrong to think that, as some general rule, the biological sciences traffic in “technical language” that is *different from* claims about species-natures (i.e., life forms). To be sure, the language of the article is “technical” in its level of detail and use of specialized terms that will be unfamiliar to non-scientists—e.g., “an α - β -adducin hetero-tetramer binds to the barbed end of F-actin as a flexible cap.” But the *kind* of claim being made here is plausibly seen as nothing other than a claim about species-nature—i.e., not different in form from “The S is/has/does F” or “S's are/have/do F.”¹² And while the authors at times report statistical findings (“focused classification revealed two subgroups: one shows an NTM from b-adducin (40% particles) and the other from a-adducin (60% particles)”) that does not show that their central claims are about “what is statistically common among individuals of the biological species.” On the contrary, everything in the article speaks against that interpretation of the researchers' own understanding of their research and its implications. Knowledge of what is statistically common is not, it seems, the kind of knowledge that they are aiming for. Put another way, the project of “reducing” life form thought to the “technical language of the biological sciences” is not the project these biological researchers are engaged in, because their technical language *instantiates* life form thinking.

¹² There is a slight complication here, but it does not touch any of the points we are making. The authors of the *Cell* article tell us that they have examined membranes from one particular species: “To characterize the spectrin-actin junctional complex, we isolated the membrane skeleton from *Sus scrofa domestica* red blood cells.” (Li et al., 2023, p. 1913). They take their research, however, to have implications for the membranes in other organisms. But this is no great surprise, since as they explain at the beginning of their article, “The spectrin-based membrane skeleton is a ubiquitous membrane-associated two-dimensional cytoskeleton underneath the lipid membrane of metazoan cells.” (Li et al., 2023, p. 1912). So while their conclusions characterize, in the first instance, the species *Sub scrofa domestica*, they are relevant to other species as well, because of similarities in structure and function across species.

So far, we've been looking at the relation between life form thought, as understood by AN, and empirical observation, scientific practice in biology, and the understanding of biologists themselves (or at least many of them). But what about debates in the philosophy of biology, and in particular debates about the proper account of biological functions? How does AN map onto the conceptual terrain sketched out by proponents of etiological, causal, or organizational accounts of function, respectively?¹³ In discussing her idea of “playing a part in the life of,” Foot says in a footnote: “It is imperative that the word ‘function’ as used here is not confused with its use in evolutionary biology, where... ‘the function of a feature of an organism is frequently defined as that role it plays which has been responsible for its genetic success and evolution’” (Foot, 2001, p. 31, fn. 10). At first glance, it might seem that Foot has in mind a selected effects account of biological functions—the most prominent etiological approach to function in biology. And we might think Foot is saying something like, “The selected effects account is fine in its own domain and for the topics that some biologists explore, but my sense of function is just different and applies to something else.” However, whether or not this is what Foot intends, this is *not* the best way to understand the relation between AN's account of function and other approaches to function in the philosophy of biology.

To begin, note the important distinction between: (1) questions concerning the function of biological parts and processes *within* the life cycle of an organism and (2) questions concerning how a kind of organism, or parts and processes belonging to a kind of organism, came into existence or “got into the world.” When William Harvey wrote, “the chief function of the heart is the transmission and pumping of the blood through arteries to the extremities of the body,” he was offering an answer to the first question, not the second.¹⁴ To see this, just notice that Harvey's claim could remain true whether God created hearts or hearts came into existence through natural processes entirely unaided by divine action. And the distinction between these two questions, we suggest, is the best way to understand the point that Foot is trying to make in the footnote quoted above. She goes on to contrast her sense of function with what she calls an “adaptation.” She writes, “to say that some feature of a living thing is an adaptation is to place it in the history of a species. To say that it has a function is to say that it has a certain place in the life of the individuals that belong to that species at a certain time.” (Foot, 2001, p. 31, fn. 10). This means that the notion of an adaptation is tailor-made to answer questions of the second sort, whereas her own sense of function is focused squarely on the first question.

Now, simply viewing something as an “adaptation” in Foot's sense—placing it in the history of the species—is *not equivalent* to adopting the selected effects account of biological functions.¹⁵ If it were, then the selected effects approach might only be relevant to questions of the second kind. But the selected effects approach aims to be relevant to the *first* kind of question, too. For example, a selected effects account typically *starts with* claims like Harvey's claim about the heart. It says that what

¹³ For summary discussions of the main approaches to function in biology, see Allen and Neal (2020), Artiga and Martinez (2016, pp. 89–95), Moosavi (2019, pp. 6–9).

¹⁴ Harvey, cited in Allen and Neal (2020).

¹⁵ This point is not, in our view, stated with sufficient clarity in either Foot (2001), Hacker-Wright (2009) or Lott (2012).

explains and grounds such functional facts about hearts are facts about the history of how hearts came to be. In particular, it says (roughly) that hearts have the function of transmitting and pumping blood in organisms *O*, because hearts contributed to the fitness of *O*'s ancestors by transmitting and pumping blood. Thus a selected effects account tries to provide answers to questions of the first type by uncovering answers to questions of the second type. Whether or not that is the correct way of understanding biological functions, the selected effects account is *not* simply changing the topic from question one to question two. Nor must anyone who accepts the very notion of adaptation therefore adopt a selected effects account of function. To see the latter point, just consider another major approach to biological functions—dispositional, or causal, accounts. Such accounts reject the idea that something's origin holds the key to understanding its function. But proponents of a causal approach to function in biology do not thereby deny that biological parts and processes can be viewed as adaptations. They just don't think viewing them this way—in light of evolutionary history—is the way to explain functions as they now exist.

What, then, is the best way to understand the relationship between the AN notion of function and other accounts of function? Neither Foot nor Thompson, nor other defenders of AN such as Micah Lott or John Hacker-Wright, offer a fully worked out account of biological teleology. However, there are clear resonances between AN and what are known as “organizational accounts” of biological function, as Moosavi (2019) has pointed out.¹⁶ In particular, AN's emphasis on life as defined by self-maintenance and reproduction is closely related to the notions of self-determination and autonomy that figure prominently in organizational approaches. And there may be ways to connect the framework of Thompsonian natural-history with the concepts of “closure” and “self-constraint” as theorized by thinkers such as Mossio and Bich (2017). Moreover, there are especially deep similarities between AN's understanding of function and the view developed in McLaughlin (2001)—a view often grouped with organizational approaches.¹⁷

To be clear, we do not offer these points as critiques of any other approaches to biological teleology. Rather these remarks are simply intended fill out the picture of AN and to suggest possible future avenues of investigation. Likewise, our earlier discussion of scientific practice and the views of practicing scientists was not intended to provide evidence *against* other accounts of biological teleology. Rather our goal was simply to clear away the mistaken idea that AN is concerned only with the ordinary or “folk” understanding of living things, and therefore somehow “unscientific” or irrelevant to what biologists actually do.

Let's now turn to Lewens' particular critique of AN.

¹⁶ To our knowledge, Moosavi (2019) is the only person to have recognized the similarities between AN and the organizational approach. At the same time, she also offers important insights into the differences between AN and some of the most prominent organizational approaches. See especially Moosavi (2019, pp. 9–13). For general discussions of the organizational or autonomy, approach, see Artiga and Martinez (2016), Bich and Bechtel (2021), Moreno and Mossio (2015), Mossio and Saborido (2016), Mossio and Bich (2017).

¹⁷ For this grouping, see Allen and Neal (2020) and Moosavi (2019) and Garson (2017). For another helpful discussion of different approaches to function and teleology in the philosophy of biology, including what is distinctive about the approach of Aristotelian naturalism, see Woodford (2016).

3 Lewens and the charge of underdetermination

Lewens' challenge to the AN account of life forms centers on a supposed problem of *underdetermination*. Before laying out Lewens' arguments in detail, we should note two things. First, Lewens does not attack Thompson's transcendental argument or its conclusion. Rather, for the purposes of his critique, Lewens *grants* the conclusion. He then argues that difficulties remain for AN, and that AN is less appealing than a Kantian-inspired alternative. Second, Lewens emphasizes that none of his arguments against life form realism depend upon features that are particular to human beings. Rather the problems apply just as much to claims about plants and non-human animals. We agree with Lewens about this. The arguments he makes relate to the general form of normativity that is central to the AN project, and we take it to be a fruitful aspect of his argument that we can, for the moment, abstract from some of the difficulties attendant upon the human case.

Lewens interprets Thompson and Foot as *realists* about life forms in the following sense: life forms can be described with greater or lesser accuracy; some of our judgments about life forms are likely to be correct; and life forms can properly be said to exist—although not to exist in a “Platonic” sense.¹⁸ However, Lewens admits that he is uncertain whether Thompson is best characterized as a realist, since Thompson asks us to focus on our descriptions of life forms rather than metaphysical questions about their grounding: “So perhaps Thompson is trying to show how we deploy the notion of life form in our descriptions of nature and why we must deploy the notion in that way, with no further implication that there are facts of the matter about life forms, or even that there are life forms” (Lewens, 2020, p. 484). And Lewens entertains the possibility that the view he proposes actually *is* Thompson's view and, if so, that his paper constitutes a helpful clarification.

What is at stake in deciding between realism and projectivism when it comes to judgments about life forms? It is natural to think that, because AN's appeal to life form thinking is meant to support *moral* realism, the account must be realist about life forms in general, apart from the specifically human case. We are sympathetic to this thought, although issues of ethics are beyond the scope of this paper. In what follows, we defend realism within the domain of life form judgments against Lewens' objection. That is, we aim to demonstrate that there is no *special* reason *not* to be a realist in this domain—i.e., no good reason to *deny* that “life forms exist,” and no good reason to think that their “existence” is simply a matter of our own projection, construction, etc. As we consider Lewens' underdetermination problem, it's worth noting the dialectical situation. Lewens purports to provide an argument against realism about life forms that *does not beg the question* against such a position.

Let us turn, then, to Lewens' argument. Lewens expresses the problem of underdetermination like this: “it is unclear what makes it the case that some natural historical judgments are true, while competing ones are false” (Lewens, 2020, p. 487). There are two ways to understand this as an objection to AN. Understood one way, the worry is a metaphysical one. What could *make it the case* that any natural-historical judgments

¹⁸ For an insightful recent discussion of Foot's understanding of “grammatical investigation,” and her relation to Anscombe and Wittgenstein, see Hacker-Wright (2021, pp. 9–16).

are either true or false? Understood a different way, the worry is epistemological. How do we *know* what is true or false with respect to natural historical judgments, and what resources could we draw upon to arrive at justified claims about life forms? Within each of these versions of the underdetermination objection, we can further distinguish two kinds of worry. One type of worry takes the underdetermination problem to apply to *any* fact about life forms or *any* knowledge about them. A second type of worry pertains to “hard cases,” where there seem to be special difficulties in there being, or our knowing, what is true or false about a particular life form. We will consider each of these versions of the underdetermination objection, starting with the metaphysical versions and then moving to the epistemological ones.¹⁹

3.1 Underdetermination: what makes it the case?

According to Lewens, realism faces a problem of underdetermination because truths about life forms are determined neither by statistical generalization nor by the evolutionary origins of a vital part or process. Thus, when we ask whether a given natural-historical judgment is true, we cannot answer this question by looking at what is statistically common—after all, what happens with most monarchs is not the same as what is true of “the monarch.” Nor can we look to evolutionary history. For natural-historical judgments belong to a “timeless present,” and Aristotelian naturalists insist on distinguishing between (a) the question of what is true of a life form, as described in a natural history and (b) the question of when and how a life form came into existence.²⁰ How, then, can AN account for there being any facts of the matter about life forms?²¹

¹⁹ Lewens’ underdetermination problem is similar to the “indeterminacy objection” developed by Woodcock (2015). But, as Lewens notes, his own argument regards all life forms, while that of Woodcock focuses on “difficult questions about the human life-form.” This is important, since in addressing Lewens’ objection to AN, we are setting aside the particular issues that arise in the human case where the general view of natural norms is applied in an ethical context. Woodcock’s objection centers on the claim, made by some proponents of AN, that we understand what is naturally good in human beings in some non-empirical or non-observational way – i.e., that we know our own form “from within,” or through the first personal exercise of our rational faculties, or through our grasp of the good, or through practical as well as theoretical reasoning, etc. (For various arguments along these lines, see Frey (2018), Hacker-Wright (2009, 2021), Hursthouse (2018), Lott (2012), Thompson (2004). However we understand this claim about non-empirical knowledge of the *human* form, what matters for our purposes is that the claim does *not* apply to plants and other non-human animals. It is not a feature of life form thought *as such*, but only the special case of thinking about our own life form. Thus, what is distinctive about Woodcock’s objection to AN places it beyond the scope of this paper. If the argument of this paper is successful as a defense of AN’s general account of natural norms, nevertheless, considered as an *ethical* program, AN still must contend with Woodcock’s indeterminacy objection with respect to the human case (Woodcock, 2015). For a discussion of the general problem of maintaining the naturalistic credentials of moral norms considered as natural norms applying to human beings see Moosavi (2022).

²⁰ On the temporality of a life form judgments, see Thompson (2008, pp. 63–66).

²¹ It may be helpful to distinguish Lewen’s critique of AN from the criticism developed by Odenbaugh 2017. Odenbaugh argues that AN faces a dilemma, because the best naturalistic account of biological function is a selected effects account (whether by natural or cultural evolution). If AN adopts a selected effects account, this leads to morally repugnant conclusions in the human case, since what will turn out to have a function in human life will include things like xenophobia and sexual violence. On the other hand, if AN opts for a different account of function—not a selected effects account—then AN ends up with an account

According to AN, the answer is simply that natural historical judgments are made true, when they are true, because there *are* vital parts and processes of the sort they describe—i.e., when the world in fact contains (or contained) the kind of organisms that are characterized by the relevant natural history. To assume otherwise is to beg the question against AN. It is true that we can't derive natural historical judgments from statistical judgments or evolutionary theory. But this is just to say that natural historical judgments are a basic form of judgment not derivable from either of these. And indeed, the transcendental argument concludes that life form judgments (with their own sort of generality) must be a basic form of judgment for us to so much as have any experience of living things. To point out that natural historical judgments are not judgments of statistical regularity nor are derived from evolutionary theory is to recapitulate AN, not to offer a criticism of it.

Recall that the natural history of a life form is an ordered system of natural-historical judgments, and the order it provides teleological: the materials that are described are the parts and processes that make up the life cycle of the organism, each understood in relation to the others as parts of a whole that standing in functional relations to one another. Roughly speaking, natural-historical judgments will be true when the world contains (or contained) the vital parts and processes they describe, as elements in the life cycle of some organism. So, the judgment, “the zebra’s kidneys help balance the amount of fluid in its body” will be true just in case zebras are real, and they really have kidneys, and balancing fluid really is a role they play—i.e., there is some unfolding process, subject to potential interruption and defined in terms of its end-point. And the judgment “the zebra’s kidneys store the zebra’s sperm” will be false, because it does not correspond to any actual vital process.

This is a response to the underdetermination objection as a general metaphysical worry. Let us now turn to the metaphysical worry about hard cases. Lewens gives the example of the judgment, “the human lives until 110.” Is this true? Of course, most humans do not reach 110. But natural historical judgments are not made true

Footnote 21 continued

of natural normativity that is not properly naturalistic, such as a form of vitalism. There are few things to note about Odenbaugh’s argument. First, Odenbaugh supposes that only a selected effects account of biological function is compatible with contemporary science. As our discussion in section two argued, we believe this is incorrect. Second, Odenbaugh’s dilemma for AN relates specifically to the human case. That is fair game, of course, for a critique of AN. But insofar as it deals with problems distinctive to the human case, it is beyond the particular concerns of this paper. Third, even in the case of non-human organisms, Odenbaugh’s criticism of AN is distinct from Lewens’. Odenbaugh’s argument centers on the naturalistic credentials of the AN, and it does not refer to the idea that natural historical judgments are underdetermined. In contrast, Lewens’ argument focuses on underdetermination, and he does not raise worries about AN’s naturalistic credentials. That said, even if Odenbaugh’s and Lewens’ arguments are distinct, they may be connected in interesting ways. One way of thinking about the connection is this: Each of them claims that AN faces a problem if it does not embrace a selected effects account of function. For Odenbaugh, the problem is that without a selected effects account, AN is no longer a naturalistic view. For Lewens, the problem is that without a selected effects account, natural historical judgments are underdetermined. Moreover, you might suppose that Odenbaugh’s argument shows a difficulty with one way of *responding* to Lewens’ argument, since if AN tries to deal with Lewens’ underdetermination worry by appealing to a selected effects account of function, it will then face the first horn of Odenbaugh’s dilemma. While nothing in our paper is intended as a direct response to Odenbaugh, we do think that our discussion of how AN relates to scientific practice serves as a partial response to Odenbaugh’s claim that, without a selected effects account of function, the AN account of biological normativity must be *non-naturalist* or *vitalist*. For another response to Odenbaugh, see Hacker-Wright (2021).

by statistics. So perhaps all humans who fail to reach 110 are simply defective in this respect, like mayflies who never make it to spring. Now consider an alternative judgment, “the human lives until 60.” It seems these two judgments cannot both be correct descriptions of the “the human.” So what facts will settle the matter?

When we consider such examples, we should keep in mind two points. First, these cases don’t suggest that there *are no* facts of the matter about life forms. For example, the difficulty of the question about the human life-span does not entail that the natural-historical judgment that “humans have one heart,” (not two or twelve) is false. Second, when we ask whether the human lives to 60 or to 110, we do so against a background provided by our understanding of how “the human” lives—i.e., the characteristic parts and processes that make up the human life cycle. It is clearly false, for instance, to claim that the human lives to be 4 years old. (And this would remain false, even if, through some disaster, it were to be statistically accurate, since humans are clearly not fully developed by the age of four.) And this point is not unique to human beings. We can make sense of difficult questions about chimpanzees, jellyfish, etc. only in light of our background understanding of “how they live.” Such understanding does not consist merely in knowing what *usually* happens with them. (If it were only that, it would provide no basis for distinguishing between interrupted and uninterrupted vital processes.) Rather this understanding involves our grasp of what is characteristic of them, in the sense specified by natural historical judgments. This further suggests that hard cases shouldn’t undermine our confidence that many natural historical judgments are true. For it is on the basis of such confidence that we can make sense of the hard cases, and recognize them *as* hard cases.

Still, there is more to say about cases like the human life span. Lewens notes a possible response available to AN: While there are facts about life forms, “there are no facts of the matter about some of the questions we might ask about them, especially when those questions are posed in very fine-grained ways” (Lewens, 2020, p. 491). This may be the right thing to say, at least sometimes.²² But we should be careful not to confuse (a) cases in which there is no determinate answer to a particular question about “how they live” with (b) cases in which the answer to “how they live” itself involves a kind of indeterminacy, in the sense of flexibility or complexity. Many natural historical judgments may be instances of (b), such as: “In circumstances like A, Ss tend to do F. But in circumstances like B, Ss tend to do G” or “Ss grow in one of two ways. Either...Or...” There is nothing strange about natural-historical judgments that have such complexity as *part of their content*.

Related to this, we propose a different response to the metaphysical worry about hard cases: The content of some true natural-historical judgments identifies a *range* of possibilities, all of which are naturally sound. For instance, the U.S. Department of Interior informs us that, “Sea otters have the thickest fur of any animal. Their fur contains between 600,000 and 1,000,000 hair follicles per square inch. Unlike most other marine mammals, otters lack a blubber layer. Instead, they depend on their dense, water-resistant fur to provide insulation.”²³ Taking this to be a true interpretation of

²² Lewens notes this response and does not offer any arguments against it. And he says, “My claim is not that the Aristotelian realist has no options” (Lewens, 2020, pp. 491–492).

²³ “12 Facts about Sea Otters for Sea Otter Awareness Week.” Available at: <https://www.doi.gov/blog/12-facts-about-otters-sea-otter-awareness-week>.

“the sea otter” (*Enhydra lutris*), we can say that a sea otter with 900,000 follicles per square inch would not be defective, on account of failing to have 1,000,000 follicles, although a sea otter with only 100,000 would be defective (and presumably unable to stay warm). The claim, “A sea otter with 1,000,000 hair follicles per square inch is naturally sound” is true, whereas the claim, “Sea otters have 1,000,000 hair follicles per square inch” is false, strictly speaking, since what is actually characteristic of sea otters—what counts as naturally sound—is a broader range of possibilities. Applied to Lewens’ example of claims about the human life span, the parallel point is that it is false that “the human lives to 60” and also false that “the human lives to 110,” since it is false that the human lives to any such specific age.²⁴

We conclude that Aristotelian naturalists need not worry about the metaphysical version of the underdetermination objection, in either its general form or as a matter of hard cases. We now turn to the epistemological version of Lewens’ underdetermination objection.

3.2 Underdetermination: how do we know?

Lewens spends more time developing epistemological worries, and these seem to be his real concern. For instance, Lewens cites a passage from Micah Lott that articulates the basic AN idea of “playing a part in the life” (Lott’s example concerns birds of paradise).²⁵ Lewens does not challenge Lott’s account of what would *make it the case* that a feature is characteristic of a life form. Rather, Lewens raises an epistemological worry: “How are we to establish that it is ‘characteristic’ of birds of paradise to attract mates via their long tails?” (Lewens, 2020, p. 493). If we take this as a question, then the Aristotelian naturalists have a ready answer: we establish this through empirical observation. We observe, for instance, the mating activity in birds of paradise and the role that these tails play in the life of such birds.

The basic idea of AN is that we arrive at our knowledge of life forms via observation of individuals, in which we identify different vital parts and processes and discern their relations to one another as aspects of the organism’s life viewed as a whole. The relevant sort of observation is a kind of *back-and-forth interpretation*, in which we view individuals in the light of some (revisable) conception of their life form, and our observations of individuals inform and shape our conception of the kind of thing these creatures are—i.e., our conception of the life form itself.²⁶ The core answer to the epistemological question is thus straightforward: life form judgments (at least about living things other than ourselves) are known empirically, through experience.

But Lewens appears to be worried that empirical observations, including the investigations of biologists, will never be able to provide the right sort of justification or adequate support for natural historical judgments. He puts the point this way:

²⁴ Thanks to an anonymous reviewer for encouraging us to consider this line of response to the metaphysical worry about hard cases.

²⁵ Lott (2012) is arguing, in response to Fitzpatrick (2000), that AN’s account of function has the resources to distinguish between genuine functions and accidental benefits.

²⁶ For elaboration of this idea, see Thompson (2004).

My general concern is that since Thompson and Foot explicitly deny that there is any simple relationship between natural historical judgements and statistical facts, and since they also deny that natural historical judgements can be understood in terms of articulating the sorts of evolutionary function claims that reduce claims about malfunction to claims about regimes of natural selection, it is unclear what makes it the case that some natural historical judgements are true, while other competing ones are false. (Lewens, 2020, p. 487)

Now, this does not amount to an argument against AN unless we presuppose that all that can be known *empirically* about living things are statistical generalities or the theoretically elaborated claims of regimes of natural selection. But to add that presupposition would be to beg the question. As we saw in the last section, natural-historical judgments will be true when the world contains (or contained) the vital parts and processes they describe. And AN claims that we come to know about vital parts and process (e.g., come to know that “the zebra’s kidneys help balance the amount of fluid in the body” is true and that “the zebra’s kidneys store sperm” is false) through empirical observation. To point out that we do not come to know this by inference from the observations of statistical regularities or theoretical claims about evolutionary origins is (as in the case of the metaphysical version of the argument) to offer a recapitulation of the Aristotelian naturalist’s epistemology, not a criticism of it.

So we should try to find a non-question begging interpretation of the epistemological challenge to AN. Here is one way to understand the challenge:

1. All our observations of living things are merely of individuals, not of life forms.
2. Life form judgments are not about individuals but are general.
3. The generality of life form judgments is not statistical generality that could be entailed by the judgments concerning individuals, nor is it corroborated by evolutionary theory.
4. Therefore, life form judgments are never *fully* justified (are underdetermined) on the basis of our observations.

This argument, however, fails to appreciate the radical conclusion of the transcendental argument, which is that our observations of individual living things are never observations *merely* of individuals, since individuals are not bare particulars but bearers of a certain life form. Indeed, the transcendental argument shows us that individual living organisms must be grasped *as* bearers of some life form for us to be able to have experience of them as particulars at all. So, we ought to reject premise 1 of the re-constructed argument.

Consider a simple example. An ornithologist sees a bird that he doesn’t recognize. He watches it swoop down from a tree and scoop up a mouse. He judges that this bird is hunting. In this case, he picks out the life form by an indexical relating it to the particular bird in front of him, “this sort of animal.” And on the basis of his observation, he might form a judgment about how this type of organism characteristically procures its food—i.e., he might make a natural-historical judgment about the life form to which this bird belongs. This may seem strange. After all, how could he be justified in making a judgment in the timeless present about a life form on the basis of a single individual’s activity at a particular moment in time? The answer is that he grasps the

individual as a bearer of the life form, and is therefore able to learn about the life form from this individual. His judgments are defeasible, of course, and it may turn out on the basis of other observations that his initial views were mistaken. And he won't be able to construct a full natural history of this sort of bird on the basis of observing a single one. That will take further observation of more specimens, but it is always by viewing the organisms as bearers of some life form that he is able to answer questions about what such organisms do and how they do it.

Perhaps, however, there is a stronger way to formulate the epistemological challenge of underdetermination. We could frame Lewens' argument as follows: The non-reductive nature of life form judgments ascriptions means that no matter how much evidence we receive in terms of lower-level (non-life form) facts, there is always an open question how we should interpret them. In this way, the epistemology of life forms is similar to that of moral truths: we can't derive life form judgments from independently recognizable facts just as we can't derive moral truths from descriptive facts.²⁷

This way of construing the argument suggests a parallel between Lewens' objection to AN and G.E. Moore's open question argument. We can distinguish two ways of understanding this argument.

1. No matter how many judgments we make that do *not* invoke life form concepts (e.g., judgments regarding chemistry and physics that do not involve vital descriptions or organisms), it is always an open question whether any particular life form judgment is true.
2. No matter how many lower-level life form judgments we make, it is always an open question whether any other higher-level life form judgment is true.

Let's consider these in turn. With respect to the first version of the worry, AN accepts that physical and chemical facts can count in favor of, or against, a life form judgment. Given the biologist's overall understanding of the organic system, it might turn out that the rate of a chemical reaction or level of a mineral could decide a question one way or the other. This fact would have the relevance it does *in light of the overall understanding of the organic whole*, including a grasp of how these physical and chemical facts *add up to* some vital process.

At the same time, AN insists that there is no general set of physical or chemical facts that entail particular life form judgments about organisms, and that biology *as such* is concerned with the biological significance of physical and chemical facts—i.e., how these facts constitute some vital part or processes. In that sense, there is some truth in the first way of putting the argument. Crucially, however, AN does not draw the conclusion about life form judgments that Moore does about claims about the good, namely that they are non-natural. Rather, since AN takes the parts, processes, and organized wholes of living things to be constituents of the natural world (constituents that we frequently and unproblematically observe), the conclusion is, instead, that we should not give a fully reductionist account of certain natural properties in terms of other natural properties. So the element of truth in the first version of the argument is not a problem for AN. It would be worrying only if we *presupposed* an argument

²⁷ We are grateful to an anonymous reviewer for this way of framing the argument.

against AN's form of non-reductionism. But Lewens not present such an argument. And indeed for the purposes of his paper he wishes to grant that reductionism about living things cannot succeed (Lewens, 2020, p. 497).²⁸ So if we are looking for a version of Lewens' argument that does not beg the question against the claim that we learn about life forms through observation, we still have not found it.

The second form of argument would be worrying if true. But AN simply does not entail this claim. It does not follow from the idea that we cannot give a reductionist account of life form judgments that these judgments cannot be determined by other, more primitive life form judgments or by judgments that deal with living things as such and employ concepts with this distinctive logical profile. Moreover, the claim seems false. As a matter of scientific practice, biologists confidently claim on the basis of certain lower-level judgments about living things that other life form judgments are true. This is not typically, however, a matter of conceptual entailment, but of compelling evidence and interpretation. This is why certain questions are not "open" in biology. While these judgments are not conceptually entailed by lower-level observations, in many cases, there just isn't any other reasonable belief to hold—e.g., "zebras have four legs"; "lions are carnivorous and they use their sharp teeth for capturing and killing prey", etc. Someone might insist that we *could*, in principle, be mistaken about these judgments. But so what? Moreover, journals like *Cell* or *Animal Behavior* reveal that biologists are constantly making judgments, on the basis of observation, that have the basic forms "The S is/has/does F" or "S's are/have/do F." What is striking is that such judgments are so often supportable and revisable in light of observation, not the fact that it is conceptually possible for these judgments to be mistaken. So AN need not and should not accept the second form of the "open question" argument. On the contrary, seeing how scientists move from more primitive life form judgments to more elaborate ones through interpreting and understanding the way that organisms function holistically lends further credence to AN's claim that biology presupposes life form judgments.

That said, perhaps we still haven't gotten to the bottom of the epistemological challenge to AN. Lewens points out that there are cases, both real and imagined, in which there seem to be multiple plausible but incompatible interpretations of a life form, each of which can fit the observations into a coherent account. As he says:

How, then, are we to adjudicate in a dispute between two imaginary naturalists who disagree over whether it is 'characteristic' of chimpanzees to kill newborns, given that this is intended as a claim about the chimpanzee's life form, distinct from truths about specific chimpanzees...since these judgements are only tied loosely to facts concerning specific traits of token organisms (for large numbers of organisms may be malfunctioning in various respects), it may be possible to maintain many different systems of incompatible judgements. It is certainly far from clear that 'the chimpanzee practices infanticide' will be decisively supported or undermined as it is assessed for its fit with plausible systems of natural historical judgements (Lewens, 2020, pp. 493–494).

²⁸ For more on this point, see Sect. 4.2 below.

The first thing to note here is that the worry focuses on hard cases. Lewens offers no argument against the general AN picture of how we arrive at knowledge of life forms—i.e., an argument that would apply to all such knowledge, and work just as well against easy cases as hard ones. Second, and closely related to this, we should note that we seem to have a great deal of knowledge about life forms that is *not* especially problematic. It may be hard to determine the truth about chimpanzee infanticide, but there seems to be no comparable difficulty about: “chimpanzees eat fruit”; “the chimpanzee has ten fingers and ten toes”; “chimpanzees groom one another”; etc. We have evidently arrived at *some* knowledge about “the chimpanzee,” and primatologists certainly appear to think so, as is clear from texts like *Wild Chimpanzees* (Arcadi, 2018). The examples that Lewens mentions don’t give us reason to think otherwise. If Lewens wants to claim that, contrary to their surface grammar and apparent logical form, these scientific statements must in fact be mere statistical generalities or simple shorthand for information that does not pertain to life forms, then we are owed an argument that this is the case. Just to ask the question, “How could scientists possibly know these sorts of facts about life forms?” does not amount to such an argument, since the answer, according to AN, is, “By empirical observation of chimpanzees and how they live.”

Below we consider the example of chimpanzee infanticide in more detail in order to show that this is a genuinely a difficult case for biologists and that the difficulty has nothing to do with Aristotelian naturalism. Nor is the difficulty alleviated by adopting a selected-effects account of function. As we shall see, the question of the role that infanticide plays in a regime of natural selection is not one that can be directly accessed epistemically to support one answer to this question rather than another. Instead, scientific practice reveals that what is more epistemically basic is the attempt, through observation of chimpanzee behavior, to place infanticide within the life cycle of chimpanzees. This allows for a conjecture about the evolutionary advantage of such behavior.

Moreover, we should consider why “chimpanzees commit infanticide” might be a hard case, but “chimpanzees eat fruit” is not. Surely this is because fruit-eating is an activity that we can easily place in our overall conception of the life cycle of the chimpanzee. Fruit-eating is the description of a vital process that we can relate to other vital processes as part of an intelligible whole. In the case of infanticide, however, it is harder to say what role this behavior has in relation to everything else that chimpanzees characteristically do—i.e., what part, if any, infanticide plays in the chimpanzee life cycle. Thus, AN both recognizes genuinely hard cases when it is right to recognize them, and it sheds light on why some cases are hard and others are not.

What about when competent and informed naturalists offer competing interpretations of a life form? Lewens notes a reply available to AN: It might be that some facts about life forms are just very hard to know. This seems plausible. After all, biologists usually have to do a lot of work to figure out “how they live.” However, Lewens suggests that this reply is unsatisfactory, because “it is not clear that there are any facts that could adjudicate in principle between alternative possible natural historical judgments, when we understand these judgements as descriptions of life forms” (Lewens, 2020, p. 491). This comment is puzzling. On the one hand, we might interpret Lewens as stating a general worry that would apply equally to easy and hard

cases. But interpreted that way the claim seems clearly false. Surely there are facts that would adjudicate between (a) a primatologist's claims about chimpanzee locomotion and (b) the fanciful claims of an ignoramus who has never seen a chimpanzee and claims that chimpanzees fly around by flapping their arms. Of course the ignoramus *might* insist, "Sure we don't *see* chimpanzees flying, because the ones we see are all defective. Natural historical judgments aren't statistical you know!" But the fact that such a reply is possible doesn't show that it is just as reasonable or well-supported as the claims of the primatologist. And when the primatologist explains to the ignoramus why he is wrong about chimpanzees, she will do so by pointing out certain facts and by appealing to what she and others have observed. So Lewens' comment does not seem correct if we interpret it as a general point that applies to all our claims about life forms.

On the other hand, we might interpret Lewens as making a point specifically about hard cases, such as chimpanzee infanticide. In that case, we need to distinguish between (a) there being *in principle* no facts that could decide between alternative possible natural historical judgments, and (b) there being no facts *available* to us here and now that could decide between alternative possible natural historical judgments. If the claim is about (a), then it seems false. Of course there *could* be additional facts to support one or another possible interpretation of chimpanzee infanticide—e.g., a previously unnoticed toxin that corresponds with infanticidal behavior. However, if the claim is about (b), then it is no trouble for AN. On the contrary, this is just another way of saying that we find ourselves in situation of limited knowledge about "how they live." Perhaps it is not clear how to characterize chimpanzee infanticide—what sort of response to the environment it is, what part it plays in the life of the species, whether it is defective, etc. Thus we have to proceed cautiously in making natural historical judgments about the matter, and we should recognize the limits of our understanding of chimpanzees. Or at least that is what AN implies. And that seems like the correct approach in the face of uncertainty.

Lewens' idea seems to be that because natural historical judgments cannot be reduced to statistical generalities, and because AN's notion of "function" is a matter of what is internal to the life cycle rather than the evolutionary origins of the life form, there is nothing left, even in principle, to help us determine whether one life form judgment is superior to another (at least in cases where there are competing coherent interpretations of the life form). But this is incorrect. To see why, let's look more closely at the example of chimpanzee infanticide. Lewens cites a 1999 paper on chimpanzee infanticide by Arcadi and Wragham. In that paper, the researchers note that it is difficult to explain why chimpanzees commit infanticide because the behavior varies widely in terms of the sex of the killers, the communities to which the victims and the killers belong, whether the killers acted alone or with others, whether the victim was eaten, and whether mothers increased or decreased their association with the killer(s) after the event. Because of this variability, we can't say with confidence what role(s) infanticidal behavior might play in chimpanzee life—e.g., to allow males to force females into estrus so that they can mate with them, to provide extra nourishment, to reduce competition, some combination of these or something else altogether. In other words, the proper interpretation of chimpanzee infanticide is

underdetermined, epistemologically speaking, by the extent of our observations up to this point.

In a 2020 paper in *Primates*, Lowe et al. report the results of more extensive observations, aimed at gaining insight into the function of infanticide in chimpanzee life. They consider four hypotheses for explaining infanticide and they identify various predictions corresponding to each hypothesis. For instance, if infanticide is a matter of meat acquisition, then we would expect for there to be no sex bias in the victims and for the victims to be cannibalized in full, whereas we would expect neither of these if infanticide is a matter of mate competition. The researchers then report on their findings, taken from “24 years of data from a single, highly infanticidal population of chimpanzees from the Budong Forest, Uganda, to test these hypotheses.”²⁹

There are three things to notice about this research. First, it is an example of back-and-forth interpretation in action. The researchers are observing and describing particular chimpanzees, and in doing so they are drawing on some implicit conception of “the chimpanzee.” What they are seeking is an answer to Thompson’s “how do they live” question—i.e., a fuller characterization of the life form itself, given in functional terms that unite the different aspects and phases of chimpanzee life. Second, the research illustrates the point that, while there may be multiple coherent interpretations of life form *at a given time*, that does not mean that nothing could *in principle* provide us with evidence for one interpretation over another. Questions about chimpanzee infanticide that were undetermined by the evidence reported by Arcadi and Wingham in 1999 are *less* underdetermined by the further evidence reported by Lowe et al. (2020). In a case like this, there is no reason to say that it is “not clear that there are any facts that could adjudicate in principle between alternative possible natural historical judgments.” Rather the uncertainty over “the chimpanzee practices infanticide” was (and is) a matter of our limited knowledge of how they live, calling for more observation.

Third, this research shows why it would be tempting, but ultimately incorrect, to suppose that the notion of function that belongs to natural-historical judgment will leave AN impotent to adjudicate between competing interpretations of a life form. As we have seen, the AN notion of function is simply the role of a part or process within an organism’s life cycle—the “part it plays.” This sense of function is *internal* to the life form; it does not involve defining or identifying the function of a biological part or process in terms of its evolutionary origins. And AN insists on distinguishing questions about what is true of a life form, as described in a natural history, and questions about how a life form came into existence. However, in the research by Lowe et al., the hypotheses for which they find the most support is *sexual selection*. And one might reasonably ask, “If we are explaining chimpanzee infanticide in terms of sexual selection, isn’t that an *essentially evolutionary* sort of explanation? Doesn’t this case, then, prove the point that Lewens is making—that in order to adjudicate between competing interpretations of chimpanzee infanticide, we have to think of function in terms of evolutionary origins?”

Tempting as this thought may be, it is incorrect. When the researchers postulate sexual selection as an explanation of chimpanzee infanticide, what this means is that male

²⁹ Lowe et al., (2020, p. 70).

chimpanzees kill infants in order to make their mothers ready to mate more quickly: “As lactation prevents females from ovulating, dependent infants are an obstacle for males seeking reproductive opportunities. A younger infant is a larger obstacle, as it represents a longer period until the mother will be sexually receptive again” (Lowe et al. 2020, p. 70). Infanticide thus brings a benefit for the perpetrator—“reduction in time until the mother is free to mate again that a male could bring about by killing her present infant” (Lowe et al. 2020, p. 70). Crucially, this explains chimpanzee infanticide in terms of its role *within the life cycle* of chimpanzees. The relevant sense of function at work here is the AN notion. The function of infanticide, on this view, is that it enables male chimpanzees to reproduce more quickly. That is its role, the part it plays, in chimpanzee life. In explaining infanticidal behavior this way, we are not making any *essential* reference to how organisms like this came into existence. And we can easily state the researchers’ sexual selection hypothesis in the canonical form of a Thompsonian natural-historical judgment: “Male chimpanzees commit infanticide so that they might reproduce more quickly with the infants’ mothers.”³⁰ Furthermore, the notion of function at work here is, as the paper details, capable of generating a variety of empirically-testable predictions—e.g., killers should not target their own offspring, mothers should be uninjured, there should be no sex bias the victims. It turns out, then, that far from revealing the impotence of natural-historical judgment (or life form thinking) in the face of underdetermination, the research on chimpanzee infanticide does the opposite.

Of course, we might still wonder how organisms like this could come into existence, or why the life of chimpanzees came to be teleologically ordered in this way. And here life form thought cannot help us. On its own, a natural-historical interpretation of a life form says nothing about where the life form came from. Here biologists must turn to evolutionary theory. Moreover, especially in cases of sexual selection (and, perhaps, in all cases), thinking about evolutionary origins can alert us to the kinds of functions that we should be looking for when we seek to determine “how they live” in the AN sense.³¹

Thus, when we look closer at the case of chimpanzee infanticide, we see that the “underdetermination” that Lewens detected was not a specific problem for Aristotelian naturalism but instead simply a matter of the state of science at a particular time. Moreover, looking at how scientists have proceeded since then demonstrates that reductionist programs are not needed to provide a more determinate answer to this difficult question about chimpanzees, neither those programs that would attempt to reduce biological concepts to those of chemistry or physics, nor those that claim that facts about biological functions must be reduced to more basic claims of statistical regularity or evolutionary origin. Looking to scientific practice indicates that what gives greater determinacy to the answer to the question about the role of chimpanzee

³⁰ Of course this exact formulation is much too general. But the point is about the form of the judgment, not the complexity of its content.

³¹ Cf. Woodford’s suggestion that, “The Neo-Darwinian view fills out the Neo-Aristotelian framework for understanding natural purpose by intensifying our sense for the competitive and cooperative dynamics of social evolution in light of which ‘vital activities’ need to be understood and identified” (Woodford, 2016, p. 19).

infanticide in the life cycle of chimpanzees involves many observations of how chimpanzees live. These observations exhibit the logical profile of life form judgments as characterized by AN, thus providing another good illustration of AN's point that biology, insofar as it treats of living things as such, presupposes life form thinking.

4 Aristotelian realism versus Kantian projectivism

As noted earlier, Lewens does not argue against Thompson's transcendental argument about life forms. Rather he claims that even if we accept the argument's conclusion, this does not entail that life forms exist. As he says, "The most Thompson's argument establishes is that we must think of organisms as instances of life forms. This does not entail that there are such life forms" (Lewens, 2020, p. 497). According to Lewens, the transcendental argument is consistent with Kantian projectivism about life forms, and furthermore, Kantian projectivism has distinct advantages over Foot and Thompson's Aristotelian naturalism. Our goal in this section is to explore Kantian projectivism. We argue that, upon inspection, Kantian projectivism faces a serious problem, and it is not an appealing alternative to Aristotelian naturalism—which we will continue to interpret as implying at least a minimal kind of *realism* about life forms.

4.1 Kantian projectivism about life forms

Lewens introduces Kantian projectivism by imagining an embryologist who is seeking to "investigate the living world" (Lewens, 2020, p. 497). Many sperm and eggs never combine to produce an embryo, and many embryos do not survive beyond early developmental stages, or they survive in a variety of different configurations. It would be utterly unmanageable to attempt to provide a biochemical or mechanistic explanation for each of these outcomes. Thus, "Some kind of bringing-to-order is required: something like a set of standard reference points that the embryologist will focus on in her explanatory aims" (Lewens, 2020, p. 497). This bringing-to-order is achieved by designating certain outcomes as the "end-points" of proper development. These end-points then serve as points of reference that "guide biological research" and "allow manageable depictions of biological processes via standardized representations of developmental sequences that in reality vary from individual to individual" (Lewens, 2020, p. 498). However, the end-points, together with the life forms to which they belong, are merely heuristic devices:

[Proper end-points] can be understood as projections onto nature, or constructions that draw from encounters with nature. They enable us to organise our knowledge of the natural world, and they coordinate further inquiry into the biochemical mechanisms of development. The appeal to proper developmental trajectories does not explain development; hence, there is no requirement that there be facts about which developmental trajectories are proper. The appeal we make to proper end-points gives us a way of organising the subject matter for what will then be a set of causal mechanical explanations for how a fertilised egg comes to acquire new capacities over time. But while their roles

are pragmatic, these end-points are also indispensable, for biological inquiry is practically impossible without such developmental standards... Biological investigators must articulate the nature of some discrete number of life forms to serve as standards, and yet there are no life forms. There are only token organisms with spectacular variability (Lewens, 2020, p. 498).

This is an interesting proposal about the role of teleological explanations and life forms in biology.³² Lewens is clear that his goal is not to offer a detailed defense of Kantian projectivism, but rather to “indicate its potential attractions and thereby encourage further investigation of it” (Lewens, 2020, p. 499). In the spirit of such investigation, let’s begin by noting a key point of agreement between Kantian projectivism and Aristotelian realism. Both positions maintain that teleological concepts are essential to our representation of the biological world *as such*. Describing Kant’s view, Angela Breitenbach puts the point this way:

Thus, on Kant’s account, to consider something in nature as organic is *already* to view it teleologically. Merely to understand, for instance, a tree *as an organic unit* is to view its parts as parts of a systematic whole and as contributing to the existence and survival of that whole. Similarly, to understand an eye *as an eye* is already to view it as part of a larger whole on which the eye depends for its existence and with reference to which it has the function of enabling vision. Kant’s discussion shows that our very *conception* of living nature inevitably presupposes teleological concepts. In this sense, the very *possibility* of organisms can only be grasped in teleological terms...we can conceive of something as organic *only* by considering it teleologically. (Breitenbach, 2009, p. 44–45)

Aristotelian naturalists concur. They also add the claim that in order to understand anything as organic—any individual organism, or any vital part or process—we must view it as belonging to a particular life form. That is the conclusion of Thompson’s transcendental argument, and because Lewens grants that conclusion, it is also *common ground* for the purposes of the present debate between Kantian projectivism and Aristotelian realism.

Let us now consider some different ways we might interpret Kantian projectivism about life forms. One question about Kantian projectivism is how to situate it with respect to the issues of realism discussed earlier. As we saw, realism about some domain standardly entails three commitments. Which of these three commitments does Kantian projectivism reject? One might interpret Kantian projectivism as accepting the first two realist commitments and rejecting the third so that life form judgments are truth apt and some are known to be true, but their truth depends on something other than the existence of life forms. Perhaps it depends, for instance, simply on the stipulations of scientists. This would be to view Kantian projectivism as a kind of constructivism about life forms. Another possibility is that Kantian projectivism is an error theory about life form judgments: although these judgments are truth apt and purport to be about life forms, the fact that no life forms exist means that they all

³² For a helpful discussion of the Kant’s complicated legacy for the philosophy of biology, see Gambaratto and Nahas (2022). Lewens proposed Kantian constructivism fits into what Gambaratto and Nahas classify as “the heuristic approach.”

are, strictly speaking, false. Still, for heuristic purposes it is useful for scientists to carry on making statements about life form judgments that are not strictly speaking true. Or Kantian projectivism could even be a form of non-cognitivism. Perhaps the view is that although we must make such judgments, they are not, in spite of their surface grammar, truth apt. Rather, they are the expression of scientists' plans, goals, or commitments. We are not sure which sort of anti-realism—constructivism, error theory, or non-cognitivism—Lewens intends to adopt, so further exploration of Kantian projectivism could involve this clarification.³³

Setting aside this question, there are other issues to resolve with respect to Lewens' proposal. First, projectivism might be understood as claiming that while conceptions of end-points, unfolding processes, and life forms are necessary at the beginning stages of biological investigation, they can be jettisoned at later stages, once we arrive at efficient causal accounts of the relevant phenomena. Interpreted this way, life forms are like the proverbial ladder that can be kicked away after one has reached the roof. We are not sure if this is the picture that Lewens has in mind. On the one hand, he talks about end-points as "indispensable." But this could be taken to mean indispensable to biological investigation overall, because essential at the beginning stages of biological inquiry, although not essential to the final stages or results of such inquiry, which will instead involve only a "set of causal mechanical explanations."

In any case, it seems clear that the strongest version of Kantian projectivism will not try to dispense with end-points, unfolding processes, and life forms, even in the explanations that are the results of biological inquiry. For we are faced with the question: explanations of *what*? Unless these are explanations of things characterized in biological terms—i.e., in terms of vital parts and processes—then we won't be conceiving of the explanandum as something organic, as part of the biological realm. And conceiving of things *as* organic requires conceiving of them teleologically. That much is common ground between Kantians and Aristotelian realists—as is, for the present discussion, the necessity of conceiving of individual living things as members of a life form. So there can be no kicking away the ladder in our explanations, for doing so would amount to kicking away the subject matter too.

A related question of interpretation concerns the claim that end-points and unfolding processes are indispensable because without them biological inquiry is "practically impossible." There are two very different ways to understand the practical impossibility of an activity. First, it might be that something is required for us to carry out an activity, *given* the way things are now, but in principle the activity could be carried out without that thing. For instance, in the early modern world, it was practically impossible to make progress in global cartography without ships. But we can imagine doing global cartography without ships—e.g., using satellites and cameras. However, a different sense of "practically impossible" is at work when we say that it is practically impossible to play basketball without a ball. In that case, we can't even imagine

³³ Lewens' Kantian projectivism is a version of the approach to biological teleology that Woodford labels "methodological teleology," which holds that "although teleological judgments are anthropomorphic, the idea of a purpose or objective has heuristic value and it is helpful—indeed necessary—to view living things 'as if' they are purposively organized and directed, even if in fact they are not in fact so." (5–6). Woodford suggests that such an approach should be considered "a special form of *error theory*" about our teleological judgments.

another way the activity could be carried out, since any sport played without a ball would not count as basketball.

So when we say that biological inquiry is practically impossible without thinking in terms of end-points and unfolding processes, what sort of impossibility is this? Should we suppose that future biologists, positioned differently and with different tools, might undertake what we consider to be biological inquiry, but without relying upon notions of end-points, unfolding processes, and parts and wholes? The strongest version of Kantian projectivism will answer: No. This is for the same reason we considered a few paragraphs ago. An explanandum that was not conceived in these teleological terms is not something we could conceive as a biological entity, and thus not something fit for biological explanation. As Breitenbach says of Kant's view, "we can conceive of something as organic *only* by considering it teleologically" (Breitenbach, 2009, pp. 44–45). Of course, we might describe some biological event in mechanical or chemical terms. But if we are engaged in biological inquiry, then we must also provide a characterization of the event that makes clear what this mechanical or chemical event *amounts to* with respect to some vital part or process. If we can't give such a biological construal of what is going on, then our description of the mechanical or chemical event cannot count as an explanation of a *biological* process, or as a contribution to *biological* inquiry. Put another way: if teleological concepts are constitutive of biological description (as both Kantians and Aristotelian naturalists hold), then they are indispensable to biological inquiry in a different and deeper way than ships were indispensable to early modern global cartography.

4.2 Only token organisms?

With these clarifications in mind, let us look again at Lewens' imagined embryologist, whose work is meant to illustrate Kantian projectivism about life forms. As Lewens presents the example, the idea seems to be the following: At the beginning of the story, as the embryologist approaches her work, she encounters the biological world in a way that is not yet given intelligible shape by any (implicit) conceptions of end-points, unfolding processes, and life forms. Instead what she encounters is a biological world populated by "token organisms with spectacular variability" (Lewens, 2020, p. 498). Then, in the second part of the story, the embryologist "projects" onto the biological world some discrete number of life forms, with their characteristic vital parts and processes. And after such projection, she now confronts a biological world with a new sort of order and intelligibility. This newly ordered world is a much more manageable object of investigation and thus the embryologist is able to proceed with her research.

However, this cannot be the correct way to think about the embryologist's activity. At least, it cannot be correct so long as we are granting the conclusion of the transcendental argument. The problem with the picture in the last paragraph is that the crucial "bringing to order" must *already* have occurred even before the *first* part of the story. As Lewens tells the story, the embryologist starts by having in view sperm and eggs, which go on to behave in a bewildering variety of ways. But "sperm" and "egg" are themselves biological descriptions—i.e., characterizations of things as vital parts with functional roles. And the lesson of the transcendental argument is that all such

biological descriptions *presuppose* some implicit conception of a life form to which the vital parts and processes belong. In which case, even at the first stage of the process the embryologist must *already* be relying upon some implicit life form conception. It cannot be the case, then, that life forms are only “projected” upon the world later on in the second part of the story.

The issue here cannot be resolved by simply redescribing the embryologist’s activity in slightly different terms, or by substituting a different example. The problem is deeper than that. As Lewens depicts things, prior to the projection of life forms we encounter a biological world that is hard to investigate. Nevertheless, what we encounter is a *biological* world—i.e., a reality that is populated by organisms and their vital activities. But the point of the transcendental argument is that we could have no determinate and intelligible notion of any biological phenomenon that was not “always already” understood in terms of life forms. Thus, the appeal to life forms cannot be thought of as a heuristic tool that we apply to a messy biological realm that needs cleaning up. For without the intelligibility provided by a conception of the life form, we could not so much as recognize a biological realm to which this heuristic tool might be applied.

So there is something confused in the suggestion that “there are no life forms. There are only token organisms with spectacular variability” (Lewens, 2020, p. 498). The problem with this idea is that, if the transcendental argument succeeds, then such a world is one of which we could have no determinate conception. It is *not* that we can conceive of the biological realm in terms of token organisms without life forms, and doing so yields a conception of the biological realm that is messy and chaotic. Rather, if we attempt to think merely in terms of individuals that belong to no life forms, then we are left with something that is, *qua* biological realm, *simply unintelligible* to us. Among other things, this has the implication that we can have no grounds for saying that such a realm displays either spectacular variability or spectacular uniformity, since we can have no determinate idea of it. It also raises the difficult question of how we might meaningfully “project” anything onto such an unintelligible “realm.” How would we know what to project, or where to project it, or whether our projection was correct or not?

The upshot is that Lewens’ way of elaborating anti-realism is unstable. Lewens offers Kantian projectivism as an alternative way of accommodating the conclusion of the transcendental argument. But if we cannot represent individual organisms except as bearers of a life form, then we cannot assume that we have epistemological access to a world of particular organisms (considered as mere individuals, not as already bearing a life form) onto which we then project our representations of life forms. Any anti-realism that grants the transcendental argument, and then presupposes that we are (somehow) able to observe a world of individual living things that do not (prior to our act of projection) bear any life form, turns out to be incoherent.

When it comes to distinguishing Kantian projectivism from AN, Lewens appears to be operating with the following assumption: If something is not required to explain biological development, then we need not (perhaps: should not) suppose that thing to be a real part of the biological realm (in a minimal sense of “real” such that there are facts of the matter about the thing). As Lewens says in the passage quoted above: “The appeal to proper developmental trajectories does not explain development; hence, there is no requirement that there be facts about which developmental trajectories

are proper.” The idea is that although developmental trajectories are in some sense necessary for biological inquiry, all the genuine *explanations* of development will ultimately be given in “causal mechanical” terms, which presumably means in terms of processes characterized by concepts from physics and chemistry. The preceding sections have shown what is wrong with this way of thinking about biological inquiry, and, in particular, why life form judgments are essential for biological explanation. However, it is worth emphasizing that our claim is not that explanations in terms of end-states, trajectories, etc. operate as explanations *of the same kind* as causal mechanical explanations. And the explanatory role of life forms is *not in competition with* causal mechanical explanation, as if the former were an alternative to the latter. Rather teleological explanation and life form concepts are essential for making intelligible physical and chemical processes *qua* biological phenomena—i.e., for grasping their significance as aspects of something living. Without including proper developmental trajectories (and, by implication, the life forms to which those trajectories belong) in our explanation of the events, it is unclear *what* any physical and chemical description amounts to biologically speaking, whether they are, e.g., defense or defecation.³⁴

That said, Aristotelian naturalists need not reject the basic assumption about explanation that Lewens seems to be operating with. Rather, what matters is that we not assume too restricted a notion of explanation. Insofar as a life form conception does not compete with a physical or chemical explanation, but rather gives distinctive intelligibility to that explanation by specifying what sort of biological process is taking place, we might say, in an Aristotelian spirit, that the mode of explanation is one of *formal causality*.³⁵ Of course, it’s open to Lewens to insist that formal causality is not a genuine form of causation, and that the sense in which appealing to life forms makes biological processes intelligible doesn’t amount to real explanation. But it is hard to see how such arguments would go, apart from defending some form of general reductionism about biological explanation. And that is avowedly not Lewens’ intention. Rather his argument purports to succeed independently of such a reductionist agenda.³⁶ As he says, “One way to respond to Thompson would be to defend a fully reductive account of what it is to be alive... I do not want to take a stand on whether this is possible. Instead, I suggest that even if we agree with Thompson and his defenders that such a reductive project will not work, this still does not suffice to defend the realist interpretation of Aristotelian species natures, or ‘life forms’” (Lewens, 2020, p. 497).

Perhaps, however, Kantian projectivism could be elaborated as a more thoroughgoing anti-realism, insisting that not only life forms but also individual organisms and biological processes are projections on to nature. On this view, it is not just that “the zebra” is not real. Neither are zebras, zebra kidneys, *this* zebra, etc. That is, the very distinction between living and non-living things, between biological processes and

³⁴ On this point, see the quote by Thompson that serves as the epigraph for this paper.

³⁵ A failure to recognize the role of formal causal explanation is perhaps why Odenbaugh (2017) accuses AN of proposing a form of vitalism. Vitalism posits a life-force (or “spirit”) that is both distinct from physical–chemical properties and operates as an *efficient* cause. For another reply to Odenbaugh’s charge, see Hacker-Wright (2021, pp. 22–26).

³⁶ On the difficulties with reductionism in biology, see Dupre (2000) and Nicholson (2014).

non-biological ones, is a projection. In thinking biologically, we are not tracking anything real, or “carving nature at the joints.” Thompson’s transcendental argument may be correct about the conditions for representing anything *as* living. But that doesn’t show that anything *really is living*—i.e., that our distinctly *biological* experiences of the world correspond to anything that is “really there” in nature.³⁷

There is, perhaps, nothing in the arguments of Foot, Thompson, and other Aristotelian naturalists that rules out this anti-realist position.³⁸ An exploration of this anti-realist view is beyond the scope of this paper. However, there are two things to note briefly. First, this anti-realist position does not pose a challenge for AN in particular, any more than to any other view that accepts the living versus the non-living as a distinction about what is “really there.” Second, the burden of proof is squarely on the anti-realist who denies that the distinction between living and non-living things is real. After all, this *seems* like a real distinction, and not just a matter of convention. Consider our sense that there is an important difference between plants, as living and rocks, as not living. This seems to pick out something important about plants versus rocks themselves, not just an arbitrary or optional way of categorizing things. Third, there is nothing about contemporary scientific practice that pushes us to question the distinction between living and non-living ones. Indeed, the very notion of the *biological* or *life* sciences (together with their discipline-specific departments and journals) suggests that the distinction is meaningful and important from a scientific point of view. Moreover, there are good reasons to think that organisms play an essential role, as both *explanans* and *explanandum*, in areas of contemporary biological science, as argued by Bateson (2005), Moosavi (2020), Nicholson (2014), and others.

5 Conclusion

We conclude with a brief remark about the specific ethical ambitions of AN when it comes to human beings. On the one hand, nothing that we have said commits us to the view that biology is the *sole* source of knowledge of life forms, or that all such judgments are made empirically. In fact, most Aristotelian Naturalists hold that when it comes to *human beings*, we have some knowledge of our own life form that isn’t known empirically.³⁹ However we understand the naturalism of this position, it will not be a matter of a crude empiricism that applies the methodology of biology to human beings in order to straightforwardly yield ethical results.⁴⁰ On the other hand, we have also not argued that AN is a compelling approach to *ethics*. At most, we have shown that some major worries about life form judgments *in general* are unfounded. While

³⁷ We thank an anonymous reviewer for encouraging us to consider this version of Kantian projectivism.

³⁸ Woodford (2016, p. 15) makes this point.

³⁹ For versions of this point, see Frey (2018), Hacker-Wright (2009, 2021), Thompson (2004).

⁴⁰ For discussions of whether, and why, AN should actually be regarded as a kind of ethical naturalism, see Jordan (2020), Moosavi (2022).

this ambition is limited in scope, it will prove necessary for a proper evaluation of the issues that arise in attempts to evaluate the human will as a natural phenomenon.⁴¹

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

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