Norms of Nature: Naturalism and the Nature of Functions

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[Signature]
Norms of Nature
for Ami
my natural norm

1779, Diderot: "...to see his norm..."

...of extreme perspectives and near approaches...
Consider, anatomize the eye: Survey its structure and contrivance; and tell me, from your own feeling, if the idea of a contriver does not flow in upon you with a force like that of sensation.

—David Hume 1779, *Dialogues Concerning Natural Religion*, Part III

*Organs of extreme perfection and complication—*

To suppose that the eye, with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selection, seems, I freely confess, absurd in the highest possible degree. Yet reason tells me, that if numerous gradations from a perfect and complex eye to one very imperfect and simple, each grade being useful to its possessor, can be shown to exist; if further, the eye does vary ever so slightly, and the variations be inherited, which is certainly the case; and if any variation or modification in the organ be ever useful to an animal under changing conditions of life, then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable by our imagination, can hardly be considered real.

—Charles Darwin 1859, *On the Origin of Species*, Chapter VI
Tracing Links of Causation

Much in the biological world appears to us purposive. Much appears governed by quite specific norms. We use these norms to assess the performance of certain objects, to determine whether or not they have fulfilled their functional roles, whether or not they have done what, in some sense, they are supposed to do. It is natural to think that the eyes of mammals are for seeing, that the wings of birds are for flying, that incisors are for tearing and molars for mashing, and so on. The theoretically inclined thus will wonder, Are there norms of nature? If so, what are these norms? From whence do they arise? How do they attach to just some traits and not others? If there are no such norms, why are we so inclined to see some parts of nature—eyes, wings, teeth—as purposive and other parts—rocks, clouds, moons—as nonpurposive? And whence this inclination? This book ventures answers to these questions.

These questions concern a striking feature of life. Living things change and virtually all such changes appear purposive. The appearance of purposiveness in the biological realm is as ubiquitous as it is striking. Organisms develop and mature, recover from illness and injury, adjust to changes in environment, and engage in myriad behaviors. Organisms also suffer disease, decay, and death, and even these processes can appear purposive. It thus is plausible, perhaps natural, to conceptualize change among the living as purposive. Anyone striving to understand the world we inhabit will be drawn to questions about these phenomena. However, in addition to their intrinsic interest, these questions arise from a prima facie tension between the methods and postulations of the natural sciences generally and the attribution of natural norms. We tend to believe that physical phenomena are the results of natural laws governing
physical elements. We tend to think of physical theories as accounts of the ways things are and the way things behave, and perhaps also the ways things might have been. But we tend to think differently about biological phenomena. Our biological theories account for the way things are, to be sure, but they also account for the way things should be. We tend to think, for example, that a malfunctioning eye, despite its defective condition, nevertheless is supposed to perform its functional task. There is a norm of performance that applies to eyes and persists in the face of incapacitation. Or so we tend to believe. The philosophical question, then, is, What are these norms of nature such that we appeal to them in the course of inquiry and such that they do not conflict with the methods and postulations of the natural sciences generally?

Biologists appeal to functions in the course of theorizing about the biological realm and it might be thought that we should turn to them for an account of what functions really are. It might be thought that the explicit or implicit understanding of functions among biologists will answer the above question. I have doubts about that. The task is to show how the notion of functions in biology fits within the larger framework of the natural sciences generally. It seems naive to think that biologists, in their appeals to functions, are concerned to solve this problem. It is one thing to appeal to functions in the course of theorizing; it is quite another to theorize about such appeals and the extent to which they cohere with other areas of inquiry. Of course, theoretically inclined biologists may explain how functions fit the methods and postulations of the natural sciences generally, but there is nothing about being a biologist that provides especial qualifications for this sort of job. Nor is there good reason to think that biologists, as opposed to nonbiologists, have purged from their understanding of functions all the metaphysical—including the theological—strains that infect the history of this notion. One can, after all, be a superb biologist and a committed theist or deist, as several of Darwin’s peers demonstrated.1 Surely one can be a fine biologist and nevertheless employ a notion of functions that does not fit comfortably the postulations or methods of the natural sciences generally. So the job,

1. Among the theists were Sedgwick and Whewell; among the deists were Herschel and Lyell. See Ruse (1979), chapter 3 and Gillespie (1979), chapter 5. See also chapter 5, section III below.
as I see it, is not to explicate or describe the way that we or certain specialists employ the concept of functions. The job, rather, is constructive and, if need be, revisionary. The job is to suggest how an apparently powerful concept is best understood within a broad domain of inquiry.2

Contemporary theories of the norms of nature fall into three general categories, each of which I describe fully in chapter 2. (1) The historical approach asserts that functions are the product of some type of historical process. The most prominent version of the historical approach asserts that the functions of any trait emerge out of the selective success of ancestral tokens of that trait. Hearts have the function of pumping blood because pumping blood is the effect of ancestral hearts that contributed to selective success and thus caused the persistence of hearts. Advocates of this approach tend to assume that some natural traits are genuinely functional while others are merely useful; they assume that the effects of some traits are “proper” to those traits, while the effects of others are incidental. The main aim of the historical approach is to account for the alleged “properness” of functions in terms of some sort of historical success. (2) The most prominent alternative to the historical approach is the systemic capacity approach. On this view, functions are attributed relative to the larger system within which the trait operates and relative to certain capacities of the larger system. The functions of any trait are those effects that, within the context of the system, contribute to the exercise of some higher-level capacity. Hearts have the function of pumping blood, relative to the capacity of the circulatory system to distribute nutrients throughout the body, because pumping blood contributes to the exercise of this higher-level capacity. Critics of this approach charge that it is incapable

2. In this respect, my approach differs from that of most contemporary theorists. From Brandon (1981, 1990), through Neander (1991) and Griffiths (1993), and up to Walsh (1996), Preston (1998), and Buller (1998), the approach to functions is generally conservative. The approach is to conserve what appear to be central intuitions concerning the nature of functions—intuitions of biologists and other specialists, mainly. The view defended here, by contrast, advocates the revision of at least one feature of functions thought to be conceptually central—the alleged normativity of functions that underwrites the attribution of malfunctions. On my view, the functions of natural, nonengineered traits are not (and cannot be) normative in the way most theorists suggest, and I offer an alternative approach to understanding malfunctions.
of distinguishing between effects of traits that are “proper” and those that are incidentally useful. In consequence, it is generally believed that, even if the systemic approach is compelling in its own right, an additional theory of functions is required to account for genuinely teleological effects. And that brings us to (3) the combination approach, consisting of various attempts to combine the historical and systemic capacity approaches into one theory. Advocates of this approach tend to assume that historical functions—unlike systemic functions—account for effects that are genuinely teleological. Motivation for the combination approach derives from this assumption, combined with the claim that systemic functions nevertheless serve important theoretical aims. One version of the combination approach claims that there is a single, unified theory that subsumes both views under the concept “design.” Another holds that both views of functions are required but must be kept separate on the grounds that each applies to distinct phenomena. And additional options have been suggested.

My aim is to develop and defend a distinct version of the second approach. In its original formulation (Cummins 1975), the theory of systemic capacity functions asserts that functions are causal or structural capacities that contribute to the exercise of some larger systemic capacity within a complex system. I accept this basic view. In addition, I defend four substantive theses, each of which extends or revises the original theory. The first asserts that the systemic approach is more general in scope and, in fact, subsumes the historical approach. The systemic approach attributes functions to the components of populations and organisms affected by selection, as well as systems not affected by selection. This approach thus warrants all the functions attributed from within the historical approach, and numerous others as well. The historical approach, in consequence, taken as a separate autonomous theory, is redundant and ought to be discarded. I defend this claim in chapter 3. The second thesis is that the systemic approach ought to be restricted to systems that are hierarchically organized. This restriction blocks the oft-repeated criticism that the systemic approach is promiscuous in the functions it ascribes. I defend this claim in chapter 4. The third thesis concerns the intuition we have that certain features of some traits are genuinely functional, while others are useful but not “properly” func-
tional. It also concerns the related intuition that certain traits, when damaged or diseased, are properly classified as malfunctional, while other traits, upon losing their utility, lose their functional status. My thesis is that, while both intuitions are in error, we nevertheless can explain the source of these intuitions. My Humean suggestion appeals to the effects of highly regular or highly complex hierarchical systems on our psychology. I speculate that such systems, insofar as they are self-preserving or self-perpetuating, cause us to expect their components to continue on in the same way, thereby generating the intuition that only some things are functional and that only some things qualify as malfunctional. I defend this revisionist claim in chapters 5, 6, and 7. The fourth thesis is that the systemic approach has superior naturalistic credentials. In particular, the attribution of systemic capacity functions is open to empirical and theoretical tests and, moreover, the theory as a whole is confirmed by the detailed case studies offered, for example, by Eng (1979) and by Bechtel and Richardson (1993). I defend this claim in chapter 6.

Virtues of the systemic capacity approach are highlighted by the defects of the historical approach. The first defect, noted above, is that the historical approach is redundant on the systemic capacity approach and hence ought to be discarded. The second is that the historical approach, in attempting to account for the possibility of malfunctions, commits itself to the existence of quite specific norms of performance that are noncausal and nonphysical in nature. I defend this construal in chapter 5. I then argue that we have powerful naturalistic reasons, external to the theory of selected functions, to reject the postulation of such norms. Third, and contrary to the claims of its advocates, the historical approach also lacks the internal resources with which to account for the possibility of malfunctions. I defend this claim in chapter 7. Accounting for malfunctions is said to be among the central virtues of the historical approach. So if the arguments of chapters 5 and 7 are sound, we ought to conclude that the historical approach, by its own lights, is a failed theory. Moreover, insofar as the combination approach inherits the central substantive theses of the historical approach, the defects of the latter infect the former.

Cast generally, then, I advocate the view that functions are nothing more than systemic capacities that contribute to the exercise of higher-level capacities we wish to understand and control. Functions, on this
view, are effects that play a role in the workings of hierarchical systems. This is to emphasize the mundane but central fact that functional properties concern the operations or workings of those parts of nature that are systemic in a rather minimal sense of the term. The relevant sorts of systems are numerous and diverse. We may analyze the capacity of salt molecules to dissolve in water in terms of the systemic functions of constituent molecules. Or we may analyze the capacity of the circulatory system to distribute nutrients in terms of the systemic functions of its components. Significantly, we can also conceptualize entire populations of organisms as systems that accomplish various kinds of work. Populations evolve in certain ways; populations also remain in equilibrium in certain ways. We thus may analyze the capacity of a population in terms of the systemic functions of its structural components. Conceptualizing functions in this way—in terms of systemic work—enables the theory to attribute systemic functions to components of even the simplest systems, as well as systems of great complexity. This, as I argue in chapter 3, is an important result, as it dissolves the need for two separate theories of functions—selected and systemic—and enables us to formulate a single, comprehensive version of the theory of systemic functions.

My answer, then, to the question, Are there norms of nature? is the following: There are components of natural systems endowed with capacities of great importance to the workings of the system. The aim of scientific inquiry quite generally is to discover, understand, and control those systemic capacities. But the components of natural, nonengineered systems, contrary to the claims of the historical approach and contrary to most versions of the combination approach, possess no norms of performance. They possess systemic capacities the effects of which enable the larger system to work in ways we wish to understand. But they do not possess the sorts of properties attributed from within the historical approach to functions. Several of the arguments developed throughout this book are intended to establish this negative view. The truth of this view, however, leaves ample room for an array of other sorts of norms, many of which are aptly characterized as natural. These are norms that emerge in the course of various human activities. There are, for example, epistemic norms generated by our informed expectations of certain categories of traits classified in terms of systemic capacities. These are important, I
believe, in understanding why we are so inclined to classify incapacitated token traits as malfunctional. I return to this topic in chapters 6 and 7. My view of the norms of nature also leaves room for norms that emerge in the course of personal, social, legal, commercial, and ethical relationships. And my answer to the question, Why are we inclined to see some things as functional and others as nonfunctional? is that certain sorts of systems cause us to expect effects that, relative to the systemic capacity we wish to understand, play especially salient systemic roles. This will become clearer in the course of my discussion of epistemic norms and the attribution of malfunctions.

Whatever the full range of natural norms involved in various human activities, my concern here is first and foremost with the sorts of norms thought to apply to nonengineered natural traits at all levels of biological organization, from the molecular to the behavioral. My concern is with the norms said to apply to genes and neurotransmitters, to hearts, eyes, and teeth, to foraging strategies and mating displays. These traits, it is claimed, are purposive or functional quite apart from our epistemic or practical concerns; these traits possess norms of performance quite apart from our attempts to understand or control them. The claim is that these norms have arisen from historical-causal-mechanical processes, and nothing else. And it is this claim I shall be concerned to assess, for I believe it to be mistaken.

The focus of my discussion thus excludes the functional status of artifacts. The functions of artifacts involve the intentions of designers and manufacturers and the social, legal, and ethical relations between manufacturers and consumers. An adequate account of artifact functions must explain how the relevant intentions and conventions help produce and sustain such functions. But these factors do not apply to the functional standing of nonengineered natural traits. It is naive to think that the functions of nonengineered natural traits—the workings of which are causal-historical and independent of our intentions or conventions—suffice as a model for understanding the functions of artifacts. It is equally naive to think that the functions of artifacts—the workings of which depend

3. I have in mind the views of Blackburn (1998), Gibbard (1990), and Harris (1999).
upon our intentions and conventions—provide an adequate model for understanding the functions of natural traits. The theory of systemic functions, as developed here, is intended to apply foremost to nonengineered natural traits. In consequence, I shall appeal to the functions of artifacts sparingly and with caution. Extending the theory of systemic functions to the relevant sorts of intentional and conventional factors involved in the functions of artifacts is a project for some other occasion.

The view I defend is also revisionist in nature. It aims to dispense with the notion that natural traits are “properly” functional or “for the sake” of some end. Function attributions are important in inquiry, as I intend to show, but their importance in no way requires us to believe in functions that are “proper” or otherwise distinct from other sorts of systemic capacities. Such revisionism might give the impression that I endorse what Enç and Adams (1992) call the “eliminativist view” of functions, according to which there is no difference between dispositional properties generally and functional properties specifically:

[Eliminativist] views identify functions merely with the activities (or dispositions) of a character that happen to interest the investigator, and they effectively reject the intuition that a real difference exists between dispositions and functions. (Enç and Adams 1992, 637)

Enç and Adams reject the eliminativist option, claiming that it conflicts with common sense. This is to assume that a condition of adequacy on any theory of functions is that it distinguish functions from dispositions generally. This seems a plausible assumption—though I think we should be prepared to discover that no such distinction can be sustained and that eliminativism is the correct view. Nevertheless, my view does not belong in the eliminativist camp; my view is revisionist without being eliminativist. The theory of systemic functions dispenses with the postulation of properties intended to explicate our sense that some effects are “proper” or “for the sake” of some end. Hence the revision. But the theory asserts that functions are specific capacities within certain kinds of systems relative to certain systemic capacities of the larger system. Not just any kind of disposition qualifies as a systemic function. As I argue in chapter 4, systemic functions arise only in the context of hierarchical systems and only when they contribute to a real capacity of the larger system. Our explanatory interests may be important in the discovery of
systemic functions, but our interests are neither necessary nor sufficient for the existence of such functions. And that makes my version of the theory revisionist without being eliminativist.

Portraying and defending the above view is the task of the chapters that follow, but the general picture can be sketched in broad strokes from the thoughts of Aristotle, Hume, and Darwin, all of whom puzzled at length over the apparent purposiveness of nature. Consider Aristotle's introductory remarks to *Parts of Animals*. Studying animals, he says, no matter how grotesque, gives us amazing pleasure:

Having already treated of the celestial world, as far as our conjectures could reach, we proceed to treat of animals, without omitting, to the best of our ability, any member of the kingdom, however ignoble. For if some have no graces to charm the senses, yet nature, which fashioned them, gives amazing pleasure in their study to all who can trace links of causation, and are inclined to philosophy. (*Parts of Animals*, 645a, 5–10)

The pleasure comes from tracing links of causation that operate within animals. But not just any links will do. Animals, according to Aristotle, are "fashioned" by nature. We experience pleasure by tracing links that reveal the way in which an animal's parts are "put together," by uncovering links the efficacy of which fulfills the proper "ends" of the animal. In doing so, we encounter a form of the beautiful:

Absence of haphazard and conduciveness of everything to an end are to be found in nature's works in the highest degree, and the end for which those works are put together and produced is a form of the beautiful. (645a, 23–25)

Now, the parts of animals can elicit an aesthetic response. Evidence for this is compelling. Many capacities of organisms involve complex interactions of several parts and layers of functional dependence, and understanding and appreciating the exercise of such capacities—respiration, circulation, digestion, locomotion, thought, speech, and more—affects us aesthetically. Indeed, I read Cleanthes's remarks in the opening epigraph as expressing one such aesthetic reaction (more on this shortly). Moreover, animal parts tend to serve animal needs, as traits that fail to contribute to an organism's survival or reproduction tend to atrophy or disappear thanks to selection and regressive evolution. It is not the case, however, that animals or natural systems generally are "put together" or
“produced.” On a more contemporary view, organisms evolve and give rise to further forms of life, but no one and no thing fashions the forms that emerge. They emerge thanks to the effects of evolutionary forces—including selection, drift, and migration—that preserve or eliminate forms that arise by mutation and recombination. Of course, selection has the effect of sorting the efficacious from the nonefficacious or the less efficacious and, as Ayala (1970) points out, this type of sorting, repeated over stretches of evolutionary time, can give rise to complex, adapted systems that otherwise would not have evolved. But selection, like other evolutionary processes, depends upon factors that are blind, nondirectional, and, to use Aristotle’s term, haphazard: Selection depends upon the range of actual mutations, the extent of migration, and the contingencies of the selective regimes. And although selection may have the effect of sorting from among such materials, that hardly amounts to the “crafting” or “putting together” of such systems. The pleasure we enjoy in tracing causal links, then, contrary to Aristotle, cannot come from discovering the ends for which an animal is put together, for the realm of nonengineered natural traits is devoid of such ends.⁴

Since the ends to which Aristotle appeals are illusory, so too are the Aristotelean functions ascribed to the parts of animals. I accept, however, Aristotle’s claim that tracing the operations of hierarchical systems such as animals is both important and attractive. In tracing links of causation that give rise to more-general systemic operations, we discover the systemic functions of natural objects. This, as we shall see, is important in various theoretical endeavors. Moreover, there is pleasure in tracing these links. We discover forms that seize our attention, that fascinate and de-

⁴ Ayala runs together language describing the production of artifacts and language describing the causal-mechanical processes that give rise to nonengineered natural traits: “The hand of man is made for grasping, and his eye for vision. Tools and certain types of machines made by man are teleological in this sense” (Ayala 1970, 9). Tools and machines are for certain ends, to be sure, but it is doubtful that the same is true of hands and eyes. We certainly should not take this as a datum, as part of the natural phenomena; rather, it should be treated as a conclusion in need of argument. As I point out above, the intentional and conventional features of artifactual functions do not apply to natural functions. Hands and eyes have an evolutionary history, of course, but they were not made for the performance of some specific task.
light us, that perplex and disgust us, that fill us with awe. We are natural systems that, thanks to our cognitive, volitional, and sensory systems, are capable of being moved in these ways by the natural systems with which we interact. It would be a great puzzle if things were otherwise. It would be puzzling if the living things with which we interact failed to command our attention and provoke discernible aesthetic reactions in us. It would be puzzling if we did not inherit from our ancestors the propensity to be gripped by living things all around us. We would be left to wonder how our species has managed to survive.

My reaction to the historical approach to functions parallels my reaction to Aristotle. Advocates of the historical approach posit functional roles with associated norms of performance. These roles are said to persist even when the requisite physical capacities are lost. But we should reject these norms as surely as we reject Aristotelean ends; this, at any rate, is the thesis of chapters 5 and 7. At the same time, and as I suggest in chapter 3, we can understand and preserve the nonnormative elements of the historical approach from within the systemic capacity approach. On my view, the functions that emerge as a consequence of ancestral selective success are nothing more than one kind of systemic capacity function. This kind of systemic function emerges in the context of an analysis of the population and the population’s components, including an analysis of the varying organisms and their varying capacities. We thus can trace theoretically important links of causation within a population and identify salient systemic capacities. And we can do so without positing the existence of norms that persist in the absence of requisite physical mechanisms.

The opening epigraph from Hume is a key passage from Cleanthes’s “irregular” argument for the existence of the Judeo-Christian God. The argument asserts an analogy between the natural and the artifactual realms, but makes the further claim that our knowledge of or access to this analogy is noncognitive. The claim, at minimum, is that our grasp of the similarity between the natural and the artifactual is not exclusively cognitive—the idea of a contriver hits us like a sensation. If we look without prejudice upon the complex adaptations of the world—the eye, for example—we simply see that such objects are the products of an intelligent contriver. We do not infer it; we see it. Or, at the very least, what
we see causes us to feel that such objects must be the result of intelligent
design; if we do not literally see it, we at least feel it. This claim has an
obvious Humean flavor, appealing to a sentiment that appears pervasive
and entrenched. This claim is also surprisingly modern in flavor. It is
similar in spirit to the intuitions, described by most contemporary theo-
rists of functions, concerning the normative status of functional proper-
ties. Cleanthes thinks that marks of intelligence are there on the surface.
Similarly, contemporary theorists take it for granted that there are marks
of design in the natural realm and that nature is designed even though
there is no designer.

At any rate, it is striking that Philo, Hume's skeptic, does not endeavor
to refute this version of the argument from design. This is striking given
Hume's general propensity to explain away recalcitrant phenomena—
miracles, freedom of will, causal necessity—in psychological or sociologi-
cal terms. An appeal to our psychological capacities would be especially
attractive after Part VIII of the Dialogues, where Philo develops the Epic-
urean chance hypothesis concerning the origins of natural order. The
chance hypothesis provides a how-possibly explanation for the emer-
gence of order that in no way appeals to an intelligent designer. Having
shown that order could arise from purely causal-mechanical processes,
it is plausible to suggest that our inclination to see the world in terms of
design is explicable in light of certain facts about our psychology, rather
than facts about the nonpsychological world.

The theory of systemic capacity functions, as developed below, adopts
this Humean strategy in limited fashion. I appeal to various psychological
speculations to display the relative strength of the systemic functions ap-
proach and also to explain away some of the presumed phenomena that
motivate the historical approach. As we have seen, some advocates of
the historical approach contend that some natural things—eyes, wings,
teeth—possess genuine norms of performance, while other things—
rocks, clouds, moons—may function as this or that but possess no such
norms. Some things are purposive, others merely useful. Advocates of the
historical approach assert that they can account for this difference while
the theory of systemic functions cannot. But this is not so. As I argue in
chapters 5 and 7, there are good reasons for rejecting the claim that natu-
rnal objects such as eyes or teeth possess the sorts of norms attributed from
within the historical approach. Moreover, and as I argue in chapters 4 and 6, the theory of systemic functions can account for the fact that we are inclined to see some things as more functional than others. The theory accounts for this inclination in good Humean fashion, without countenancing the roles and norms of performance posited within the historical approach.

Finally, the second epigraph with which this book opens comes from a well-known section of the Origin in which Darwin admits that complex adaptations like the eye pose a powerful prima facie challenge to his theory. But he also insists that, if guided by reason, we can construct a plausible how-possibly explanation of the evolution of such adaptations, no matter how complex they may be. Like Hume's Philo, Darwin is concerned to establish the possibility that order and adaptations arise from purely causal-mechanical processes. But unlike Philo (and Hume), Darwin offers a specific kind of causal mechanism and an abundance of evidence for the existence and efficacy of that mechanism; Darwin's how-possibly explanation, once filled out, shades into a powerful how-actually explanation. In defending the claim that the order and complexity of adaptations like the eye could have arisen as a gradual and cumulative effect of natural selection, Darwin is resisting the creationist tendencies of his peers. As Hull (1973) demonstrates, Darwin's critics—including his most accomplished peers—could not accept the suggestion that natural selection is potent enough to explain the emergence of traits as functional as the eye. Selection alone, they claimed, could not explain the emergence of such highly adapted complexity; some form of intelligence was required, if only to guide the evolutionary process from afar. And as Gillespie (1979) shows, the doctrine of creation was embraced in various forms. Some theorists (for example, Agassiz) insisted that new species had to be the effects of special acts of creation; others (Richard Owen) insisted that the emergence of new species had to be ordained by a predetermining will; still others (Asa Gray, Charles Lyell, and Alfred

5. Brandon (1990) appeals to the notion of a how-possibly explanation in order to characterize the empirical constraints on adequate selective explanations. The considerations offered address the worry, pressed by Gould and Lewontin (1979), that adaptationist explanations all too often are illegitimately unconstrained. See Brandon (1990), chapter 5.
Wallace) insisted that the variation necessary for selection had to be the work of an intelligent, designing deity. These critics agreed that God’s designing intentions enter the historical process at some time or other. They agreed that our explanations had to appeal to God’s intentions because the design of the natural world was simply too complex and too vast—marked by too much intelligence—for natural selection.

Advocates of the historical approach to functions, of course, do not embrace theism or deism—not, at any rate, in their philosophical works. Unlike Darwin’s critics, they insist that selection can account for natural design. Nor do they claim that nature is literally designed, only that it has a kind of design, one that arises out of the process of selection: “... one of Darwin’s important discoveries is that we can think of design without a designer” (Kitcher 1993, 380). But it is here, in the postulation of natural design, that I demur. Advocates of the historical approach and of the combination approach assert that the biological realm is designed in some respect or other and that we can understand this design in terms of natural selection. On my view, it is a mistake to hold that nature is designed in any sense of the term. There is order, regularity, degrees of complexity, and degrees of adaptedness—but no design. Of course, we analyze natural systems into systemic capacities in order to understand and control their operations, and it is tempting to conceive of these systems in terms of some sort of design. But we are wrong to give in to such temptation. Natural systems are comprised of parts that interact with one another, and sometimes these interactions are astonishingly complex and elegant. But that shows only that natural systems work—they exercise higher-level capacities by virtue of organized lower-level capacities—without having been designed and without exemplifying marks of design. Darwin did not show us how to understand the world in terms of design despite the absence of a designer; he showed us instead that we ought to stop thinking of the world in terms of design. He showed us that the biological realm exhibits great regularity and complexity as a result of nothing more than causal and mechanical historical processes.

6. This type of claim is surprisingly common in the literature on functions, from Ayala (1970) to Allen and Bekoff (1995). And other philosophers appeal to this claim in theorizing about various phenomena. Dretske (1995), for example, endorses Kitcher’s assertion in the course of developing a theory of consciousness.
My aim is to show how to understand the attribution of functions in biology and elsewhere in a way that coheres with the methods and postulations of the natural sciences generally. And my strategy is to develop a theory of functions compatible with the fact that the nonengineered, natural realm is devoid of design. To accomplish this, we must revise—not simply explicate—the concepts involved, especially our concepts of function and design. We must relinquish the associations we have between these notions and the norms of performance posited by the historical approach. Our naturalistic scruples demand this. On the view offered here, the living realm is populated with complex, adapted systems that work, that accomplish a seemingly endless array of tasks. All these systems are products of evolutionary processes. But none of these facts underwrites anything more than the attribution of systemic capacity functions. The urge to attribute norms that violate our naturalistic commitments is, I believe, best explained by considering the nature of the urge. We can trace the causal and structural links between the parts of plants and animals and thereby formulate predictions and explanations, but to think we can do more is to regress to a brand of metaphysics untethered from the world we strive to understand.