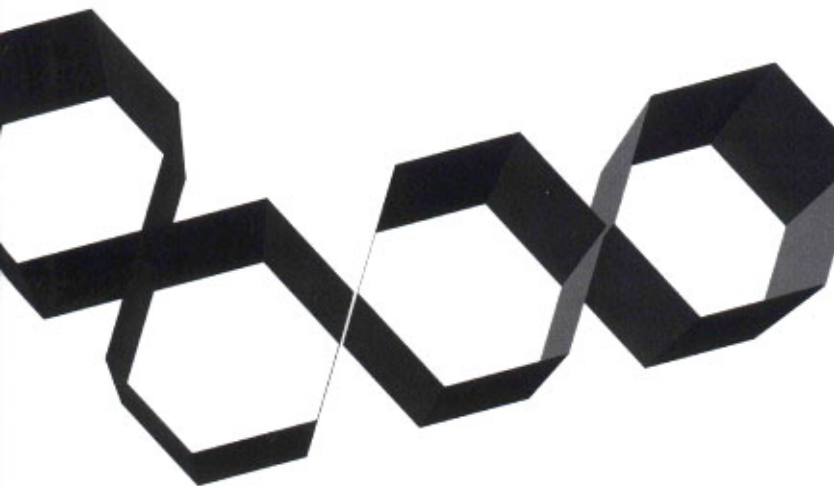


PETER MCLAUGHLIN

# What Functions Explain

Functional Explanation and Self-Reproducing Systems



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## What Functions Explain

This book offers an examination of functional explanation as it is used in biology and the social sciences, focusing on the kinds of philosophical presuppositions that such explanations carry with them. It tackles such questions as: Why are some things explained functionally while others are not? What do the functional explanations tell us about how these objects are conceptualized? What do we commit ourselves to when we give and take functional explanations in the life sciences and the social sciences?

McLaughlin gives a critical review of the debate on functional explanation in the philosophy of science that has occurred over the last fifty years. He discusses the history of the philosophical question of teleology and provides a comprehensive review of the postwar literature on functional explanation. The question of whether the appeal to natural selection suffices for a naturalistic reconstruction of function ascriptions is also explored.

*What Functions Explain* provides a sophisticated and detailed analysis of our concept of natural functions and offers a positive contribution to the ongoing debate on the topic. It will be of interest to professionals and students of philosophy, philosophy of science, biology, and sociology.

Peter McLaughlin is *Privatdozent* in the Department of Philosophy at the University of Constance.



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## Functional Explanation and Self-Reproducing Systems

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*For Lea and David*



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# **Part I**

## **Functions and Intentions**





# 1

## Introduction

We give and take functional explanations – not any old functional explanation and not of anything and everything. But there are occasions when we accept reference to the function of something as a satisfactory answer to a genuine why, how, or what question. And we often do this without – at least knowingly – presupposing or implying that there is any intentional agency involved. Under the appropriate circumstances certain kinds of things are explained, to the satisfaction of those involved, by appealing to their functions. In many areas of the life sciences, such references may in fact merely be shorthand for hypotheses about the past or present adaptive value of organic or behavioral traits and about the role of natural selection in their genesis; but this is certainly not always the case. And biology is not the only discipline in which functions are regularly adduced. Functional explanation has also been rampant in the social sciences.<sup>1</sup>

There is a large philosophical literature on functional explanations.<sup>2</sup> The statement ascribing a particular function to some entity can be interpreted as the answer to a number of different questions. We might ask: What does the heart do? What role does it play in the operations of the body? Which organ pumps the blood? Why do we have a heart? Which organ is it that has the function of pumping the blood? What is the function of the heart? Why does the blood circulate? To these and many other questions we might in the appropriate context sensibly reply: “The function of the heart is to pump the blood.”<sup>3</sup> In some of these, or similar cases, we may intend the statement purely descriptively; or “function” may be used as a metaphor or *façon de parler*. However, in some cases we seem to be offering an explanation, though it need not in each of these cases be an explanation of the same kind. It is only the explanatory use of functional ascriptions that will be of

interest in the following: Some analyses of such ascriptions take us to be explaining (or attempting to explain) why we have a heart; others take us to be explaining what the heart does.

In the philosophical literature there are great and generally self-serving differences in the descriptions and evaluations of the use of functional explanations. Some consider all (legitimate) appeal to function in scientific explanations to be merely metaphorical, because all genuine functions presuppose intentionality: "Except for those parts of nature that are conscious, nature knows nothing of functions."<sup>4</sup> Others not only find functional vocabulary methodologically unobjectionable but also take it to be empirically ubiquitous: "Furthermore, biology standardly treats function as a central explanatory concept."<sup>5</sup> There is no consensus on what the question is, let alone what the answer ought to be.

The fault line running through this debate seems to follow the question of norm and value. Does the attribution of function presuppose a valuation of the end towards which it is a means – at least in the sense that the function bearer is supposed to perform its function? Is value always relative to a particular perspective, system, scheme, or language? Is there intrinsic value? To characterize something as having a function – whether in descriptive or explanatory intent – is to view it as a means to an end, as instrumental to or useful for something that itself is valued or somehow normatively distinguished.

It is, of course, possible that reference to function in an explanation of organic traits or cultural practices is merely metaphorical – in other words, that it simply evokes some kind of vague analogy to human intentionality and thus may be somehow psychologically satisfying without being rationally justified. This would be the case if human intentionality were the only source of purposiveness in the world (and were itself not explainable in naturalistic terms): All seemingly non-intentional purposiveness would then be due to accident or to our lack of insight into deterministic connections. To ascribe a function to nonartifacts would either be merely to talk about them metaphorically as if they were products of human intentionality or else to view them literally as (nonhuman) artifacts and thus to presuppose an intentional (superhuman) creator. This view – whether articulated as a *metaphor thesis* or as *implicit creationism* – must assume that the functions attributed to organs and institutions are functions in just the same sense as the functions of artifacts. But this is much easier to assert than to argue for, and it is almost certainly false. In any case, it should be a subject

for investigation, not for a priori judgment. In the course of this study, I shall be asking what assumptions about the objects considered make various views on function ascriptions satisfying. As it stands, the assertion that natural functions are either metaphorical or divine is simply one particular variant of an antinaturalistic credo and is *prima facie* no less metaphysical than a commitment to intrinsic value in nature. This does not make the position wrong; it merely denies it the privilege of the default setting. Thus, the question whether human intention by (metaphorical) extension ultimately explains natural or social purposiveness or whether a more basic natural purposiveness by specification generates human intentionality should not be prejudged. As one commentator has put it: "it seems at least as plausible that the concept of 'intending to' is derived by restriction and qualification from a much broader concept of 'direction toward an end.'"<sup>6</sup> Both of these views must be taken seriously. It may in fact turn out that the metaphysical price of the second is higher than we would like to pay. However, let us first find out what exactly it is.

In one of the stronger accounts of intentionality and action, G. H. von Wright sees all teleological or functional explanation of behavior to presuppose intentionality. That is, in order to explain some behavior teleologically (functionally) we must first understand it as intentional action.<sup>7</sup> The explanation that a spider spins its web in order to acquire food is only then (nonmetaphorically) acceptable if we conceptualize the spider's spinning behavior as intentional. While von Wright's analysis is extremely plausible in many regards, it is in fact offered only as an analysis of behavior and perhaps (in some extended sense) of the products of this behavior, not as an analysis of the structures and systems that behave. It is *prima facie* much less plausible to assert (and von Wright does not) that the organs (parts) of a spider can only be said to have functions if the spider is viewed as the product of intentional action.<sup>8</sup> While it is clear that our talk about functions involves a number of presuppositions that determine the conceptualization of the systems whose parts possess functions, it still remains to be seen what this conceptualization actually involves. We shall in fact see that the conceptualization of systems displaying nonintentional functions is significantly different from that of systems that are intentional artifacts.

The question I shall be dealing with in this book is not so much what a functional explanation is, or what its logical or linguistic form is supposed to be, or whether it is a "good" type of explanation or not.

Rather, the question I shall be asking is, what kinds of things can be functionally explained? Why are some things explained functionally while others are not? What is the difference that is supposed to make the difference? What does the use of function-ascription statements to explain certain kinds of objects tell us about how these objects are really conceptualized? Thus, I shall not be asking what is the right metaphysics for turn-of-the-millennium philosophy and does it countenance functional explanation, but rather what are the operative metaphysical presuppositions of an explanatory appeal to functions. But here, too, I shall not be interested in all cases and all assumptions. Some metaphysical assumptions occasion no great or unusual difficulty. For instance, if we were to find that a particular kind of explanation only makes sense on the metaphysical assumption that there are causal relations among events in the material world, few of us would get excited. Causation presents a metaphysical problem of course, but causation is not the kind of metaphysical presupposition that need move us to reject a theory. A commitment to causation is a metaphysical price most of us are willing to pay. Some functional explanations presuppose little more than causality. I shall deal with some of these in Chapters 4 and 6; and then drop them because they are metaphysically unproblematic. Other kinds of functional explanation will turn out to be metaphysically more expensive. The strategy of this study will not be to seek out the metaphysically least-problematic use of functional explanation and then recommend it, but rather to pursue those uses of functional explanation that are widespread and perhaps metaphysically more expensive and then to try to articulate more clearly what metaphysical commitments they demand.

There are many different philosophical analyses of explanation and various ongoing controversies about what an explanation is. These latter can and need not be settled here. However, I take it that functional or teleological explanations are only then genuinely problematic and thus of special significance, insofar as they are taken to give a causal explanation of why the function bearer is where and what it is. I can see no objection in principle to a noncausal explanatory use of functions (for instance, as a device for theory unification) and thus no additional grounds for controversy in such a case due to the appeal to functions. Therefore, I shall generally presuppose that explanation means causal explanation. But the interesting question is not so much whether functional explanations are reducible to ordinary causal explanations under certain conditions. I presume that many may well be in

some sense reducible in principle, while they may not be in practice – though the usual skepticism as to the preservation of natural kinds in reduction is certainly justified. In such a reduction, we presume that some feedback mechanism mediates causality from the effects of a functional item back to the item itself, and we use a vocabulary that is vague enough that we can arrange the types and tokens appropriately, so that no contradiction, assumption of backwards causality, or other unpleasant by-product is implied. The really interesting question is, I think: What kind of system is *S* if we can sensibly speak functionally about it, even when we believe there are probably appropriate causal mechanisms of some kind? How do we conceptualize a system whose parts can be function bearers?

Contemporary debate about the analysis and the status of functional explanations has reached the stage where it has been characterized by “the dull thud of conflicting intuitions.”<sup>9</sup> Definition attempts, which once kept getting longer and more complicated, have now stabilized as quasi-machine-readable reformulations with unexplained notational conventions are paraded past our intuitions. Counterintuitive counterexamples are suggested: We are asked think about instant organisms, brain tumors that happen to correct hormone imbalances, bullet-stopping pocket bibles, and sewing machines with self-destruct buttons that don’t work. Some standard types of counterexample have become established and are traded back and forth between the proponents of *etiological* and of *dispositional* interpretations. And, in fact, each of these schools seems to have settled down to live in peace with its counterexamples. But this kind of peaceful coexistence with counterexamples is possible only for stipulative definitions of the concept of function. If we stipulatively define the term *function* in biology (say) as the effect of an adapted trait (etiological view) or as the adaptive effect of a trait (dispositional view), then intuitive counterexamples to the usage prescribed by the definition have no force, because they merely presuppose other conceptions of function. Nonetheless, stipulative definitions do, in a sense, relate to everyday usage as flat roofs relate to standing water: However tight they are, they tend to leak. If the prescribed usage of the term goes too much against intuition, it will constantly tend to be used falsely. We will also begin to ask what work it really does for us.

In the following, I shall argue that the real objection to the various analyses on offer, is not that they don’t capture some one of our intuitions about functions, but that, by doing this, they miss the philo-

sophically interesting point of our adamant proclivity to teleological vocabulary when speaking of biological and social systems. I shall not be collecting intuitively plausible examples and counter-examples but rather looking for the construction principles of such intuitive examples, at the processes they are supposed to be examples of. I shall be arguing not that this or that semiformal translation of a function-ascription statement is better than another, but rather that our use of functional ascriptions to explain certain kinds of objects can tell us something significant about how we fundamentally conceptualize these objects and about the presuppositions we make in doing this. When in the following I do refer to intuitions or to “what we would say” or “what we mean” in a particular case, this is not intended as justification of vernacular function ascriptions but merely as description of a practice whose metaphysical presuppositions we want to investigate. The bias in deciding what exactly intuition actually “says” in doubtful cases will always be in favor of the metaphysically more expensive alternative. This is a methodological matter of course, because we want to know what we might have to accept if we stick to functional vocabulary, not what we might be able to get away with. Thus, my question will not be: Are functional explanations “good” explanations according to some pregiven standard? But rather: What kinds of things do we explain functionally? Why do we do this? And what can this tell us about the presuppositions we implicitly make about the things we explain in this manner? This is the sense of the title: *What Functions Explain*.

I shall, for the most part, stick to a few standard examples. While it is less entertaining always to use the same boring example of the heart beating in order to circulate the blood, it nonetheless has the same kind of advantage as mass-use software – most of the kinks have been worked out. We don’t have to worry about doubts as to the empirical truth or the appropriateness of the example or other factors that might muddy the issues. With some other standard examples this is not the case; for instance – to take the most famous example – the function of chlorophyll for photosynthesis in plants is (famously) open to extraneous questions: whether chlorophyll is really always necessary for photosynthesis or whether xanthophyll will on occasion do the job; or whether a chemical substance should be attributed a function at all, instead of the organ that secretes or extracts it. Do things that are inside an organism but are not part of the organism have functions? Do oxygen molecules have the function of nourishing the cells while

they are still in the bloodstream, or only on arrival? Do symbiotic parasites have functions like organs? What if you can't tell the difference between the two? However, even if we were to want to answer such questions at some point, it would still be appropriate first to understand a simple paradigm case. Perhaps we should also leave open at first the question of whether particular functional explanations are best seen as members of a class of explanations or as instantiations of a type of explanation: Every member of a class is just as much a member as any other, but tokens of a type can instantiate it better or worse. And to characterize a type we should perhaps best stick to Whewell's dictum: "The type must be connected by many affinities with most of the others of the group; it must be near the center of the crowd, and not one of the stragglers."<sup>10</sup> Thus, the paradigm generally used to explicate functional explanation will be the function of the heart in blood circulation, not that of the faulty self-destruct button on your sewing machine. We can always change our examples later once we have understood the paradigm case.

Functional explanation is considered for various reasons by many to be illegitimate, and we shall analyze some powerful arguments to this effect. There are also a number of different attempts to "save" functional explanation by reducing its claims, appealing to different senses of "explanation" and thus separating it from the unsavory teleology that is often associated with it. This is not the tack I shall take. I shall not be looking for a particular use of teleological vocabulary that can be reconciled with mechanism or reductionism. There are some such uses, and these will also be considered in Chapter 6 (and to a certain extent in Chapter 4). But as soon as any particular use of such vocabulary turns out to be merely metaphorical, heuristic, or just descriptive of unproblematical causal connections, it will cease to be of interest and I shall drop it. I am more interested in those uses that are not so reconcilable – most particularly, I am interested in those that can be reconciled with determinism but not with reductionism. It will turn out that most genuine functional explanations involve not so much an illicit appeal to final causes as an implicit appeal to holistic causality. Furthermore, this holism itself is generally relativized by appealing to various kinds of identity over time, so that the causal relation of a system to the properties of its own parts is interpreted as the relation of a system to the properties of the parts of some successor system. The task of this analysis will be to explicate the sense and rationale of such implicit assumptions. I shall not be

justifying or criticizing functional explanation but rather trying to analyze what's in it.

Recent literature analyzing functional explanations can be divided into four major areas:

- (1) Biology and its philosophy, where the discussion is concerned primarily with questions of adaptation and evolution.
- (2) Social science and its methodology, often in connection with the distinction between latent and manifest functions.
- (3) General philosophy of science as shaped by C. G. Hempel and Ernest Nagel, where the discussion began as a philosophical reflection on the use, abuse, justification, or lack thereof of functional explanations in the special sciences. More-recent discussions in the philosophy of science tend to deal only with biological (and artificial) functions and are increasingly often less a second-order reflection on problems in scientific explanation than a preliminary to the fourth area of study: naturalistic philosophy of mind.
- (4) Naturalistic philosophy of mind, where an explication of biological function is sought that can help in reducing intentional vocabulary to physiological or biological vocabulary. Whereas Hempel and Nagel were very stern with both the biological and the social sciences in treating functional explanation, contemporary philosophy of mind tends to be excessively lenient with biology on this head. A great deal of the interest in functional explanation is due to naturalist projects; and I suspect that philosophers of mind are much keener on allowing (or encouraging) biologists to use functional explanations than are the biologists themselves. Biologists could in general probably get along fairly well, if they had to, without the term *function* by substituting either *causal role* or *selective advantage* or *adaptive value*.<sup>11</sup> Thus, there is a very real danger that the vested interests of philosophy of mind in intentionality lead it to foist more teleology upon biology than the biologists need or want by providing a self-indulgent analysis of functional explanation. This is aided and abetted by the tendency of some philosophers of biology to call any explanation *teleological* that adverts to natural selection and to exaggerate the extent of the teleological vocabulary that can actually be legitimated by natural selection.

My interest is primarily in the third area as a reflection on the first and second, even though, given the state of the literature, the fourth



area will play a very significant role in the following study. I shall analyze *natural* or *objective functions* or, more precisely, the bearers of such functions: The function bearer is a means to the end named by the function. The heart is a means to the end, blood circulation. The Hopi rain dance is a means to the end, social cohesion. Because functional descriptions always involve instrumental, or means-ends, relations, they must thus inevitably display some analogy to descriptions of human intentional and instrumental actions or to the products of such actions. However, I shall not be concerned primarily with cases of genuine intentionality or goal-directed behavior, where some kind of representation of an effect is part of the causal explanation of that effect, whether this representation is taken as mental or material or both. Because much of the literature interested in the fourth area, naturalistic philosophy of mind, is basically doing conceptual analysis, there is a strong focus on providing an analysis of functions that also includes the functions of artifacts and the purposes of actions. Most of the intuitions that this kind of conceptual analysis is supposed to capture or mobilize are based on discourse about actions and artifacts. I shall not, however, concentrate much on artificial functions and the intuitions they support. Even if the ultimate explanation of intentional purposefulness should turn out to be naturalistic, there is nothing quite so intuitively plausible as the (antinaturalistic) distinction between body and mind. And the intuition that (nonreducible) human intention is the source of genuine purposiveness and is a genuine causal factor in the production of certain material systems (artifacts) is about as antinaturalistic as you can get. If naturalism should succeed in forcing us to abandon these intuitions, so much the better, but it seems that the naturalist strategy, too, should demand that natural, nonintentional functions be explained first without appeal to artifact-based (antinaturalistic) intuitions, so that the artifactual functions can later be reduced to the natural ones. A too-strong dependence on intuitions based on intentionality must cripple the naturalist project from the start. Thus, whether or not artifactual and natural (intentional and nonintentional) functions are categorically distinct and whether or not the former can be reduced to the latter, it is natural functions that must be addressed first, if we don't want to prejudice the answer.

Thus far, I have merely defined the object of study, the apparent phenomenon of nonintentional purposiveness. Some may take most examples of such phenomena to be illusions or confusions based on metaphor, but the phenomenon of nonintentional purposiveness is

undeniable. Even in the unlikely event that most apparent examples can be shown to involve surreptitious appeal to intention, there is still always accidental purposiveness, however seldom this might occur. And furthermore, if natural selection can, for instance, produce apparent purposiveness on a regular basis, one might be able to take it as the point of departure for a naturalist reduction. In any case, non-intentional purposiveness is in fact what we – rightly or wrongly – often mean preanalytically by certain kinds of expressions. This is also the phenomenon that Kant had in mind when he introduced a “*Zweckmäßigkeit ohne Zwecktigkeit*,” that is, a *purposiveness not due to purposeful action*, into his reflections on biology and human history.<sup>12</sup>

In the following, while I will not always be able to avoid lapsing into taking sides in various disputes, the primary aim is one of descriptive metaphysics: to articulate the metaphysical presuppositions or the ontological commitments of the explanatory use of function ascriptions. Although I shall stick mainly to biological examples, the point is not to analyze functional explanation as used in biology but functional explanation as such. Thus, we want to be able to explicate the explanatory value and the ontological commitments of talking about the functions of wings, beaks, and webbed feet, but also of puberty rites, public executions, and natural language. Both the life sciences and the social sciences often countenance functional explanation without assuming teleology in either its Aristotelian or its medieval and modern sense. Today, those using functional vocabulary appeal neither to the *dunamis* or the immanent goal that lies at the essence of a duck and its webbed feet nor to its representation in the mind of an artisan God. Neither of these views reflects the actual ontological commitments of the twentieth-century ornithologist. But what do and don't the commitments of this functional vocabulary have in common with the commitments of the sociologist?

My own concentration on biological examples can be legitimated from three perspectives: subjective, intersubjective, and objective. My own scientific background includes ethology but not ethnology, and my specialized philosophical work has focused more strongly on philosophy of biology than on philosophy of the social sciences. Second, the larger part of the philosophical literature on functional explanation either deals with it primarily on the example of biology or restricts itself explicitly to biological explanation. But there is also a third and objective reason for the focus, which can only be fully legitimated

in the course of the presentation: There are two different kinds of (causally intended) functional explanation in biology, only one of which has a correlate in social science. It is often the ambiguity introduced by the difference between what may be called *evolutionary* and *physiological functions* that makes many biological examples (that appeal to intuition) somewhat confusing. As a placeholder for the later analysis, let me put it this way: Organisms reproduce themselves both as tokens (growth, regeneration) and as types (propagation). Social formations only reproduce themselves as tokens, as individual entities; they don't as a rule spawn others of their type. Function bearers in biology contribute either to maintenance or to propagation, to survival or to generation; function bearers in sociology contribute to maintenance (survival). Because the analysis of biological functions covers both kinds of function and reproduction, it is there that the specific difference should be made clear.

I shall argue that function ascriptions are generally taken to be explanatory in the causal and unsavory sense only in a particular kind of system, a kind of system encountered primarily in the biological and social sciences. The systems of which some parts are said to have functions in an explanatory sense are conceived as self-reproducing systems, that is, as systems whose identity conditions over time include their continual self-reproduction – either as the same individual or as successive instantiations of the same type. A system that remains the same only insofar as it re-produces itself by renewing and replacing its own parts is also temporally prior to (many of) these parts and can thus, without backward causality, be held to be causally responsible for the existence and/or properties of these parts. Thus, the key concept in explicating the sense of functional explanation will be the concept of the self-reproduction of a system.

One further contingent fact about the current philosophical discussion will influence form and content of the presentation. Philosophical naturalism will play a particularly important role in the presentation because this is the dominant approach in philosophy of biology more narrowly conceived and because in much of the other literature a naturalistic explanation of intentionality presents the main motive for dealing with the question of functional explanation in the first place. In fact, some recent literature even has a tendency to be somewhat parochial in this regard so that the philosophical debate is often conceived not to be a broad discussion among various positions but is taken to be simply the technical part of an inner-naturalistic project.

Take the following statement by one very prominent contemporary philosopher of science:<sup>13</sup>

An interesting feature of all extant philosophical accounts of what the concept of function means is that they are *naturalistic*. Although the theories vary, they all maintain that functional claims are perfectly compatible with current biological theory.

That something so evidently false as an empirical statement isn't immediately recognized as such by its author (or his editor) indicates that at least some of the participants in the discussion have a rather selective perception of what the alternatives are. It is not at all clear that all the functional claims we make with regard to biological or social phenomena are in fact perfectly compatible with current scientific theory or with naturalism or scientific materialism as a metaphysical position. For many of us, this is something that we would like to have demonstrated before we are willing to embark on a carefree metaphysical shopping spree with our teleological credit cards.

Within this framework, one of the most important questions that I shall attempt to answer is the following: Does natural selection as such get you all the teleology you need for a naturalistic interpretation of functional explanation? The answer will turn out to be no. Even the naturalist needs a bit of Aristotle to reconstruct our functional attributions. That is going to be the metaphysical price. I am not going to advocate simply paying that price, although Aristotle, too, was a naturalist. But I will insist that the naturalist who wants to use functional explanations without holistic metaphysical commitments cannot rest on Darwin's laurels. There is more work to be done.

In their explications of the concept of function, many naturalists attempt to find a general characterization that covers all actual uses of the term – outside of the social field. Such a characterization, if achieved, would have only those determinations common to organic and to artifactual functions. A general concept like this would be more abstract than either the organic or the artificial, each of which would possess some particular determinations not found in the other or in the general concept. I don't know precisely what the use of such a general abstract classificatory concept might actually be, but it would, in any case, be of no use whatsoever for a naturalistic explanation of intentionality. A naturalistic account of horses, zebras, and donkeys doesn't look for an abstract general concept of the genus *equus* under which these species can be subsumed; rather, it looks for a concrete ancestor