

This article was downloaded by: [Duke University Libraries]
On: 09 November 2011, At: 12:49
Publisher: Routledge
Informa Ltd Registered in England and Wales Registered Number:
1072954 Registered office: Mortimer House, 37-41 Mortimer Street,
London W1T 3JH, UK



Australasian Journal of Philosophy

Publication details, including instructions for
authors and subscription information:

<http://www.tandfonline.com/loi/rajp20>

The teleological notion of 'function'

Karen Neander ^a

^a Australian National University

Available online: 02 Jun 2006

To cite this article: Karen Neander (1991): The teleological notion of 'function',
Australasian Journal of Philosophy, 69:4, 454-468

To link to this article: <http://dx.doi.org/10.1080/00048409112344881>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.tandfonline.com/page/terms-and-conditions>

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

THE TELEOLOGICAL NOTION OF 'FUNCTION'*

Karen Neander

I. Introduction

Penguins are myopic on land and this is normal for penguins; it is a by-product of an optical system that has the primary function of providing sharp visual focus under water where the penguins find their food. This familiar notion of 'function' (or 'proper function' as it is also called) has two very interesting features. It is normative—there is a standard of proper functioning from which actual traits can diverge. And it is teleological—the function of the penguins' eyes of providing sharp visual focus under water explains why the penguins have the eyes they have, and why they have land myopia, by explaining what their particular optical system *is for*. At least it appears to do so.

This paper is mainly concerned with how proper functions generate teleological explanations; why an etiological theory is the right way to understand this feature of the notion; and why the propensity theory is the wrong way, contrary to the claims of John Bigelow and Robert Pargetter in their paper on the topic [3]. What we principally want to understand is how the biological notion of 'a proper function' can be both teleological and scientifically respectable. Today it is generally accepted that it is both these things, but a search back through the literature reveals only failed attempts to account for the fact.¹ I aim here to set the record straight. I will not be directly concerned with functional norms in this paper, although in other places [17, 19] I have argued that functional norms also require an etiological theory of functions. Millikan [22], Griffiths [10] and I [17, 19] have elsewhere also replied to the various standard objections to etiological theories.²

* An early draft of this paper was read to the Department of Philosophy, Research School of Social Sciences, Australian National University. I am grateful for the many useful comments made there, and for discussions with Frank Jackson, Paul Griffiths, Peter Menzies, Philip Pettit and Huw Price. I would also like to thank an anonymous referee for the *Australasian Journal of Philosophy* for some very helpful comments.

¹ I mention some of these later in the paper. Most notable in this context is Larry Wright's attempt [30] to do what I attempt to do here, i.e., to show that according to an etiological theory, teleological explanations based on biological function are scientifically respectable. Despite his having clearly failed to show this, I believe that Wright was basically on the right track. More about this later.

² These objections can be found in Wright [30], Boorse [4], Nagel [16], and more recently Bigelow and Pargetter [3].

My plan is this. In section II, I will examine the general pattern of teleological explanations, and the exact nature of the puzzle surrounding them. Once we have stated the puzzle, an etiological theory falls out as the obvious candidate for its solution, or so I will argue. Roughly speaking, on the etiological theory I favour, the proper function of a trait is to do whatever it was selected for. We look to the trait's selection-history to determine its function, hence the theory is called an 'etiological' theory, or sometimes an 'historical' theory. In the third section of the paper I explain how the correct etiological theory permits biological functions to generate teleological explanations that fit the general pattern. And in the fourth section, preceding some brief concluding remarks, I look at the opposing claims made by Bigelow and Pargetter on behalf of the propensity theory they have advocated. The propensity theory agrees with the etiological theory that proper functions belong to systems that are subjects for selection.³ The main difference between the two theories is that while the etiological theory says that functions are determined by *past* selection, the propensity theory says they are determined by aptness for *future* selection. The difference is crucial for teleological explanations, I aim to show.

II. The Puzzle and Pattern of Teleological Explanations

My formulation of the puzzle might seem to be biased towards an etiological solution, but I think this is true only in the benign sense in which a clear formulation of a problem often takes us half-way to the solution. Confining ourselves to post-Aristotelian uses of teleology, the puzzle comes in two parts. There is a *prima facie* general problem concerning all teleological explanations, including purposive explanations, and also a more interesting problem concerning teleological explanations that appeal to functions, and biological functions in particular. It is helpful to remind ourselves of the general *prima facie* problem first, although its solution is fairly obvious, because it provides some useful clues regarding the form of solution needed for the particular problem concerning biological function.

The general *prima facie* problem with teleological explanations is often said to be that they are 'forward-looking'. Teleological explanations explain the means by the ends; a development or trait is explained by reference to goals, purposes or functions, and so the explanans refers to something that is an effect of the explanandum, something that is forward in time relative to the thing explained. Of course this is quite unlike ordinary causal explanations in which the explanans refer to prior causes of the explananda.

³ There have been two broad strands of thinking on teleological systems. One emphasizes causal feedback loops and preferred state analysis, while the other emphasizes their being products of (or subjects of) selection processes. Causal feedback loops can be rewarding to study, but although homeostatic and homeorhetic models are useful heuristics for understanding some complex mechanisms, they are not useful for distinguishing teleological from non-teleological systems, or for understanding teleological explanations *per se*. See Hull [12, pp.104-111]. They do not seem to attract much attention as such these days, but see Levy [14] for a recent exception.

Indeed, because teleological explanations seem to refer to effects, rather than prior causes, it looks at first sight as though backward causation is invoked. For example, we may offer an explanation of the switch on the wall by saying 'it dims the lights' and in doing so we apparently offer an explanation of the switch that cites its effect rather than its cause. Barring backward causation it looks as though the switch's turning on the light cannot causally explain the switch's being there on the wall, and so it looks as though the explanation is illegitimate. The *prima facie* problem gets worse, if that is possible, because many purposes, goals and functional effects are never realized: most athletes never win their gold medal, some inventions fail to perform their intended function, hearts occasionally fail to pump blood, and so on. Unrealized effects have no potential as causes of anything at all, yet mention of them is taken to explain the existence of the item for which they are potential but unrealized effects.

This is the *prima facie* general problem concerning teleological explanations, but where agency is involved the solution is transparent. In such cases, teleological explanations can be understood as a species of normal causal explanation, and if we briefly consider purposive explanations we can quickly discover how such explanations work.⁴ Suppose that Hagar explains his refusal to drink alcohol by saying that he is going to lose weight. If Hagar loses weight, this follows rather than precedes his restraint, so the explanans refers to something that follows rather than precedes the explanandum. But this is merely a mock puzzle, because in this case the explanans is not simply 'forward-looking' to a hoped for effect of Hagar's behaviour, it also implicitly refers to a precedent of his behaviour—Hagar's *intention* to lose weight—and it is Hagar's *intention* to lose weight that causally explains his unusual restraint at the pub.

In other words, there is an ambiguity in talk of purposes. A purpose is both a future desired effect, and a certain more or less resolute attitude to bringing about that future desired effect. The state of affairs to which I have the purposing attitude typically occurs after my action and so cannot be a cause of it, but my purposeful attitude to this state of affairs occurs before the action and so is not disqualified, for reasons of timing at least, from being its cause. This ambiguity also explains how unrealized purposes are explanatory. When purposes go unfulfilled, the agent still has a purpose, it is just that the resulting purposeful behaviour doesn't bring about the state of affairs that the behaviour was intended to bring about. Clearly, the explanatory power of purposive explanations does not derive from their explicit reference to future effects so much as their implicit reference thereby to past intentional attitudes to those future effects. The explanatory clout comes from an implicit backward reference to prior causes, so these teleological explanations are just a species of ordinary causal explanation

⁴ Some deny that purposes are causes, but as long as talk of purposes implies underlying causally efficacious realizations, purposive explanations can be causally explanatory, even though purposes themselves are not, strictly, causally efficacious. See Jackson and Pettit [13].

after all. I labour the obvious here, because it is this rather obvious insight into the nature of purposive explanations which provides the key to understanding the general form of teleological explanations, and functional explanations in particular.

The problem with teleological explanations becomes more interesting when we turn to those which appeal to functions, although with the functions of artifacts, the solution to the teleological puzzle might be just as readily available. If an artifact's function is the purpose for which it was designed, made, or put in place, then an artifact's function could explain the artifact in the same way that the purpose of some behaviour explains the behaviour. While the explanans explicitly refers to effects of the explanandum, or more specifically, while the functional explanation explicitly refers to the effect of the artifact that is its function, it could also implicitly refer to past, causally explanatory intentional attitudes to those effects, or in other words, to someone's intention to arrange for those effects to come about. So, in the case of the switch on the wall that is 'there to dim the lights', the dimming of lights explains the the switch's being on the wall, because when we learn the switch's function we learn that someone arranged for the switch to be there on the wall with the purpose of making the lights dimmable. Teleological explanations of artifacts thus look as though they might be a special form of purposive explanation, providing schematic purposive explanations that implicitly refer to agents' intentions. These agents acted to design, make, or place the artifact thus and so, with the purpose of bringing about the effect that is the artifact's function (or minimally, with the hope of bringing about the capacity for effecting the function).

The more intransigent problem arises where there is no intentional agent involved, as with biological function. Once, in the hey-day of Creationism, biologists standardly believed that God played the part of purposer, and on this understanding biological functions became a kind of artifact function, and could be treated as suggested above. However, in modern biology we cannot properly interpret the forward-reference of functional explanations as an implicit backward reference to past, causally explanatory intentional attitudes on the part of God. This is why, for quite some time, teleological explanations appealing to biological function fell into ill repute.

However, the apparent explanatory power of teleological explanations which appeal to biological functions is quite robust. That the koala's pouch has the function of protecting its young does seem to explain why koalas have pouches. That the bee's dance is for directing other bees to pollen does seem to explain why bees dance. I suppose it is just barely possible, perhaps, that this apparent explanatory power is illusory, based on hangovers from our Creationist past, or due to our mistaking the metaphorical for the literal, when we speak of 'Mother Nature's intentions', 'evolutionary design', and so on. However the thesis that we are persistently irrational in this respect is psychologically implausible in contrast to a theory of functions that shows such explanations to be legitimate. Any theory which delivers a fully-fledged teleological notion of biological function, consistent

with the tenets of modern science, has a plus in its favour. Nonetheless, despite the general robustness of subjective satisfaction with these explanations, there are some who can resist them. There are two main views opposed to the view that I hold, that biological functions are intrinsically and universally teleological.

(1) The strongly opposed view has it that any so-called 'teleological explanation' derived from biological function is merely misguided pseudo-explanation. Morton Beckner, for instance, insisted that, 'Only the most Palaeozoic reactionary would claim that "Plants have chlorophyll" is explained by "Plants perform photosynthesis"' [2, p. 112], and Robert Cummins has expressed a similar view [7]. The main motive for this view seems to be a wish to condone the notion of a biological function, combined with inability to see how any teleological explanation it generates could be scientifically respectable.⁵

(2) A psychologically more plausible, weaker negative position has been taken by some others: for example, John Canfield [6], Michael Ruse [24], and William Wimsatt [28]. On this view, function attributions can sometimes, but not always, provide an explanation of the thing to which the item is attributed, but only when combined with further background knowledge. There are significant differences amongst these authors in their development of this view. For instance, Ruse [24, pp. 190-193] argued that function attributions can explain the trait to which the function is attributed when the function is vital, or in other words, when it is necessary for the survival and/or reproduction of the organism or population, given its actual organization. He suggests that, with the additional premise that the function is vital, a function attribution can provide an explanation along the lines of the covering-law model given by Hempel [11]. Canfield suggests that the additional relevant information is background evolutionary theory. Canfield, like Ruse and Wimsatt, argued that all functions are (roughly) causal contributions to fitness, and so when we learn a trait's function, says Canfield, we are often in a position to surmise that this adaptive effect is what caused the trait to evolve.⁶ Wimsatt goes further and maintains that teleological systems necessarily arise through a selection process. These views, particularly Wimsatt's, are closer to the view I will be defending, but whereas my view is that function attributions universally and intrinsically justify teleological explanations, their view is that function attributions usually (but not always) justify teleological explanations, and only when combined with background theory extraneous to (not implied by or contained in) the function attribution. Again, the main motive for disallowing that biological

⁵ Cummins also has a specific objection to the kind of teleological explanation that Larry Wright tried to defend. My account is somewhat reminiscent of Wright's, so Cummins may also object to mine on similar grounds. See fn. 9, this paper.

⁶ A trait is *adaptive* if it contributes to the fitness of the organism in its current environment, it is an *adaptation* if it has evolved due to past contributions to fitness. Most traits are both (i.e., are adaptive adaptations) but some are only one or other of these. According to etiological theories traits with functions are necessarily adaptations, they are not necessarily adaptive.

functions are intrinsically and universally teleological seems to be failure to see how the position can be maintained without violating the tenets of modern science.⁷

I argue in the next section that an etiological theory of proper functions reveals them to be universally and intrinsically teleological. As should be apparent by now, the theory of functions that shows most promise of capturing the 'forward-looking' nature of teleological explanations is, paradoxically, the theory that is also 'backward-looking'. If biological functions can generate genuine teleological explanations, there must be implicit reference in talk of functions to the causal history of the traits that have the functions.

III. How Functional Explanations Fit the Pattern: The Etiological Theory

An etiological theory of functions claims that what counts as a function of a trait is determined by that trait's history. There are now a number of etiological theories on offer. Francisco Ayala [1] and most notably Larry Wright [29, 30]⁸ offered early versions, according to which functions are determined partly, but not wholly, by selection history. Influenced by Wright, I subsequently developed an etiological theory, according to which functions are wholly determined by history [17, 19] and so, independently, did Millikan [20, 22]. Let me explain how I believe an etiological theory is best understood.

In my view, the central element of the etiological approach should be seen as the simple idea that a function of a trait is the effect for which that trait was selected. This is the general, everyday notion of a proper function. It is, according to this idea, the function of the switch on the wall

⁷ This view is also imposed by the underlying theory of functions held by these authors, according to which, roughly speaking, functions are causal contributions to fitness (are adaptive). These 'goal-contribution' theories have serious problems, and have not been actively defended in print over the last decade. Consider the fact that an individual expression of a trait (e.g., Mary's thyroid) can be dysfunctional, and make no actual causal contribution to fitness, yet such a trait still has a function it is supposed to perform. To accommodate dysfunction (and maladaptive traits, and idiosyncratic accidental contributions to survival and reproduction) these 'goal-contribution' theories usually standardize proper functions to some type of statistical norm. Functions are said to be 'standard' or 'typical' contributions to fitness relative to the species (or an age-group or sex of a species). However this attempt to reduce functional norms to statistical norms fails, as shown by pandemic or epidemic diseases, for example. Boorse raised, and attempted (unsuccessfully) to deal with this problem in his [5].

⁸ Wright [30] argued that teleological explanations unpacked from the second of his requirements for function ascriptions. This required that, for X to have the function Y, X is there (where it is in the form that it is) because (ordinary, causal) it does Y. On the most literal and obvious reading of Wright's formula, a particular item has a function if it is caused to be there by its performance of the function. For instance, your thumb has the function of helping you to grasp objects if your thumb is there on your hand, shaped thus and so, because it helps you to grasp objects, and similarly, the handle on your coffee cup has the function of saving your fingers from burning, if saving your fingers from burning caused the handle to be there on the side of the cup. Wright's critics, Boorse [4] and Nagel [16], pointed out that his 'solution' seems to rely on reverse causation. Others have since also quickly dismissed Wright, for instance Millikan, in a footnote to her [22]. However, despite Wright's failure to get the details right, a reading of the main body of the text [30] shows that he was aiming, and came very close to, an account of teleological explanations similar to mine.

to turn on the light, because the switch was put there for that purpose. I will come back to artifacts in a moment, but first I will explain how this everyday notion of a function is precisified for the purposes of modern biology. It is a common mistake to suppose that a good theory of proper functions will be univocal with respect to both the functions of artifacts and biological, evolved functions. There are important differences of detail that vary with the kind of selection process involved.

Where natural selection is the relevant selection process, there are two constraints on function ascriptions that do not apply in the case of intentional selection by an agent. (1) Selection is always of types, not tokens. So function attributions belong primarily to types and only derivatively to tokens; your opposable thumb, for example, has a proper function in virtue of the fact that this type of trait has a proper function. Natural selection operates over whole populations and not on individual items—there is no way that an individual instance of a trait, such as Margaret Thatcher's nose, can be selected. Just what the unit of selection is, is controversial, and there may be a number of equally suitable candidates. However, it is clear that the unit of selection is not a trait of an individual organism. Genotypes might properly be seen as the unit of selection, since genotypes can proportionally increase or decrease in the gene-pool. Phenotypes are also indirectly selected, through their role as intermediary between genes and environment. But however the debate about units of selection is settled, function attributions in biology belong primarily to types—genotypes and their phenotypic expressions, perhaps—because it is types, not tokens, that are selected for their effects.

Furthermore, (2) since natural selection lacks foresight and is a blind causal process operating over random mutations, it can only operate on actual past causal contributions to inclusive fitness. It is always past performances of the functional effect (the effect that becomes the function) by the parts and processes of ancestral organisms that play the causal role in the etiology of present items.

Let's see how this works in a particular case—your opposable thumb. In so far as your opposable thumb is the result of selection, it is, indirectly, the result of natural selection for thumbs of that type.⁹ According to the

⁹ An objection may arise at this point. Elliott Sober [25, pp.147-155] argues that natural selection does not explain the traits of individuals. This may be what concerns Cummins about teleological explanations (see fn. 5, this paper). Sober draws an illuminating distinction between (what he calls) selectional explanations and developmental explanations. The latter explain how traits occur in individuals, whereas the former, he argues, can only explain the distribution of traits in a population. For a rejoinder to Sober see my [18]. There it is argued that a causal explanation of an individual's trait, if it travels back sufficiently far in time, will involve us in a description of that individual's ancestry, and therefore (to save absurd reiteration) in generalizations about the distribution of traits in that ancestral population. If so, it follows that a sufficiently exhaustive developmental explanation of an individual's trait will include a selectional explanation of the nature of that individual's ancestry. (Roughly, the idea is that you have an opposable thumb, in part, because you come from a long line of ancestors *all of whom had opposable thumbs*, and no countervailing mutation occurred to prevent you from inheriting the trait.) In other words, although the distinction between developmental and selectional explanations is illuminating, the two kinds of explanation are not mutually exclusive.

theory I favour, the function of your opposable thumb is to assist in grasping objects, because it is this effect which opposable thumbs contributed to the inclusive fitness of your ancestors, and which caused the underlying genotype, of which opposable thumbs are the phenotypic expression, to be selected. In brief, grasping objects was what the trait, the opposable thumb, was selected for, and that is why it is the function of your thumb to help you to grasp objects.

This is the logical form of most biological functions, since most biological functions are evolved functions. Even those functions that have resulted from human cultivation or selective breeding practices are evolved functions. After all, being cute, useful, tasty, or good company for humans is just another way to be more fit. Only those physiological traits that result from genetic engineering will be exceptions to the general rule that biological functions are evolved functions. Where a trait results from intentional selection by an agent it will have an intended function, along the lines of the standard artifact functions that I will shortly describe.

But first, notice the neat fit between this understanding of evolved biological functions and the general pattern of teleological explanations outlined earlier. Since evolved biological functions belong principally to types, not tokens, the forward-reference to a trait's function, to what the trait is supposed to do, serves as an implicit reference to past selection of that type of trait for that type of effect. We have here, in common with other teleological explanations, an explanans that explicitly refers to something that postdates the explanandum. In this case the explanans is a biological function attribution, so it explicitly refers to what the trait is supposed to do. In common with other teleological explanations, we also have an explanans that implicitly refers to a selection process that pre-dates the explanandum, for the function of the trait is whatever it did that caused it to be selected by natural selection. So understood, biological function attributions generate teleological explanations that are unobjectionable, and so understood they conform to the general pattern of teleological explanations.

So far my position may seem to coincide with that of Paul Griffiths, who takes himself to be agreeing with Ruth Millikan¹⁰, when he says that '... the central element of the etiological approach [is] the idea that the

¹⁰ As I understand her, Millikan has a different approach again. All functions, according to Millikan, are directly or indirectly determined by causal processes that satisfy the constraints I describe as applicable to natural selection. That is, selection is of types, and the causal process relies on past performances of the function-effect by ancestral items (of which the item that has the function is a copy). Millikan does not, however, attempt to assimilate intentional selection to this schema, as Griffiths does. Instead, she claims that those artifacts that do not 'evolve' (see fn. 11 of this paper) have (what she calls) 'derived' proper functions. According to Millikan, the functions of these artifacts derive from the maker's intentions, which in turn have derived proper functions, courtesy of the evolved biological functions of the intention-making mechanism. Thus, for Millikan, all functions involve natural selection, or analogous processes, and intentional selection does not generate functions independently. To my knowledge, she does not defend any theory on the general nature of selection. Millikan's tiered approach to functions obscures the simple structure of teleological explanations, and the parallel between those that appeal to biological function and those that appeal to artifact function. However, her approach is compatible with this understanding of teleological explanations, I think.

past effects of a type provide an explanation for the existence of current tokens of that type' [10]. However, I disagree with this claim. It is true for evolved functions, because that is the way that natural selection works, but it is not true for functions which are the result of intentional selection.

I suggest that the function of an artifact is the purpose or end for which it was designed, made, or (minimally) put in place or retained by an agent. Once again, its function is the effect for which it was selected, but the selection is usually intentional selection by an agent.¹¹ Since there will often be several agents involved, and each might have a different purpose, we might want to distinguish between 'design functions', 'user functions', 'occasion functions', and so on. The everyday notion of an artifact's function is context sensitive, and in some contexts one intentional agent can take precedence over another. However, although the particular context might highlight the intentions of the user, rather than the designer, say, the function of an artifact is always whatever it was selected for. A frying pan intentionally seized to hit someone over the head literally becomes a weapon on that occasion, because the user selected it for that use on that occasion, but its standing function is frying food because that is the effect for which it was designed and bought.

Because intentional design has a very different *modus operandi* from natural selection the constraints differ. Whereas evolved functions must be generalizable over types, artifact functions may be idiosyncratic. Unique inventions, like the additions to James Bond's brief case, can have proper functions peculiar to them because they can be individually selected for particular effects. Also, because intentional agents do have foresight, there need be no past performances of the functional effect, nor any 'ancestral' artifacts to do any performing. It is enough, in the case of intentional selection, if the designer believes or hopes that the artifact will have the desired effect and selects it for that purpose.

Griffiths has suggested that, where intentional selection is involved, the agent minimally imagines an artifact and some hypothetical alternatives performing the functional effect. He claims that this imagined relative success in performance plays a causal role in producing the item. But intentional selection need not always involve an explicitly imagined performance of the functional effect by the artifact and hypothetical alternatives. It needn't always involve comparative trial and error testing in the imagination. For one thing, inventing might sometimes be a purely cognitive and inferential affair—so that reason alone, rather than imagination, sometimes leads to the design outcome. For another, in some cases there may be only one apparent way to achieve a desired outcome, so there may be no comparison with alternatives. Griffiths' suggestion has the merit of attempting a univocal

¹¹ As a number of people have pointed out, there are also artifact functions that derive from a selection process more akin to natural selection. This can occur, for example, where trial and error results in a successful artifact, and the artifact is copied by artisans who do not fully understand how each feature of the artifact contributes to its functioning, but know that if the whole is copied exactly the desired outcome will be achieved.

analysis of the notion of 'selection' as found in 'natural selection' and the 'selection of artifacts'¹² but unfortunately it does not succeed.

Natural selection is one type of selection process, which counts literally as such, through the death of a rewarding metaphor. It has both important differences and similarities to intentional selection by an agent. Some of the important differences have been noted in this section. One feature they share, is that the products of both lend themselves to teleological explanations. That is, they both give rise to what Wright called 'consequence-etiologicals', which are causal explanations of a special kind, those in which an effect of the trait being explained 'plays a role'. The role played, however, depends upon the kind of selection process. In the case of natural selection, effects of past instances of that type of trait causally contribute to increased replication of the trait. While in the case of intentional selection, it may be that a mental representation of the effect is what plays the causal role.

To summarize the main point of the last two sections: teleological explanations of the functional variety are like purposive explanations, in that they explicitly refer to a future effect of a trait for which that trait was selected. In doing so they explain the trait by implicitly referring to the causally efficacious selection process from which it resulted. We do not understand teleological explanations correctly, as a species of ordinary causal explanation, unless we understand that they are not only explicitly 'forward-looking' but also implicitly 'backward-looking', and it is only in virtue of this implicit looking back to prior causes that teleological explanations are explanatory.

IV. The Propensity Theory and Functional Explanations

These claims run contrary to claims made by Bigelow and Pargetter in their paper on functions [3]. They claim, in effect, that if biological function is a genuinely teleological notion then the theory required to explicate the notion is some kind of propensity theory. According to their propensity theory, a function is a disposition apt for selection. They suggest that a *biological* function confers upon the creature that possesses it a survival-enhancing propensity, and that a biological function is a disposition to systematically contribute to the creature's survival in its 'natural habitat'. Bigelow and Pargetter concede that their theory is 'revisionary' but argue that it is motivated by two major considerations. (1) They believe that the etiological theory is the best alternative to their theory, but that there are serious objections to the etiological theory, and (2) they believe that their theory restores explanatory power to functions. The objections to the etiological theory have been dealt with elsewhere (as mentioned in the introduction to this paper). Here I will concentrate on (2)—the alleged success of the propensity theory in restoring explanatory power to functions. I will give their claim a little more flesh, and then assess it.

¹² Griffiths offers this an extension of Darden and Cain's 'Selection Type Theory' [8].

Bigelow and Pargetter believe that the propensity theory captures the 'forward-looking' nature of functional explanations because, according to the propensity theory, functions are dispositions apt for selection *in the future*. Its main advantage, as they see it, is related to this. They believe the propensity theory restores significant scientifically respectable explanatory power to functions by allowing us to explain the evolution of a trait by saying that a trait evolves because it serves a function. They do not explicitly talk of teleology, but the puzzle they address at the start of their paper is the teleological puzzle with which we are familiar. They describe it as follows:

Even when a character does perform its supposed function, the future events that result from it cannot play any significant "scientific" role in explaining the nature and existence of the character. The character has come into existence, and has the properties that it does have, as a result of prior causes . . . So it is hard to see what explanatory role functions could have. Crudely put—backwards causation can be ruled out—structures always have prior causes—hence reference to future events is explanatorily redundant. Hence functions are explanatorily redundant. [pp. 181-182]

They complain that although some alternative theories are 'nearly right or partly right',

. . . they do not restore to functions any significant explanatory power. In particular, they deny to functions any causal efficacy. So, for instance, they will not permit us to explain the evolution of a trait by saying that it evolved because it serves a specific function. [p.182]

We are now in a position to see that the claim that the propensity theory restores significant explanatory power to functions is false.

To begin with, the propensity theory does not capture the general pattern of teleological explanations. It is true that the propensity theory is forward-looking, but the trouble is that it *only looks forward*. As we have seen, teleological explanations can explain present items because talk of their purposes or functions involves implicit reference to prior causes, specifically past selection processes. However, understood according to the propensity theory, talk of functions involves no implicit reference to prior causes. According to it, talk of functions only has implicit reference to future selection, but future selection can only explain future instances of traits, not present ones. So the propensity theory clearly fails to permit functions to explain all they seem to explain. When we say that koalas have pouches to protect their young, we take ourselves to be explaining why presently existing koalas have pouches, not why future generations of koalas will have pouches.

Still, it is independently of interest whether the propensity theory bestows on functions some other significant form of explanatory power. Bigelow and Pargetter claim that the propensity theory allows us to explain the evolution of a trait by saying that it evolves because it serves a function. But this claim fares no better when considered independently, apart from

its relevance to teleology. There is a distinction between a trait *servicing* a function and *having* a function. The parson's pocket bible that fortuitously stops the bullet from killing the parson *serves* as a bullet-stopper, but does not have bullet-stopping as its function. A trait serves a function Z just as long as the trait does Z, and if a trait cannot do Z, it does not serve the function of Z-ing, even if Z-ing is its function. (It is the function of all kidneys, diseased or otherwise, to filter the blood, but if they are very diseased they will be incapable of performing, or serving, this function.) So having a function and serving a function are different matters. It follows that any account of what it is to *have* a function will allow us to say that traits evolve because they *serve* a function, simply because a trait need not have a function in order to serve it. The claim made on behalf of the propensity theory, if taken literally, is thus a claim to which all extant theories of function are entitled.

There is, perhaps, a more interesting and less trivial interpretation of the claim made on behalf of the propensity theory. What may have been meant (although it was not said) was that the propensity theory permits us to say that characters evolve because they perform their proper function. This is more substantial. Now the claim is that traits evolve because they have a function which they also serve. I want to make two points relating to this.

First, it approximates the truth only if we accept the propensity theory's revision of our function talk. According to current usage, a new mutation has no function. At best it has accidentally beneficial effects. This accords with the etiological account, which says that new mutations have no function until they have been selected for their fitness-enhancing effects. Of course we cannot rule out the possibility that some revision of our function talk may be necessary, but I question the alleged necessity for revision in this case. We have no theoretically driven need to say that a newly mutated trait evolves because it *has* a function, it is sufficient to say that it evolves because it serves it.

At best, and given a certain amount of revision, the propensity theory permits us to paraphrase evolutionary findings that can be expressed in other terms. How much is paraphrased is unclear. Sometimes Bigelow and Pargetter say that functions are survival-enhancing propensities, and sometimes they say they are dispositions apt for selection in the creature's 'natural habitat'. But a disposition to enhance survival and a disposition to be selected are not quite the same thing: reproductive functions (for example, giving birth or chest-beating by male gorillas) often endanger life and so are not survival-enhancing, but they are fitness-enhancing, and so are apt to be selected. Aptness for selection must also include heritability, and competitiveness with current alternatives. More or less can be built into the propensity account of 'function' depending on how we interpret it. Reading the propensity theory thinly, it will often be true that a trait evolves (in part) because it has a 'function' (i.e. because it systematically enhances survival, or less thinly, because it systematically enhances fitness in the creature's 'natural habitat').

The problem is, however, that we can easily express this in other terms, and we can be more exact in the process—that is, simply by saying that a trait evolves (in part) because it systematically enhances fitness, or in other words, because it is adaptive in the actual environment. Reading the propensity theory richly, if a trait has a 'function' (i.e. is apt for selection in the creature's 'natural habitat') then it will generally be true that the trait will evolve—it will evolve, accidents (etc.) aside, if the creature is in its 'natural habitat'. But once again, I can see no advantage of an explanatory nature in our being able to express the matter this way. The propensity theory permits us to say that a trait evolves because it has a 'function' (barring accidents and given that the creature is in its 'natural habitat') which is just to say that a trait evolves because it is apt to evolve.

I sometimes think that the appeal of the propensity theory is due to a piece of faulty reasoning that can be captured as follows:

(P₁) Biologists say the bee-sting evolved because it protected the hive.

(P₂) Protecting the hive is the proper function of the bee-sting.

(C) So, biologists say the bee-sting evolved because it performed its proper function.

The argument is invalid, however, if C is understood *de dicto*. The etiological theory permits us to agree with P₁ and P₂ while rationally denying C, understood *de dicto*. According to the etiological theory, protecting hives is the bee-sting's proper function only after selection of it for that effect. Thus the bee-sting is selected for protecting the hive—true; but initially this is not the bee-sting's proper function, although it subsequently becomes so.

The propensity theory does not restore significant explanatory power to functions. It also has other problems as a theory of functions, but it is not my purpose in this paper to provide an overall critique of the theory.¹³

V. Some Closing Remarks

The teleological notion of a 'function' is critical to modern biology for two

¹³ I will briefly mention three. (1) The theory relies crucially on an unanalysed notion of a 'natural habitat'. For useful comments on this, see Millikan [22, p.300]. (2) Functions do not seem to be dispositions apt for selection, or dispositions of any other kind. Items which have functions in common do not always have dispositions in common (an atrophied thyroid gland has the function of producing thyroid hormones in appropriate quantities, but it does not have the disposition to perform this function—its disposition is quite different from that of normal thyroid glands, and different again from that for hyperthyroidism). (3) Contrary to the propensity theory, dysfunctional traits are dysfunctional precisely because they have functions that they are supposed to perform, but which they lack the disposition to perform. So the propensity theory makes a nonsense of talk of dysfunction, which in turn has disastrous ramifications for the role of the notion in defining biological categories. It is in virtue of their proper functions, not in virtue of their actual capacities, or their morphology, that most parts and processes in organisms are classified, as I briefly explain in the closing remarks.

main reasons, and I want to note these very briefly before closing.¹⁴ First, the notion is the ‘conceptual glue’ of biology, in the sense that a great proportion of biological categories are functionally defined, as Beckner once argued [2, pp. 112-118]. Take the heart, for instance. Biologists need and have a category that ranges across species, but hearts are morphologically diverse across different species. Some hearts have a single pump with one auricle, some a single pump with two auricles, some have a ventricle partly partitioned, and some, like us, have the two separate ventricles. Hearts are also morphologically diverse within a species, because of pathological deviations from the norm, due to disease, injury or deformity. They are all, however, *organs for pumping blood*. Not that all instances of hearts are able to pump blood. Some are too disabled. However, they are all *supposed* to pump blood; by which I mean that pumping blood is what they were selected for—it is their proper function. Secondly, the notion plays an obviously central role in ‘functional analysis’ which is aimed at describing how an organism functions normally (and, in medicine, how it dysfunctions, or what happens when it functions abnormally). The physiologist’s analysis of the human digestive or circulatory system, for example, proceeds by way of a decomposition of the system into its functionally individuated parts (the stomach, the oesophagus, etc.), and in turn their functionally individuated parts, and then theirs, and so on, down to the cellular and sub-cellular level. And then a description of the proper function of each part is given, that being the contribution of each part to the functioning of the whole, when the system is functioning properly.¹⁵

Although Beckner and Cummins were correct about functions having other theoretical roles in biology, they were wrong in thinking that teleology in biology must be a scientific scandal in post-Creationist times. The biological notion of ‘a function’ is a genuinely teleological notion. Teleological explanations do not play a significant role, as such, in evolutionary theory, and they certainly do not substitute for evolutionary explanations of the origins or persistence of traits. However, if my claims in this paper are correct, teleological explanations based on biological function are a perfectly respectable form of elliptical causal explanation. According to the etiological theory I defend, talk of functions involves forward-reference to the effects that items or traits are supposed to have, and also an implicit backward-reference to a causally explanatory selection process, during which those items or traits were selected for those effects which are their functions. This parallels other teleological explanations that are apparently less problematic. The etiological theory can therefore explain some otherwise

¹⁴ Our interest in this notion has additional motivation, since it is now employed in various naturalistic and teleological theories of mind and language, for example see Dennett [9, ch. 8]; Lycan [15, chs. 4, 5 and 6]; Millikan [20]; Papineau [23]; Sober [26]; and Sterelny [27].

¹⁵ Cummins [7] has a useful discussion of functional analysis. However, he suggests that the notion involved is what I call a ‘causal-role function’, which is a causal contribution to any complexly achieved overall activity (of the system concerned) in which we happen to be interested. In [19, section 7] I discuss problems with this.

anomalous facts about our attitude to explanations that purport to be teleological, although they appeal to biological function. They *are* genuinely teleological, if this theory is correct.

Australian National University

Received August 1990

Revised October 1990

REFERENCES

1. F. Ayala, 'Biology as an Autonomous Science', *American Scientist* 56 (1968) pp. 207-221.
2. M. Beckner, *The Biological Way of Thought* (New York: Columbia University Press, 1959).
3. J. Bigelow and R. Pargetter, 'Functions', *The Journal of Philosophy* 84 (1987) pp. 181-196.
4. C. Boorse, 'Wright on Functions', *The Philosophical Review* 85 (1976) pp. 70-86.
5. C. Boorse, 'Health as a Theoretical Concept', *Philosophy of Science* 44 (1977) pp. 542-573.
6. J. Canfield (ed.), *Purpose in Nature* (Englewood Cliffs, N.J.: Prentice Hall, 1966), 'Introduction'.
7. R. Cummins, 'Functional Analysis', *The Journal of Philosophy* 72 (1975) pp. 741-765.
8. L. Darden and J. A. Cain, 'Selection Type Theories', *Philosophy of Science* 56 (1989) pp. 106-129.
9. D. Dennett, *The Intentional Stance* (Cambridge, MA: MIT Press, 1987).
10. P. Griffiths, 'Functional Analysis and Proper Functions', *British Journal for Philosophy of Science* (forthcoming).
11. C. G. Hempel, 'The Logic of Functional Analysis' in L. Gross (ed.) *Symposium on Sociological Theory* (New York: Harper & Row, 1959) pp. 271-307.
12. D. Hull, *Philosophy of Biological Science* (Englewood Cliffs, N.J.: Prentice-Hall, 1974).
13. F. Jackson and P. Pettit, 'Functionalism and Broad Content', *Mind* 47 (1988) pp. 381-400.
14. E. Levy, 'Networks and Teleology' in *Philosophy & Biology: Canadian Journal of Philosophy*, Supplementary Vol. 14. (1988).
15. W. Lycan (ed.), *Mind and Cognition: A Reader* (Cambridge, MA: Blackwell, 1990).
16. E. Nagel, 'Teleology Revisited', *The Journal of Philosophy* 84 (1977) pp. 261-301.
17. K. Neander, *Abnormal Psychobiology*, Ph. D. thesis, La Trobe University (1983).
18. K. Neander, 'Discussion: What Does Natural Selection Explain? Correction to Sober', *Philosophy of Science* 55 (1988) pp. 422-426.
19. K. Neander, 'Functions as Selected Effects: the Conceptual Analyst's Defense', *Philosophy of Science* 58 (1991) pp. 168-184.
20. R. G. Millikan, *Language, Thought and Other Biological Categories: New Foundations for Realism* (Cambridge, MA: MIT Press, 1984).
21. R. G. Millikan, 'Thoughts without Laws: Cognitive Science without Content', *The Philosophical Review* 95 (1986) pp. 47-80.
22. R. G. Millikan, 'In Defense of Proper Functions', *Philosophy of Science* 56 (1989) pp. 288-303.
23. D. Papineau, *Reality and Representation* (Oxford: Blackwell, 1987).
24. M. Ruse, *The Philosophy of Biology* (London: Hutchinson University Library, 1973).
25. E. Sober, *The Nature of Selection* (Cambridge, MA: MIT Press, 1984).
26. E. Sober, 'Panglossian Functionalism and the Philosophy of Mind', *Synthese* 64 (1985) pp. 165-193.
27. K. Sterelny, *The Representational Theory of Mind* (Oxford: Blackwell, 1990).
28. W. Wimsatt, 'Teleology and the Logical Structure of Function Statements', *Studies in the History and Philosophy of Science* 3 (1972) pp. 1-80.
29. L. Wright, 'Functions', *The Philosophical Review* 82 (1973) pp. 139-168.
30. L. Wright, *Teleological Explanation* (Berkeley: University of California Press, 1976).