Title: Edmond Goblot's (1858-1935) Selected Effects Theory of Function: A Reappraisal

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Abstract: At the beginning of the twentieth century, the French philosopher of science Edmond Goblot wrote three prescient papers on function and teleology. He advanced the remarkable thesis that *functions are, as a matter of conceptual analysis, selected effects*. He also argued that "selection" must be understood broadly to include both evolutionary natural selection and intelligent design. Here, I do three things. First, I give an overview of Goblot's thought. Second, I identify his core thesis about function. Third, I argue that, despite its ingenuity, Goblot's expansive construal of "function" cannot be right. Still, Goblot deserves (long-overdue) credit for his work.

Keywords: Philosophy of biology; Edmond Goblot; biological function; selected effects

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1. Introduction

According to the selected effects theory of function, a biological trait's *function* is, very roughly, whatever it was selected for by natural selection (or some comparable selection process). The function of the butterfly's eyespots is to deflect attack away from vital organs because that's what they were selected for. A chief virtue of the selected effects theory is that it makes sense of how function statements can work as teleological explanations – which is implicit in at least some strands of biological usage. If functions are selected effects, then when we attribute a function to a trait (say, deflection of attack to eyespots) we are quite literally offering an explanation for *why that trait exists*. No other account of function – perhaps with the exception of the "organizational theory" – even purports to make sense of this feature of biological usage.

A consensus among philosophers of biology is that the selected effects theory was first formulated independently by Neander (1983) and Millikan (1984), though perhaps earlier work such as Wright (1973), Wimsatt (1972) and Ruse (1971), gestured in that direction. One goal of this paper is to challenge that consensus. The forgotten French philosopher of science, Edmond Goblot (1858-1935), should be credited with formulating the theory, or at least an early incarnation of it. In a series of papers, Goblot (1899; 1900; 1903) argued, quite rigorously and explicitly, first, that function statements are teleological explanations, and second, that function statements can be teleological explanations only if *functions are selected effects*. My goal is not in any way to undermine the originality and insight of Neander, Millikan and their followers. It is rather to ensure that Goblot receives long-overdue credit for his prescient discovery.

But this paper does not simply have the goal of insisting that Goblot receive some intellectual credit. That fact alone would be worthy of an extended footnote in a philosophy of biology textbook, and not a whole paper. Goblot, however, did much more than that. He articulated a very distinctive (even by today's standards) version of the selected effects theory. For Goblot, "selection" was much more inclusive than evolutionary natural selection. It was even more inclusive than the abstract notion of "differential reproduction," or "differential retention," as some would have it. For Goblot, "selection" refers to a very general process wherein *one possibility is realized, to the exclusion of another, by virtue of an apparent advantage*. For Goblot, evolutionary natural selection, and intelligent design, are two subtypes of this abstractly-specified process.

Moreover, Goblot seemed to think that *this* claim – that functions are selected effects (when "selection" is broadly construed) – is *a conceptual analysis of both lay and scientific use of "function."* If Goblot were right, that would be game-changing even by today's standards. For it would imply that the selected effects theory, properly grasped, embraces both biological and artifact functions, scientific and lay usage, modern and ancient usage. This expansive construal of the selected effects theory deserves serious consideration.

To be fair, some philosophers of biology have flirted with expanding the selected effects theory to be more inclusive, that is, to allow processes other than evolutionary natural selection to produce new functions. These thinkers include Millikan (1984) herself, Papineau (1984), Godfrey-Smith (1992), Griffiths (1993), Kitcher (1993), and Garson (2011). Dennett (1969), Wimsatt (1972), and Wright (1973) also gestured toward the possibility of such an all-encompassing theory. Goblot, however, is unique in that he joined two ideas that nobody else joined: First, he attempted to specify, rigorously and precisely, the nature of this general process *of which* natural selection and intelligent design are subtypes. Second, he posited that this fact, that functions are selected effects – when selection is understood in this expansive way – is part of a correct conceptual analysis of "function." This is a new thing.

Unfortunately, it seems to me that, while there's something right about Goblot's expansive way of thinking about functions, his particular construal of function cannot be right. That's because there's no single *kind* of process in the world of which natural selection and intelligent design are subtypes. The illusion that there is a single kind of process in nature arises from a hidden equivocation in the very idea of "selection for an advantage." As I'll show, one sense of the phrase points to human choice; the other to evolutionary natural selection; these – as Darwin himself recognized – cannot be fused in any non-metaphorical way. Though Goblot's attempt fails, it's a quite *noble* sort of failure, one that still demands a serious philosophical reckoning.

2. Goblot's Basic Account of Function and Teleology

Goblot wrote two major papers on the topic of function and teleology, "Fonction et Finalité" of 1899 and "La Finalité Sans Intelligence" of 1900.[1] Crucially, Goblot intended the two papers to be read as a continuous whole. This can be seen from the fact that the purpose of the first paper is to raise a general problem about biological functions, and the purpose of the second paper is to solve that problem. In fact, the first paper actually ends with the parenthetical remark "*A suivre*" – "to be continued." This is important for us, because it helps us to see that the two papers are intended to be read as one long meditation on functions.

Though the two papers are meant to be read as one, each pursues a distinct question and offers a distinct thesis. The first paper, "Fonction et Finalité," argues that *function statements are teleological explanations.* When we say, for example, "the function of the eyespots on butterfly wings is to deter attacks away from vital organs," we are, in ordinary biological discourse, trying to explain *why butterfly wings have eyespots*. The second paper, "La Finalité Sans Intelligence," argues that teleological explanations are grounded (in a way to be determined) by evolutionary natural selection. Hence, on the surface, his position seems nearly identical to that which Larry Wright developed in

[1] A third paper, his "La Finalité en Biologie" of 1903, is a commentary on other works and will not be discussed here.

1973: function statements are teleological explanations (a trait has a function if the trait "is there because" it serves the function), and one way that a trait can have a function is if it was shaped by natural selection for the effect in question.

As we will see, however, Goblot goes much further by arguing that functions *are just* selected effects, where selection must be construed broadly enough to include both evolutionary natural selection and intelligent design.[2] Before diving deeply into Goblot's analysis, I'll turn to the text to draw out Goblot's own presentation of these two theses. Any further analysis we conduct must be based squarely on Goblot's own words.

His first paper argues that the function of a trait is not just any useful effect it happens to have. Rather, a trait's function is the effect that the trait (in some sense) was *made for*. It's an effect that plays into an explanation of the trait itself. He begins his analysis by pointing out that functions, in the ordinary biological sense of the term, are peculiar and worthy of serious philosophical reflection:

> Of the properties of cells, tissues, and organs, some are, and others are not, *functions*. Sometimes scientists intentionally use this word *function*; sometimes on the contrary they take care to avoid it; the definition is difficult, but the use is not at all arbitrary (1899, 495).[3]

He then argues that, in ordinary biology, we only call something a "function" when we think that the effect in question is somehow part of an explanation for the trait's existence:

> The blood cell fixes atmospheric oxygen; it also fixes carbon monoxide and nitrogen dioxide…Of these three chemical properties, only the first one is a function; and the only reason that one calls it that, is that the cell is made to draw, in its passage in the lungs, atmospheric oxygen…If the cell also fixes other gases, these properties are not functions, for it *is not made for that* (1899, 497-8; emphasis in original).

The problem, of course, is that it is very difficult to see how an *effect* of a trait can be part of the explanation for that very trait, unless we are invoking some sort of supernatural principle, such as divine intervention or a mysterious vital force:

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[2] One might think that this is precisely what Wright (1973) was saying, particularly because of his suggestive comments on pages 162-4 about the similarity of the concept of *selection* in natural selection and in intelligent design. One would be mistaken, for reasons to be discussed in Section 4. *Wright did not think that functions were selected effects*, regardless of whether "selection" is construed narrowly or broadly. This was, of course, a major point of Neander's (1983) and Millikan's (1984) critiques. See Garson (2016, Chp. 3) for more on the relevant historical background.

[3] All translations from the French are my own.

> Certain physiologists seem to have a sort of distrust for this idea of finality, which, despite them, can be found in all parts of their science. They dare not look at it directly; finality seems unknowable; for them, it is an anti-scientific, and almost mystical, idea (1899, 499).

Nonetheless, teleology is such a critical part of physiology itself that if we eliminate teleology, we eliminate physiology, too:

> Does there exist, in the facts, a teleological order? Put differently, is physiology possible?...The existence of a teleological order is the postulate of the science of life…The physiologist must therefore assume the reality of a teleological order, as the physicist assumes the reality of a constant and necessary order (1899, 504-5).

That is the puzzle that his paper ends with: teleology seems both impossible and necessary.

The purpose of his next paper, "La Finalité Sans Intelligence," is, as the title indicates, to point the way to a solution. If, in the past, a trait was shaped by evolutionary natural selection for a certain effect, *then that trait exists now precisely because of that effect*. If the flower's nectar glands were selected for attracting insects, then we can rightfully say, *now*, that the nectar glands exist (that is, one reason flowers have nectar glands) *because* they attract insects. When selection is present, a trait's effect can be cited as part of an explanation for its existence, without appealing to theism or vitalism.

> But if it happens that an individual character is an *advantage*, natural selection will make of it a species character, and that because it is an advantage. Hence again there is finality, but finality without intelligence…It is easy to see that these examples [e.g., "the function of nectar glands in flowers is to attract insects"] answer to the definition of finality, for the consequent is the *raison d'être* of the antecedents. Cross-fertilization exists because it causes greater fecundity; nectar glands, large or brilliant corollas, perfumes exist because they have the effect of attracting insects...It would not be exact to say that the effect is here the cause of its cause, but it is true to say that it is the reason for it; the existence of the cause is explained by the effects that it produces (1900, 402-3).

And later:

> [After selection,] the final term [that is, the trait with the function which is now a "fixed" species character] no longer has an accidental character, since it is this very advantage, which has become a species character. Utility is the origin of finality; utility characterizes the initial term, it *serves* a certain end, but it is not made for this end; finality characterizes the final term; it is well made for this usage, since it is because of its utility that it became fixed as a species character. (1900, 404).

In sum, Goblot holds that function statements are teleological explanations, and that natural selection can vindicate such explanations, since natural selection shows how a trait's effect can play a role in an explanation of that trait's existence. As we will see, however, Goblot thinks that the relation between function and selection is, in fact, even more intimate than this.

3. Rethinking Teleology as Selection

What is really innovative about Goblot's thought, even by today's standards, is what I take to be his core thesis about biological functions, one that is never stated explicitly but implied throughout the text.[4] I will try to articulate the view as follows: *As a matter of conceptual analysis, an object has a function when it is the result of an abstract kind of selection process. In this selection process, one possibility is realized to the exclusion of another on account of something like "the appearance of an advantage* [l'apparition d'un avantage]*." The function of the object is just this advantage. Evolutionary natural selection, and intelligent design, are two different subtypes of this abstract process.*

My main textual evidence that this was, in fact, Goblot's view of function, stems from the extraordinary closing section of "La Finalité Sans Intelligence." There, he states that *all* teleology, intelligent or not, somehow involves *a selection between possibilities and the preferential realization of one over another*:

> All finality, intelligent or not, is a *choice* between possibilities…Natural selection is the effective *trial* of all of the possibilities. The one which is the best wins only by proof of its superiority. Intelligent finality is more rapid and economical, since the possibilities are judged before being tried; or rather, the trials are made ideally instead of being carried out. It is also therefore a sort of selection, which operates between ideas. The God of Leibniz conceives in thought all of the possible worlds; he compares them, judges them, and realizes the best...There is therefore, in the divine understanding, *competition* between the possible worlds and *selection* of the best. Things are no different in our own deliberations. There is a competition between the diverse choices we can make, and selection of that which is or which seems to us the best. The initial term is always the appearance of an advantage; the final term the realization of this advantage. The analogy is therefore complete between intelligent and unintelligent finality; only intelligence abridges the path and diminishes the effort. Finality, therefore, is not at all the characteristic mark and like a seal of intelligence imprinted on its works. Intelligent finality is a specific mode of finality in general. (405-6)

[4] Bonsack (1976) is the only paper that I've encountered that critically engages with Goblot's teleology. His main complaint is that Goblot defines *finalité* differently in different places, and that he introduces inappropriate value notions. I agree with thrust of his critique, but I find a unified notion of biological function underlying Goblot's presentation. (I thank Antoine Dussault for drawing Bonsack's paper to my attention.)

In this passage, Goblot leads us through three major areas where teleological statements loom large, and shows us that, in each of the three domains, teleology exhibits the same fundamental pattern. First, he asks us to consider intelligent design in the creationist worldview. Suppose we are willing to agree that some feature of the world is designed by God for certain end. We can then ask ourselves: what exactly is God doing when God "designs" something? It consists in none other than this: God somehow *surveys* a vast array of possibilities, and *chooses* to realize one possibility over another because of an apparent advantage.

In the lengthy passage cited above, Goblot is quick to point out that the same pattern is exemplified in *human* decision-making. When a person designs something, something takes place in her mind that is like a competition between imagined possibilities, and one possibility is ultimately realized, over another, because of an apparent advantage.[5]

Finally, and most importantly, Goblot sees evolutionary natural selection as conforming to this basic pattern. Natural selection, he thinks, involves a *competition between possibilities*, wherein one possibility is realized, over another, because of the appearance of an advantage. At this juncture, one might suspect that Goblot is playing a semantic game with us, or that he is abusing the natural contours of ordinary language. Surely, natural selection isn't a competition between *possibilities*! To the extent that natural selection is a "competition," it's a competition between *actual* organisms (cells, groups) and not merely *possible* ones.

Though natural selection must be seen as a competition between *actual*, rather than *possible*, beings, for Goblot, natural selection is also, and at the same time, a competition between *possible species characters*. When a new variant arises in a population through a genetic mutation – say, the first butterfly with eyespots on its wings – that variant represents a *possible species character*. It is not yet an actual species character; it must compete with other variants to earn that title. One thing that natural selection does is that it takes a possible species character and transforms it into an actual species character because of an advantage it possesses:

> But if it happens that an individual character is an *advantage*, natural selection will make of it a species character, and that because it is an advantage. Hence again there is finality, but finality without intelligence…(1900, 402)

[5] Christophe Malaterre has pointed out to me that the French text admits of a different interpretation, where "our own deliberations [nos propres délibérations]" refers to an *inter*personal, rather than *intra*personal, decision-making process. For example, we can speak of a committee "deliberating over" various social policies. This interpretation would still imply that the kind of function a social policy has is the same *kind* of thing as the kind of function that a biological organ has.

It is because of this somewhat unconventional perspective on natural selection that Goblot can see it as conforming to the basic pattern of teleology in other domains.

4. Convergence and Divergence

As I noted earlier, Goblot is not the only person to suggest a deep similarity between natural selection and intelligent design. Many philosophers have hinted at a deep connection, even identity, between the two sorts of things. It is impossible to do justice here, in a rather short paper, to the rich similarities and differences between these theorists. Here it will have to suffice to say this: nobody, with the exception of Goblot, has ever held this convergence of ideas:

(1) Functions are selected effects.
(2) "Selection" in (1) must be understood very generally to encompass natural selection and intelligent design.
(3) (1), understood in terms of (2), is a conceptual analysis of both ordinary and scientific language.

An all-too-brief perusal of the literature will show exactly how and where Goblot departs from others. To begin with, Wright (1973) didn't accept (1), at least not as a conceptual analysis. He thought that, as a matter of conceptual analysis, a function of a trait is just an effect that explains the trait's existence. He does discuss the similarity between natural selection and intelligent design, and even the idea that they both exemplify, in a very abstract way, a kind of "selection process" (see pp. 163-4), but he never *identifies* function, as a matter of conceptual analysis, with this abstract "selection process." He identifies it with what he calls a "consequence-etiology."

Wimsatt (1972, 13) seemed to accept that, empirically speaking, functions probably always involve selection, where "selection" is understood broadly to encompass both natural selection and intelligent design: "the operation of selection processes is not only *not* special to biology, but appears to be at the core of teleology and purposeful activity wherever they occur." But he adamantly rejected that this should be understood as a conceptual analysis.

Dennett (1969), too, describes a deep analogy between natural selection and learning, and even suggests that selection is at the root of teleology itself (64), though he does not develop this insight into a theory of "function" *per se*. In fact, Dennett has pursued this analogy throughout much of his work, particularly in his classification of "Darwinian," "Skinnerian," and "Popperian" creatures (1995), each of which involves the operation of different sorts of selection processes.

Millikan (1984) defined functions in terms of a general process involving the differential reproduction of one type of entity over another. Her view of "reproduction" is expansive enough to include trial-and-error learning and learning by imitation (p. 28). But in her view, differential reproduction does *not* include the process wherein a person creates an

artifact for the first time. (The first hammer did not have a history of differential reproduction on account of its past success.) Goblot's view is, therefore, more inclusive than hers. Similarly, Papineau (1984, 557-8) states that mental states can undergo natural selection within the lifetime of an individual, and thereby acquire (selected effects) functions – but not, presumably, the artifacts that are produced by said mental states.

Kitcher (1993), to whom I'll return in the next section, says that function is "design," as a matter of conceptual analysis, and that natural selection and intelligent design are two subtypes of this "design." Unlike Goblot, however, he does not articulate what "design" is supposed to be *such that* it encompasses both. That is, he never articulates what this non-metaphorical form of "design" is supposed to amount to, other than alluding to Darwin's view that natural selection can be seen as a kind of "design without a designer."

Neander (1991) holds that functions are selected effects, but only in the sense of Darwinian natural selection. Hence, her theory of function is only supposed to apply to the biological sort of function, and it is only intended as a conceptual analysis of *modern biological usage*. She notes, in passing, the possibility of a theory like Goblot's, but chooses not to develop it in any detail (p. 175).

Griffiths (1993) sketches a theory of artifact function that rests on the idea that artifacts come from a kind of "competition" of ideas. But he says explicitly that natural selection and artifact design are quite different things and that there is no single concept of function that applies to both (p. 421).

5. A Critique

If Goblot were right, that would be a game-changer for contemporary philosophical discussion of function and teleology. That is because it would give us a version of the selected effects theory that effortlessly captures teleology in every domain in which it arises, both natural and conscious, human and divine. It would also, as a conceptual analysis, unify both modern and ancient usage, as well as scientific and lay usage. For Goblot, by "function," *everybody has always meant selected effect*.

Unfortunately, Goblot's expansive analysis of function simply does not work. The reason is that *there is no single kind of process in the world, loosely called "selection for an advantage," of which both natural selection and intelligent design are two subtypes*. There is only a strained analogy. Goblot's view relies, ultimately, on an unacceptable anthropomorphism.

The crux of the matter is this: in the standard selected effects theory, an object's effect becomes that object's function by virtue of the fact that that sort of object has an *actual, historical, track record* of producing that effect. Having an *actual, historical track record* of producing a given effect is necessary for having a function, in the ordinary selected effects sense. Artifacts, however, are not subject to this constraint. As far as artifacts go, it is possible for the effect of some artifact to be its function even if that artifact has no

actual, historical track record of producing that effect. Neander (1991, 174-5) makes precisely this point in enumerating the differences between natural and artifact functions. The very first twist corkscrew that was ever invented, back in 1795 by the Reverend Samuel Henshall, no doubt had the function of opening wine bottles, even though it had no actual historical track record of doing so. True, there may have been a kind of "virtual selection process" involved in the production of the first spiral corkscrew, a selection process that took place in the Reverend's mind. *But the physical corkscrew, that is, that physical type of thing, was not selected because it actually ever opened a wine bottle, since it had never done so*. It was selected because someone (namely, Henshall), *thought*, or *surmised*, or *believed*, or *reckoned*, or *figured*, that it would have that advantage. But anticipated advantages are not real advantages, any more than imaginary ponies are real ponies. To say that all function involves something like "selection for an advantage" obliterates that distinction.

Let me put the point somewhat differently: Goblot's argument involves a fallacy of equivocation. In the fallacy of equivocation, two or more premises only seem to support a conclusion because of a critical ambiguity in a word or phrase that appears in the premises. Goblot, I maintain, is guilty of such an equivocation. We can reconstruct his argument as follows: *natural functions involve selection for an advantage; artifact functions involve selection for an advantage; so, natural and artifact functions both involve selection for an advantage*. The ambiguity is this: in the first premise, the "advantages" in question are real, actual advantages; in the second, the "advantages" in question are merely imagined or hoped for. But imagined advantages are not real advantages – any more than imagined ponies are real ponies.

The problem is analogous to the problem in Kitcher's (1993) theory of function. Kitcher attempts to define "function" simply and solely in terms of "design." He then says that human invention, and Darwinian natural selection, are two subtypes of this "design." The problem is that the apparent unity of the concept of function is purchased at the cost of an equivocation: there is no single kind of thing called "design," of which human choice and natural selection are subtypes. The latter is "design" in name only; it is a clever anthropomorphism to speak of natural selection as a form of design, but this analogy cannot bear any real theoretical weight.[6]

6. Conclusion

If Goblot is wrong, then what is the right way to think about function and selection? First, if we are to maintain that functions are selected effects, we should continue to understand "selection" in a *relatively* narrow sense which requires (not as a sufficient condition, but as a necessary one) something like an actual history of differential reproduction, or differential retention, on account of the effect in question. It is not enough that some agent *hopes* or *anticipates* or *surmises* that the object will have the relevant effect. In

[6] That said, there is much to appreciate in Kitcher's view, in particular the distinction between selection having a "direct" versus an "indirect" role in a trait's function.

contrast, functions in the realm of *artifacts* come about because the artifact bears the right kind of relationship to an agent's mental states – though the precise nature of that relationship remains highly contentious. But I think we should give up the search for a unified theory of biological functions and artifact functions. Too many smart people have tried and failed for that to be a fruitful endeavor.

Now, it may very well be true that, as a rule, when someone produces an artifact, that event of production is preceded by something like a *virtual selection process* in the agent's mind. Dennett (1995) calls us "Popperian creatures" for our ability to carry out a hypothetical trial-and-error in our minds before implementing our schemes in the real world. But this, in my view, is incidental to an artifact's having a function. It is not by virtue of the fact that a selection process takes place "in the designer's mind" that the artifact acquires a function. As Wimsatt (1972, 15-16) argued some time ago, if God is real, and if God had a creative hand in designing the universe or some of the things in it, he wouldn't have had to go through anything like a virtual form of trial-and-error in order for his creations to have functions. He would have just known what to do.

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