

On Several Misuses of Sober's *Selection for/Selection of Distinction*

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Abstract

Teleological Theories of mental representation are probably the most promising naturalistic accounts of intentionality. However, it is widely known that these theories suffer from a major objection: the Indeterminacy Problem. The most common reply to this problem employs the Target of Selection Argument, which is based on Sober's distinction between Selection for and Selection of. Unfortunately, some years ago the Target of Selection Argument came into serious attack in a famous paper by Goode and Griffiths. Since then, the question of the validity of the Target of Selection Argument in the context of the Indeterminacy Problem has remained largely untouched. In this essay, I argue that both the Target of Selection Argument and Goode and Griffiths' criticisms to it misuse Sober's analysis in important respects.

1- Introduction

One of the main goals of naturalistic accounts of the mind is to provide a naturalistically acceptable account of mental representations. Nonetheless, while this naturalistic framework has been assumed by many people, it has turned out to be very difficult to provide a detailed reductive account of how representations (and hence intentionality) can arise in the natural world. Nowadays, many philosophers agree that the most promising approach is some kind of Teleological Theory of representation, which draws on Stampe (1977), Dretske (1981), and Millikan (1984)'s seminal work.

Unfortunately, despite the good prospects of Teleological Theories, there are still some important problems that have not been satisfactorily addressed. In particular, the Indeterminacy Problem is probably the more prominent objection against this sort of accounts. Since Fodor (1990) originally formulated this problem, many replies have been offered by supporters of Teleological Theories. By far the most common answer boils down to some version of what some call 'the Target of Selection Argument'. In this paper I will first present the Indeterminacy Problem and then consider how the Target of Selection Argument is supposed to deal with it. Then, I will explore Goode and Griffiths' criticisms to this argument and argue that their reasons for rejecting the Target of Selection Argument are misguided. Nonetheless, my goal is not to defend the Target of Selection Argument, but rather to show that both this argument and Goode and Griffiths' criticisms are misapplying Sober's distinction. At the very end, my aim is to uncover several misuses of Sober's selection for/selection of distinction carried out by both friends and foes of the Target of Selection Argument, and all that in the context of one of the most important problems of current naturalistic theories of mind.

A second aim of this paper is to shed some light on the notions of selection for/selection of, which very recently came under attack by Fodor and Piattelli-Palmarini (2010). There is still a vivid discussion about how should we properly understand these notions (e.g. Sober, 2010) and I think considering them in the context of Teleological Theories may help to take a different and original perspective on this issue.

The structure of the paper is the following. In the first section I briefly present the Teleological Theory and the Indeterminacy Problem. Then, I set up the Target of Selection Argument as defended by Millikan, Sterelny and others, and put forward Goode and Griffiths' objection to it. In the last part of the paper, I first argue that Goode and Griffiths are misapplying Sober's analysis, and, secondly, provide some reasons for thinking that the Target of Selection Argument is also misusing Sober's distinction, even if for different reasons.

1.1 Teleological Theories of Representation

Teleological Theories of representation (also called 'Teleosemantic Theories') aim at providing a naturalistic account of the mind.¹ Basically, the idea is to explain the origin of mental representations by appealing to the function of certain biological systems, and then to explain away the notion of function by appealing to evolutionary processes. Let me briefly elaborate on these ideas.

Teleological theories of representation usually assume a so called *etiologial* definition of function. According to this notion, the function of a trait is the effect that explains why this trait was selected for (Ayala, 1970; Millikan, 1984; Wright, 1973). In a nutshell, functions are selected effects (Neander, 1995). For instance, the function of the heart is to pump blood (and not, for instance, making thump-thump noises) because the fact that past hearts pumped blood explains why hearts were selected for by natural selection. Most supporters of the etiologial definition of function claim that this notion of function is not a mere stipulative definition, but a widely used concept in different areas of biology (Godfrey-Smith, 1993; Neander, 2002; for an exception, see Millikan, 1993).

The second step in the teleological approach is to show that this notion of function can explain how mental representations can arise in the biological world. The core claim of these proposals is that some organisms have evolved an internal mechanism whose function is to produce representations. Very roughly, the idea is the following: in an ancient ancestor (or set of ancestors) of some organism it once appeared a mechanism that spread and got fixed in the population because it happened to produce a mental state that correlated with a certain external event.² The reason this mechanism spread and was

¹ The target of some teleological theories is still much broader than that; they try to account for *all* kinds of representation (including, for instance, animal communication). See Millikan (1984, 2004, 2005) and Stegmann (2009).

² Of course, the represented state does no need to be *external* to the organism; for instance, one might have a mental representation of tissue damage in his leg. Nonetheless, I am going to assume that representational mechanisms only represent external states of affairs to keep the discussion as

maintained in the population is that producing these internal states when certain states of affairs obtained was advantageous for these organisms (for instance, because that helped them to get resources, avoid predators...). Hence, organisms having this mechanism outperformed organisms that lacked it. These are the kind of processes that, according to teleological proposals, have given rise to representational mechanisms in the natural world.

When such a mechanism is found in an organism, the function of representational system is to produce certain internal states (the representation) when certain external state of affairs obtains (the represented state of affairs).³ More precisely, the core idea of Teleological Theories can be summed up in the following two theses (TT):

(TT)

A mental state R represents a state of affairs S iff the mechanism M that produces states R has the function of producing R when S obtains.

The mechanism M that produces mental states R has the function of producing R when S obtains iff the mechanism M was selected for because it produced R when S obtained.

So, according to teleological views, R represents S because the fact that R correlated with S was advantageous for the ancestors of the organism, and that is what explains that the representational mechanism was selected for (and hence, why it exists nowadays).

Notice that the theory requires two important features in order for R to represent S. First, R must have correlated with S. This relation is usually understood very weakly; correlation just requires that the presence of R should increase the probability of S's occurrence.⁴ Secondly, the presence of S has to be relevant for the fitness of the organism (again, in a weak sense of 'relevant'). For instance, S can be certain sort of food, a predator, a mate... only if S is relevant for the fitness of the organism (either beneficial or detrimental) can R signaling of S be selected by evolution. In other words, TT requires that the fact that R indicated S must have been advantageous for the organism, since that is what explains that the function of the representational system is to produce R when S obtains, and hence why R represents S at all.

simple as possible and because this is in fact what happens in the main case exposed here. Nothing essential hinges on that assumption.

³ In some theories, what is relevant is not the function of the representational system, but the function of the representation itself (Papineau, 1987, 1993, 1998). For present purposes, I am going to ignore these distinctions.

⁴ More precisely, R correlates with S iff $P(S|R) > P(S)$

The teleological view of representation has turned out to be a quite successful proposal and it is able to deal with most of the problems of other naturalistic theories.⁵ However, despite all these advantages, there is an important objection these theories have not yet been able to address. This well-known difficulty is usually called the 'Indeterminacy Problem'.

1.2 The Indeterminacy Problem

According to 'TT', the content of a representation is determined by what explains that representations of this type have been selected for by natural selection. So, in order to ascertain what a given mental state represents we should look at the state of affairs that correlated with R and whose representation provided an advantage for this kind of organism.

In a nutshell, the Indeterminacy Problem consists in the fact that there are many different states of affairs S that satisfy these conditions. More precisely, there are many different states of affairs that correlated with R and can explain why having those mental states when S obtained was advantageous for the organism. The paradigmatic example used to illustrate this claim is the hunting mechanism of leopard frogs.

1.2.1 Mental Representations in Frogs

The hunting mechanism of leopard frogs (*Rana Pipiens*) has been extensively studied by ethologists since the 50s. There are two biological mechanisms involved in the hunting behaviour of leopard frogs: the visual system and the digestive system (which in frogs includes the tongue-snapping mechanism). On the one hand, the frog's visual capacity is for less accurate than ours. They can only distinguish black moving shadows moving at a certain distance, so they are unable to discriminate between bees, pellets, flies or any other small object that casts a black shadow and moves at certain velocity. Nonetheless, they have evolved a quite successful hunting mechanism: whenever they detect a black moving thing passing in front of them at certain distance at a certain velocity, they throw their tongue out and catch whatever they find at that location (Lettvin et al., 1951, Nishiwaka, 2000). Obviously, due to their poor visual mechanism, many things can elicit this hunting mechanism, but the key point is that in the environment where frogs evolved, usually enough these black moving things were flies.⁶

⁵ Let me mention just two: first, it is able to explain how misrepresentations are possible. Roughly, a representation is false iff the representational mechanism fails to fulfil its function. Secondly, it can explain why a mental state can represent S even if most of the time the representation is false (as happens very often in the biological world). According to 'TT', for R to represent S it suffices if R correlates with S *usually enough* for the representational system to be selected for. Other accounts (such as Causal Theories, Stampe (1977), Dretske (1981)) fail to satisfy both desiderata.

⁶ As it is common in the literature on this topic, I am going to assume throughout the paper that frogs only prey on flies. Even though it is empirically false (Neander, 2006; Nishikawa, 2000), this simplification is going to be very helpful in order to keep the example as simple as possible.

Thus, *prima facie* it seems that 'TT' can explain why frogs represent the presence of a fly. Since producing a mental state every time a fly was present was advantageous for frogs, the correlation between the mental state and the presence of a fly can explain why frogs evolved this mechanism. Consequently, if that were the only candidate for being the content of the mental state, 'TT' would get this case right, and it would lend strong support in favour of the theory.

Unfortunately, the problem illustrated by leopard frogs is that there are many states of affairs other than the presence of a fly that historically correlated with R and whose signaling could have provided an advantage to frogs. For instance, one obvious candidate is the presence of a black moving thing; since in the environment where frogs evolved, usually enough black moving things were flies, signaling *there is a black moving thing* could also explain why the mechanism evolved. Similar stories can be designed with the result that frogs represent *there is food*, *there is a nutritious animal* and many others. Thus, there seems to be too many candidates for being the represented state of affairs and 'TT' falls short of determining a *single* content.

In other words, the problem is that Teleological Theories underdetermine the content of the mental representation; Teleological Theories warrant multiple content attributions in cases where science and common sense would warrant a single content attribution (Martinez, 2010).⁷ So if the teleologist wants to stick at the project of naturalizing intentionality, he needs to find a way of narrowing down the candidates for content attribution, and doing it in a way that roughly satisfies our intuitions. This is what the Target of Selection Argument aims at.

2- Solving the Indeterminacy Problem

The Indeterminacy Problem is probably the most famous objection against Teleological Theories and the one that has convinced more people that this project is essentially flawed. The teleologist desperately needs a reply to it.

In this respect, there is a very common argument that has been highly influential in the debate on Teleological Theories of representation and that in a famous paper Goode and Griffiths (1993) called the 'Target of Selection Argument'. In fact, most philosophers

⁷ One might doubt that science and common sense warrant such a single and specific content attribution. That is, one could argue that the teleological theorist should just bit the bullet and claim that frogs represent something as indeterminate as *there is a moving black thing*, *there is a fly*, *there is frog food*,.... The problem with this suggestion is that if we accept such indeterminacy at this stage, it is going to be very difficult to prevent similar indeterminacy in more complex organisms, where we do have the intuition that there is a more specific content (Price, 2001). In any event, in this paper I discuss the arguments from those who think that Teleosemantics must yield a unique and specific content. Consequently, I am going to assume that the Indeterminacy Problem is an important objection against Teleological Theories.

working in this tradition have used this reasoning without being explicit about it (Agar, 1993; Millikan, 1993; Price, 2001; Shapiro, 1992; Sterelny, 1990). The same argument can also be found in more recent debates that are concerned with evolutionary accounts of more complex representations such as concepts (Prinz, 2002). Given the crucial importance of the argument and the Indeterminacy Problem, I think it deserves careful consideration.

2.1 The Target of Selection Argument

The Target of Selection Argument (TSA) relies on the idea that the Indeterminacy Problem can be solved by specifying more carefully what the mental representation has been *selected for* tracking. Supporters of the TSA claim that if we correctly employ Sober's distinction between *Selection for* and *Selection of*⁸, the alleged underdetermination of content by Teleological Theories will vanish. More precisely, they think the way Sober's analysis can help us to discover the content of mental representations is by assessing the truth of certain counterfactuals.

Let me illustrate how the argument is supposed to work. Suppose we know that there are two states of affairs A and B that usually cause a mental state R. Further, imagine that either R's correlation with A or R's correlation with B is sufficient for explaining why having R was beneficial for the organism (this is the situation that gives rise to the Indeterminacy Problem). The idea underlying the Target of Selection Argument is that in order to know whether R is tracking A or B, we should consider whether the relation between A and R is more robust than the relation between B and R, where robustness is understood as a counterfactual supporting condition.⁹

For example, an instance of the Target of Selection Argument applied to the case of black dots and flies relies on the truth of the following counterfactuals: if black dots had not been accompanied with presence of a fly (but, say, by the presence of a pellets) the representational system would not have evolved, but if flies had not been linked to the presence of black dots (but, say, to the presence of red triangles) frogs would have evolved a representational system sensitive to red triangles. So the relation between flies and frogs is more robust than the relation between black dots and flies. Consequently frogs represent *there is a fly* and not *there is a black dot*. In other words: in the nearest possible world (or maybe: in the set of nearest possible worlds) where black dots do not correlate with flies, the representational system tracks flies and not black dots. This is how the Target of Selection Argument is intended to show that the causal relationship between the fly and the representation is more robust than the relationship between black dots and the

⁸ I will explain this distinction in more detail below.

⁹ Some readers may have noticed the strong similarities with Fodor's Asymmetric Dependence Theory. However, a crucial respect in which both accounts differ is in the fact that Fodor does not appeal to Sober's distinction in order to defend his counterfactual condition (see Fodor, 2010). In the last part of the paper, I will argue that, despite this important distinction, my arguments will probably also apply to Fodor's Asymmetric Dependence Theory.

representation. The claim is that detecting black spots is just the actual mechanism *by means of which* frogs detect flies. The counterfactuals aim at establishing that were circumstances a bit different (in particular, did A and B come apart), the mechanism would track flies but not black dots. So it seems that the hunting mechanism evolved because it correlated with flies and not because it correlated with black moving things. This is an instance of the Target of Selection Argument, the key argument used by defenders of Teleological Theories against the Indeterminacy Problem.

Interestingly enough, Millikan¹⁰ and Shapiro use the same kind of argument in order to conclude that frogs represent *there is food*. They argue that the system detects flies only because they are food; if flies had not been food, frogs would have evolved a similar mechanism for detecting food, not for detecting flies. In the same vein, Price (2001) seems to be using a similar argument to defend that its content is something like *nutritious fly*¹¹. Sterelny (1990, p.127) concluded from the TSA that they represent *there is fly*. In short, this is the argument appealed to by almost all teleosemanticists in order to solve the Indeterminacy Problem.

2.2 Goode and Griffiths' arguments against the TSA

The fact that the Target of Selection Argument (TSA) has been so common in order to reply to the Indeterminacy Problem explains why Goode and Griffiths' (1995) paper against this argument has been so influent (Papineau, 2003). Goode and Griffiths pursue two strategies in order to undermine the TSA. First, they attempt a *reductio* of the argument by drawing an absurd consequence that, according to them, follows from it. This consequence is supposed to show that there is something deeply wrong about the reasoning underlying the TSA. Secondly, they try to identify the error: according to them, this mistake is due to a misuse of Sober's selection for/selection of distinction. Let me explain both ideas in some detail.

2.2.1 A Reductio of TSA

Goode and Griffiths claim that if the TSA were sound, it would lead us to the absurd conclusion that frogs represent *there is a fitness-enhancing thing*. They argue as follows: If flies had not been fitness-enhancing, there would have been no selection for catching flies; instead, frogs would have acquired a mechanism for catching fitness-enhancing things. Similarly, if proteins X had not been fitness-enhancing, there would have been no selection for catching proteins X, but for ingesting fitness-enhancing things. The same kind of argument can be employed with all candidates for being the content of the representation; therefore, since the relation between the frog's mental state and being fitness-enhancing is the most robust one, we should conclude that frogs represent *there is a fitness-enhancing thing*.

¹⁰ Millikan also provides a different (and brief) argument against the Indeterminacy Problem in Millikan (2004, p. 85)

¹¹ It must be said that Price (2001, ch 2-3) explicitly rejects the TSA. Nevertheless, she implicitly uses it when spelling out the *abstractness condition*.

In fact, notice this argument against TSA has far-reaching implications;¹² the problem is not just that frogs would represent *there is a fitness-enhancing thing*, but that *any* representational system in the natural world would have this content, since arguably the same kind of counterfactuals are going to be true of any other representational system (see Papineau, 1987, p.68). Since Teleological Theories claim that any representational system originated by a process of selection, it is not difficult to see that the relation between the representations and the property of being fitness-enhancing is always going to the most robust one. But, obviously, the claim that the content of all representations is *there is a fitness-enhancing thing* is preposterous. This conclusion increases the intuition that TSA cannot be right as it stands.

Of course, Goode and Griffiths contention is that something has gone wrong in this reasoning. But what?¹³ They suggest that the problem is in the use the TSA makes of Sober's selection for/selection of distinction (Sober, 1984). Since the Target of Selection Argument is supposed to show what a mental representation has been *selected for* tracking, the argument heavily draws on a particular understanding of these notions. Griffiths and Goode's strategy is to show a misuse of Sober's analysis is at the core of the TSA.

2.2.2 Selection for/selection of

Sober (1984) introduced this distinction and famously illustrated it with the example of a child's toy. Imagine a cylindrical toy with three levels; between the levels there are two layers with several holes, which are bigger in the upper layer than in the lower one. Now, suppose that we introduce three kinds of balls at the toy's upper level; some of the balls are red and small, some are blue and medium size and the rest are yellow and large. If we shake the toy, all the red balls will end up at the bottom, the blue at the middle and the yellow at the top. Sober suggests that we can describe the result in two different ways; on the one hand, given that there are only red and small balls at the bottom, we can say there has been *selection of red balls* and *selection of small balls*. The properties *being red* and *being small* have been selected of because all balls at the lower level have both of them. But, obviously, there is something important this description is missing out. Even if all the balls at the bottom have both properties, they have been selected *because* they are small, and not *because* they are red. That is: in the toy there has been selection of redness and smallness, but only *selection for smallness*.

According to Sober, what grounds this distinction is the existence of a causal relation between the size of the ball and the end result (the small red balls at the bottom) that does not exist between the colour of the ball and the outcome. The idea is that there

¹² Goode and Griffiths' silence about this point suggests that they were not aware of it.

¹³ This result might lead some people to think that this is not a reductio of TSA, but rather of the whole project of accounting for intentionality using an evolutionary framework. I think that is too rush a conclusion. There are good reasons for thinking this project is worth pursuing (see introduction). Furthermore, in the last part of the paper I am going to argue that there is something specifically wrong about TSA.

has only been selection *for* small balls (and not for red, blue or yellow balls) due to this causal relationship. So what distinguishes selection for from selection of is the existence of some causal relation between some of the ball's properties and the final state of affairs that lacks between the properties of the ball that have merely been selected of and the outcome.¹⁴

On the other hand, since there is a distinctive causal relationship between the properties that have been selected for and the outcome, Sober suggests a way to single them out. He points out that the causal relevance of the property that has been selected for grounds the truth of the following counterfactuals: if the ball had been red but not small, it would not have been selected, but if it had been small but not red it would still have been selected. This is what entitles us to conclude that the balls have been selected for smallness and not for redness. The counterfactual evaluation is a method for finding out which of the different properties was the causally efficient one.

2.2.3 A Possible Misuse of Sober's Distinction

Certainly, the distinction between selection of / selection for underlies the Target of Selection Argument. What motivates the whole teleological project is the notion of selection for, and the TSA is regarded as a natural extension of this reasoning. However, Goode and Griffiths point out that there is a fundamental difference between the properties used in Sober's argument and the properties involved in the TSA, that accounts for the fact that the latter misuses Sober's counterfactual analysis. The key issue, they claim, is what kind of properties is used in each case.

Goode and Griffiths argue Sober's reasoning can only be employed between properties that are at same level of explanation, that is, only between competing properties. To see that, consider Sober's toy again. Sober's distinction is useful in order to tell whether there has been selection for redness or selection for smallness, but the same reasoning yields unsatisfactory results when applied to non-competing properties, such as colour and red. For example, suppose we design a toy that instead of levels with holes has a light-reflectance sensitive mechanism, such that only the balls that have certain light reflectance (in particular, the light reflectance that produces in us sensation of red) can get to the bottom. In that case, it seems perfectly fine to say that in Sober's toy there has been selection for colour (instead of selection for size), but *also* that there has been selection for redness. Both properties were causally efficient, and hence it seems that both claims are true.

But, crucially, notice that if we used the reasoning suggested by Sober among these properties, we would get the absurd conclusion that there has only been selection for red, and not selection for colour. That is so because in the nearest possible world where the ball

¹⁴ More precisely, since causal relations hold between facts/events (or states of affairs), the idea is that there is a causal relationship between *the fact that the ball is small* and *the fact that the small red balls end at the bottom layer* that lacks between *the fact that the ball is red* and *the fact that a small red balls end at the bottom layer*.

has some colour but it is not red, the balls are not selected, but in the nearest possible world where the ball is red, it is still selected. So, one might argue, the relation between redness and the outcome is more robust than the relation between the colour and the outcome and hence, there has been selection for redness and not for colour. But, of course, this conclusion is absurd. Goode and Griffiths' point is that, in the same vein, trying to apply to argument in order to decide whether frogs have been selected for preying on flies or fitness-enhancing things is misleading, because these are properties at different levels and hence non-competing properties. In a nutshell, their claim is that *being a fly* and *being fitness-enhancing* (or any other property that generates the Indeterminacy Problem) are non-competing properties in the same sense that being red and being colourful are, and for this reason we should not apply Sober's distinction to the frog case.

Goode and Griffiths (1995, p.103) illustrate their argument with the example of the polar bear's fur. Arguably, the thick coat of polar bears was selected for being warm, but a warm coat must also be a heavy coat, so both heaviness and warmth were selected of. Since nowadays thick coats are both warm and heavy, how can we find out which property was selected for? well, if the coat had been heavy but not warm, it would not have been selected, but if it had been warm but not heavy, it would still have been selected. This is how Sober's strategy gets us to the conclusion that there was selection for a warm coat but just selection of a heavy coat. So far so good. What Goode and Griffiths suggest is that this reasoning is valid because *being warm* and *being heavy* are at the same level of explanation; it would be wrong to apply this reasoning between properties that are not competing ones. For instance, consider the properties *being a warm coat* and *being fitness-enhancing*. They argue if we applied the reasoning underlying the TSA we would get us to the absurd conclusion that there has been selection for the coat being fitness-enhancing and not for the coat being warm, since the following counterfactuals are true: "If the bear's coat had been warm but not fitness-enhancing, it would not have been selected, whereas if it had been fitness-enhancing and not warm it would still have been selected" (Goode and Griffiths, 1995, p. 104). That would be clear a misuse of Sober's distinction, since we do not think we have to choose among these properties. Goode and Griffiths suggest this is due to the fact that Sober's argument does not allow us to decide between the property of *being warm* and the property *being fitness-enhancing* because they are at different levels. The counterfactual analysis yields the wrong results when applied to non-competing properties.¹⁵

For this reason, Goode and Griffiths claim that when the TSA uses Sober's distinction in order to pick out one among the different candidates of content attribution, it is misusing his analysis. Since *being a fly* and *being fitness-enhancing* are properties that belong to different levels of explanation, the counterfactual analysis can not be employed here. As we saw, Sober's distinction is only supposed to apply between competing properties. This

¹⁵ Of course, that does not exclude the possibility of there being some other way of telling whether there has been selection for properties at different levels. What this argument shows is that properties at different levels cannot be compared *directly*; redness should be compared with blueness and orangeness, and colour should be compared with size.

is why Goode and Griffiths claim that the philosophers that use the Target of Selection Argument in order to solve the Indeterminacy Problem are misinterpreting Sober's analysis.

2.2.4 Solving the Indeterminacy Problem without the TSA?

Goode and Griffiths are well aware that if the TSA is rejected, we are left with the Indeterminacy Problem again. If the TSA can not be used in order to pick out one among all the possible properties that frogs could be representing (*being food, being a fly, being nutritious, being fitness-enhancing...*), then it seems that Teleological Theories are never going to provide a convincing naturalistic account of mental representation.

Tempting as this conclusion may be, Goode and Griffiths try to resist it. Even if they urge that TSA should be abandoned, they also think that, nevertheless, the Indeterminacy problem can be solved. They contend that the different levels of analysis suggested by the previous discussion may reveal a plausible solution to the Indeterminacy Problem. Of course, if they manage to show that there is no real problem of Indeterminacy, they will not only have undermined the TSA, but also shown that Teleological Theories have no need for it.

Their strategy is basically to dissolve the problem. The idea is the following: we saw that Sober's distinction allows various properties at different levels to be selected for. Goode and Griffiths' own view is that the content of the frog's mental state depends on the theoretical perspective we take on the issue. Hence, different explanatory purposes will reveal different representational relations between frogs and the environment. For instance, the claim that frogs are supposed to detect fitness-enhancing things might be a good description if we take the perspective of population genetics and evolutionary games theory. On the other hand, the claim that frog's represent the presence of a fly might be adequate for ecology and finally, the claim that frogs represent moving black dots might be more adequate for neuroanatomy (Goode and Griffiths, p.101-3; for a similar view on the latter, Neander, 2006).

Goode and Griffiths (1995, p. 107) conclude from this analysis that "the apparent indeterminacy of etiological functions is a genuine indeterminacy but a harmless one". They think the fact that Teleological Theories predict that the same mental state represents different things should not be considered a problem, because these different representational descriptions actually correspond to different levels of explanation in various areas of biology.

2.2.5 State of Play

It is time to recapitulate. First, we saw that Teleological Theories have a serious problem of indeterminacy. Then, we considered the most common reply to this problem: the Target of Selection Argument. We argued that this argument is based on Sober's selection for/selection of distinction and this is precisely where Goode and Griffiths' argument against TSA comes in. They criticize that the TSA misapplies Sober's analysis because the counterfactuals employed in the TSA involve properties that are at different levels and,

hence, that are non-competing. According to them, Sober's analysis only applies between exclusive properties. However, Goode and Griffiths don't refuse the TSA because they are willing to vindicate the Indeterminacy Problem; instead, they claim the Indeterminacy Problem is a fake problem, because each content attribution predicted by Teleological Theories corresponds to a description employed in a different area of biology. The abundance of content attributions is supposed to be explained by the wealth of explanatory projects.

In the remainder of the paper I am going to first argue that Goode and Griffiths' solution to the Indeterminacy Problem is unsatisfactory. Secondly, I am going to show that their reasons for rejecting TSA are unconvincing and that, in fact, they are misusing Sober's analysis in their criticisms. Finally, I will argue that even though Goode and Griffiths' objections are flawed, indeed the TSA misapplies Sober's distinction. At the very end, I will conclude that TSA is invalid, and for this reason the Indeterminacy Problem is still a worry that needs to be properly addressed by defenders of Teleological Theories.

3- Problems with Goode and Griffiths' Account

Let us start by Goode and Griffiths' attempt to solve to the Indeterminacy Problem by appealing to the diversity of biological explanations. A first worry we might have with their solution is that if by offering this reply they intended to rescue Teleological Theories from the Indeterminacy Problem, their proposal does not look very promising. As we said at the beginning, Teleological Theories aim at naturalizing intentionality; this is what underpins the strategy of explaining the origin of representations using the notion of function and then analyzing the notion of function in non-intentional terms. In contrast, on Goode and Griffiths' view what frogs represent utterly depends on the observer's explanatory purposes, and for this reason they seem to be giving up the naturalistic project, which is inherent to Teleological Theories. If the content of the frog's mental state hangs on the observer's interests, then the project of providing a naturalistic account of intentionality is doomed.

But still, some people might agree with this conclusion and think that, despite all alleged advantages, the teleological strategy is essentially flawed. So the fact that Goode and Griffiths' proposal compromises the teleological project cannot be used as an argument against their criticisms of the TSA. In order to show that their view is unsustainable we need to provide independent reasons. That is what I intend to do next. First, I will put forward what I think is wrong with Goode and Griffiths' analysis of the TSA and, afterwards, I will argue why, nevertheless, TSA is also mistaken.

3.1 Properties at Different Levels

Let us start by spelling out in more detail what Goode and Griffiths mean when they claim different properties can be at the *same or different level*. This is crucial, because in order to assess their arguments, we need a more precise description of what 'level' here means. In a nutshell, I think what Goode and Griffiths suggest is that the relation between properties at different levels is the same kind of relationship that holds between functional properties and their realizers, or between determinables and determinates:

It is clear what has gone wrong here [in the TSA]. A higher-level explanation is being regarded as an alternative to a lower-level one, instead of a supplement to it. (...). To put the matter in terms by Jackson and Pettit (1988), the fact that the same general 'programme explanation' can be realised by a different 'process explanation' in other cases does not impugn the causal reality of the process explanation that underlies it in one particular case! (Goode and Griffiths, 1995, p. 104)

Notice that this interpretation smoothly accounts for the fact that Sober's selection for/of distinction cannot be used between properties of higher and lower orders such as being colourful and being red. We saw that the counterfactual analysis yields the wrong results if it is applied to this kind of properties and Goode and Griffiths argue that this is a general feature concerning properties of different ranks. Consequently, I will interpret Goode and Griffiths' general complaint as follows: any counterfactual analysis that involves properties of higher and lower order is a misuse of Sober's selection for/selection of distinction.

In particular, Goode and Griffiths contend that, in the example suggested above, being fitness-enhancing is a higher order property while being warm is a lower one. The idea is that the coat's being warm is the way the coat realizes the property of being fitness-enhancing, in the same sense in which being scarlet is the way an apple instantiates the property of being red. Thus, the relation between being warm and being fitness-enhancing parallels the relation between functional properties and their realizers or between determinates and determinables.

3.2 Indeterminacy Problem and levels of explanation

Unfortunately, I think Goode and Griffiths' argument can not be right, because there is an important feature that shows that there is a crucial difference between properties at different levels in this sense and the properties that generate the Indeterminacy Problem. In the case of functional properties and their realizers or determinates and determinables, lower-order properties *imply* the higher-order properties. For instance, suppose functionalism about the mind is true and being in pain just is being in a certain functional state. Further, suppose C-fibers firing is one of its realizations; then, if C-fibers are firing in my brain, then necessarily I am in pain. Indeed, in every possible world where someone has C-fibers firing, she is in pain. Similarly, in every possible world where something is scarlet, necessarily it is red. And so on.

Note that the fact that lower-order properties imply higher-order properties in every possible world makes it impossible to formulate the counterfactuals required by Sober's analysis in the appropriate way. To evaluate whether the ball was selected for being small or for being red, we consider the nearest possible world where the ball selected is small but not red and the nearest possible world where the ball is red but not small. But the same cannot be done if we are assessing whether it has been selected for being red or for being colourful, because there is no nomologically possible world at which a ball is red but not colourful. Since one cannot make sense of one of the counterfactuals, Sober's analysis cannot be used between these properties. Therefore, what explains that Sober's analysis does not apply to determinate and determinable properties (or functional properties and

their realizers) is that there is an entailment relation between them that makes the counterfactual evaluation impossible. Since there is no possible world where the realizer exists without the functional property being instantiated (or the determinate without the determinable) Sober's analysis cannot possibly be carried out between these properties.

So, certainly, all that suggests (as Goode and Griffiths point out) that Sober's analysis cannot be used between properties that belong to different levels. Now, the problem I want to focus on is that if that is what Goode and Griffiths meant by 'properties at different levels', it is unclear whether the properties that give rise to the Indeterminacy Problem are properties at different levels.

For instance, think about the two properties that Goode and Griffiths use as an example; the polar bear's coat being warm and its being fitness-enhancing. They claim Sober's analysis cannot be employed here because they are properties at different levels. But if by 'different levels' they mean that the relation between them is the same kind of relation that holds between functional properties and their realizers or between determinates and determinables, then clearly being warm and being fitness-enhancing are *not* properties at different levels. The proof is that there is a possible world where the coat is warm but is not fitness-enhancing, and there is a possible world where a coat is fitness-enhancing but not warm. Since both situations are nomologically possible, the relation between *being warm* and *being fitness-enhancing* is not the same kind of relation that holds between the properties of *being red* and *being coloured*. Therefore, this is not an instance of lower and higher-order properties.

In other words, my argument is that *being fitness-enhancing* and *being warm* do not have the same relation as *being red* and *being coloured*, since it is possible for a coat to be warm but not fitness-enhancing but it is not possible for a ball to be red but not coloured. Therefore, the reasons that explain why Sober's distinction cannot be used between the properties *being red* and *being colourful* do not justify a similar treatment of the properties *being warm* and *being fitness-enhancing*.

More generally, the problem that Goode and Griffiths overlooked is that the reason that explains why Sober's analysis cannot be applied to some properties (namely: that they are higher and lower-order properties), cannot be used in the cases that generate the Indeterminacy Problem. For instance, in the example of frogs, the relation between the different properties that are candidates for being the content of the frog's mental state is not a relation between determinates and determinables. *Being a fly*, *being food*, *being nutritious* or *being a black moving thing* are not properties that belong to different ranks, but just different properties. The relation between these properties is not like the relation of determinables and determinates or between functional properties and their realizers, because there is a possible world where any of these properties is instantiated but not the rest of them. And since they are not properties of different ranks, nothing blocks the use of Sober's counterfactual analysis in that case. Therefore, the claim that Sober's analysis cannot be applied to them because they are properties at different levels is misguided. Paradoxically, by trying to point out a misuse of Sober's distinction, Goode and Griffiths

misapply it in the context of representational systems. Consequently, they have failed to show what is wrong with the Target of Selection Argument.

4- The Real Misuse of Sober's Distinction in the TSA

So far, I have argued that Goode and Griffiths' argument against the Target of Selection Argument misapplies Sober's distinction. My purpose now is to show that even if Goode and Griffiths' analysis is flawed, there is in fact something deeply wrong with the Target of Selection Argument. In this section, I am going to move away from Goode and Griffiths' approach and consider an original argument that suggests that the TSA is probably mistaken as a solution to the Indeterminacy problem. And since I want to claim that the Target of Selection is flawed while at the same time accepting Sober's distinction and counterfactual analysis, what I need to show first is that the TSA is *not* an instance of Sober's analysis. That will leave the TSA in need for independent justification. In the last section, I will argue that it is highly implausible that support for the TSA will ever come.

4.1- Why we are not dealing with Sober's distinction

First, let me argue why the proponents of the Target of Selection Argument are misusing Sober's distinction, even if they do it in a different way from the one suggested by Goode and Griffiths. I think the main problem with Target of Selection Argument in the context of representational systems (such as the frog) has to do with the fact that the counterfactuals they are using are not supported by Sober's proposal. Let me first present a case that abides by Sober's schema, and then show why the TSA departs in important respects from it.

Consider again whether the polar bear's fur evolved because it is heavy or because it is warm. As we saw, Sober's strategy for dealing with this case consists in evaluating the truth of certain counterfactuals: if the polar bear's fur had been heavy but not warm, it would not have been selected, but if it had been warm but not heavy, it would still have been selected. That shows that there was a causal relationship between the property *being warm* and the actual presence of the coat in polar bears that lacks between the property *being heavy* and the presence of coats. Therefore, (following Sober's recipe) there has been selection of the fur's being heavy and selection of the fur's being warm, but only selection *for* fur's being warm.

So far so good. But, crucially, notice that in the evaluation of these counterfactuals two sets of features have been kept fixed. On the one hand, the environment and the action of natural selection (both can be regarded as other causes of the final outcome). On the other, (and this is the crucial feature) the end result. That is, only one of the initial conditions (the fur's properties) has been changed when determining the counterfactual conditions. Similarly, in Sober's example, we assess the truth of the counterfactuals keeping the structure of the toy fixed, the action of shaking, and finding out which of the ball's

properties guarantees *the same outcome*.¹⁶ However, note that the frog's example is radically different in this respect; in the frog's case, if we alter any of the original properties (fly, food, proteins,...) the *end result changes dramatically*. If flies had not been black moving dots, frogs would have died out; but, similarly, if moving dots had not been flies, frogs would have died out as well. In the same vein, they would have died out if flies had not been nutritious, if they had not caused black shadows, if they had not been fitness-enhancing... or perhaps, if they had survived, they would surely have evolved a very different representational system (compare: in the original toy, if the balls had not been red but still small, we would have exactly the same result: red small balls at the bottom) So, in the case of representational systems, if we keep all conditions fixed and just change the property that generates the Indeterminacy, any of the changes leads to the likely extinction of frogs, or at most a change in representational system.

Thus, what the TSA suggests is to consider the nearest possible world where flies are not black moving things and frogs still have a *similar* representational system. In order to employ the Target of Selection Argument to the Indeterminacy Problem, we must change both sides of the causal relation: not only a property of the fly must be different, but also the frog's representational system. Since keeping the representational system fixed would imply that frogs disappear in any of the counterfactual situations, the TSA holds that in order to know what frogs are tracking we need to assume some changes in the representational apparatus as well. However, that points at an important disanalogy between the two cases; it might be interesting to consider what kind of changes would lead to a different result (for instance, to the presence of yellow balls at the bottom) but this is *not* what Sober's counterfactual analysis is supposed to reveal. Sober's analysis deals with the actual state of affairs (the small red balls at the bottom) and wonders what caused this state. But in the case of frogs, we cannot change any of the fly's relevant properties (being a fly, being food, being fitness-enhancing,..) and getting exactly the same representational system. Consequently, contra the TSA, Sober's analysis cannot be applied to representational systems.

Let me state my point in a different way. Sober's distinction is supposed to identify the properties that caused a trait's selection in evolution. His counterfactuals are supposed to distinguish the properties that were causally efficient from the ones that were not. For instance, redness might be a cause, while smallness might not be. In contrast, in the case of representational systems, all candidates we consider have been causally efficient. *Ex hypothesi*, the fact that there were flies, that they were food and also fitness-enhancing things causally explain why having a representational system was beneficial. Indeed, the Indeterminacy problem precisely arises because there are different causal properties that could explain why having a certain representational system was beneficial. Since the

¹⁶ Notice that one could keep the properties of the fly fixed and change the properties of environment (or natural selection) so as to examine which of the latter properties were causally responsible for the *same* outcome. What I think is illegitimate is to alter some of the alleged causal properties (flies, environment or natural selection) and *also* change the outcome. I want to thank an anonymous referee for pointing this out.

problem is not between causal and non-causal properties, but between different causal properties, Sober's distinction is not going to help us here.

The first problem, then, of applying the Target of Selection Argument to the representational case is that the underlying causal relation between properties is different from Sober's examples, and that fact is manifested in a different structure of the conditionals. While in Sober's original analysis only the properties of the cause are changed and everything else is kept fixed, in using the TSA the properties of the representational properties (the outcome) are also altered in important respects. So, certainly, this is a misuse of Sober's distinction, even if it is different misuse from the one Goode and Griffiths thought.

Nonetheless, I am well aware that showing that this argument misuses the selection for/selection of distinction is not yet its refusal, since supporters of the TSA could argue that there might be independent reasons for thinking this reasoning is sound. They might try to argue that it derives in a non-obvious way from Sober's own insights or they might instead assume the TSA is a valid inference supported by an alternative argument. Still, I think it puts some pressure on those that want to use it in order to solve the Indeterminacy Problem. If the reasoning presented here is cogent, defenders of the TSA should provide independent reasons for thinking that the truth of these counterfactuals can underpin the distinction between selected for/selected of attributions. Only if this support is provided can this account help to solve the Indeterminacy Problem.

However, instead of awaiting such a proposal, let me shortly argue why I think it is very unlikely that the reasoning underlying the TSA ever gets justified.

4.2 Counterfactual Evaluation

Is it possible to find independent reasons (not based on Sober's analysis) for justifying the Target of Selection Argument? I do not know whether such thing is possible but let me argue why I think it is highly implausible that this reasoning is vindicated. In that respect, the main problem of the Target of Selection Argument (one that has been overlooked by most people working in Teleosemantics) is that it yields strongly counterintuitive results.

For instance, consider a possible use of Target of Selection Argument between the properties *being a fly* and *carrying proteins X* (whatever properties make flies nutritious for frogs). The person who uses this argument will need to consider the case where these properties come apart and assess the robustness of each relation through the truth of the following counterfactual: if flies had not provided proteins X to frogs, frogs would have evolved a mechanism sensitive to whichever other organisms had proteins X, instead of evolving a mechanism that could digest whichever proteins flies carried. In other words, in the nearest possible world where flies do not carry proteins X, frogs have evolved a mechanism sensitive to whatever carries these proteins and not sensitive to flies. If these counterfactuals were true, the TSA would lead us to the conclusion that frogs represent the presence of proteins X.

But notice that the truth of this counterfactual is far from obvious; in fact, there are many circumstances that can make this counterfactual false. For instance, other animals that could provide proteins X might be too hard to catch; they might be poisonous, or too fast, or too big. Similarly, there might be some constraints on the structure of the frog's hunting mechanism that make very costly the evolution of a device for preying on these other organisms.

Indeed, it is not difficult to think of many situations in which it might be easier (in terms of evolutionary costs) to keep catching flies and adapt to the different proteins that flies provide than completely changing the hunting mechanism so as to be able to keep ingesting proteins X. If the latter is the case and, in fact, the nearest possible world where flies do not carry proteins X is a world where frogs have evolved a mechanism for detecting flies and not proteins X, then we would have to conclude that in our world frogs represent the presence of a fly.

It is important to stress where the problem lies; the objection I am raising is *not* that, if TSA were sound, it would be hard to assess whether frogs represent the presence of flies or the presence of proteins X. The problem with that reasoning is that it is highly implausible that what frogs represent *in our world* depend on these counterfactuals. Whether other animals carry proteins X, how difficult are such animals to catch, or whether some facts about the structure of the frog's hunting system makes it very difficult to evolve a different snapping mechanism seem to be completely irrelevant issues concerning the question whether frogs are *actually* preying one thing or the other. On the contrary, if the TSA was a good way of reasoning these counterfactual conditions would help to determine whether frogs represent flies or proteins X. I think this result is highly counterintuitive.

To make the point clearer, let me spell out in more detail what would follow from accepting TSA. Suppose the Target of Selection Argument is adequate and the counterfactuals that involve a change in the properties of flies as well as a change in the representational system are relevant for content determination. Then, the following conditionals would be true: on the one hand, if in the nearest possible world where flies do not carry proteins X, tracking proteins X is too costly, frogs would be representing *there is a fly* in the *actual* world. On the other hand, if in the nearest possible world where flies do not carry proteins X, tracking X were not too costly, frogs would be representing *there are proteins X* in the *actual* world. At this point I think the worry is fairly obvious: it is highly implausible that the content of mental states of current frogs depend on the truth of these conditionals. The truth of these counterfactuals depends on the availability of certain proteins in other organisms, on the developmental constraints of frogs, on other proteins that flies could provide to frogs... but such things are completely irrelevant when considering what frogs are representing in our world.

Notice that the same kind of problem could be formulated with any property that gives rise to the Indeterminacy Problem: being a fly, being nutritious, being a fitness-

enhancing,...¹⁷ In fact, I think the same kind of problem arises when evaluating any representational system. The truth of the counterfactuals on which the TSA depends hangs on issues that do not seem to be relevant at all in content determination. Therefore, I think there are good reasons for thinking that Target of Selection Argument is not going to be part of the right naturalistic theory of content. The most plausible conclusion, I think, is that the TSA should be abandoned.¹⁸

Finally, let me just point out that the objection to the TSA presented here is not a version of the general worry that possible-world talk is inadequate for uncovering relations holding in the actual world (cf. Fodor and Piattelli-Palmarini 2010, ch.6-7). In fact, I argued that Sober's original analysis already commits one to accept that what happens in other possible worlds can help to discover what is the case in our world. The worry is rather that the particular state of affairs at other possible worlds that are relevant according to the TSA seem intuitively irrelevant in establishing the content of representational systems in the actual world. So the problem is with the particular predictions of TSA and not with the possible world reasoning in general.

5- Conclusion

As I said at the beginning of the paper, Teleological Theories of representation have been very successful theories, since they have solved many of the objections of other naturalistic theories, but so far they have been stuck with the well-known problem of indeterminacy. In this respect, the Target of Selection Argument, used by the most prominent teleosemanticists like Millikan, Sterelny or Price, has been the most common answer to the problem, but I hope I have been able to show that this argument is clearly unsatisfactory. On the one hand, because it misuses Sober's selection for/selection of distinction, (even if

¹⁷ Even if most of the discussion has revolved around the property *being fitness-enhancing* (due to Goode and Griffiths paper), this is probably not the best example, since what kind of property fitness is is a much disputed issue in philosophy of biology (Rosenberg and Bourchard, 2008). As a consequence of this uncertainty, it is hard to assess whether the argument provided in this paper is a knockdown objection against the TSA applied the property *being fitness-enhancing*. Nonetheless, the fact that this argument works very well with the rest of properties that generate the Indeterminacy problem and also with a certain interpretation of 'fitness' strongly suggests that the objection presented here has a general character.

¹⁸ The argument offered in section 4.2 could also be developed as an objection to Fodor's Asymmetric Dependence Theory (Fodor, 1990). Fodor's approach is based on the idea that the law that links black specks to the frog's mental states is asymmetrically dependent on the law that links flies to the frog's mental states; in other words, it assumes that the latter nomological connection is *more robust* than the former. However, if the argument presented here is sound, asymmetric dependence cannot justify attributions of content, for the very same reasons TSA fails. Consequently, Fodor's theory will also fall short of solving the Indeterminacy Problem. Unfortunately, developing these ideas would require a long discussion that exceeds the limited scope and extension of this this essay.

not for the reasons Goode and Griffiths suggested). On the other, because it is highly implausible that this way of arguing gets independent justification.

This result puts some pressure on the defender of the Teleological Theory, since the most common reply to the Indeterminacy Problem has been blocked. Are Teleological Theories utterly unable to solve this problem? Certainly, this is a very important question and many naturalistic projects hang on it. Wide branches of philosophy and biology are still awaiting a conclusive answer to this pressing objection.

Finally, I hope the general discussion on the notions of selection *for*/selection *of* may shed some light on the nature and use of these concepts, which surely are two of the most fundamental and controversial concepts in any account concerned with the evolution of cognition.¹⁹

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¹⁹ ¹⁹ The final publication is available at www.springerlink.com

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