Teleosemantics, Infotel-semantics and Circularity

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Abstract

Peter Godfrey-Smith and Nicholas Shea have argued that standard versions of teleosemantics render explanations of successful behavior by appealing to true beliefs circular and, consequently, non-explanatory. As an alternative, Shea has recently suggested an original teleosemantic account (that he calls 'Infotel-semantics'), which is supposed to be immune to the problem of circularity. The paper argues that the standard version of teleosemantics has a satisfactory reply to the circularity objection and that, in any case, Infotel-semantics is not better off than standard teleosemantics.

1 Introduction

Teleosemantics is usually regarded as one of the most promising naturalistic accounts of representation and content. Its main goal is to explain in non-intentional terms what it is for a state to be endowed with certain representational content. There are currently several teleosemantic theories on the market, with significant disagreements among them (see, for instance, Millikan, 1984; Papineau, 1993; Price, 2001; Abrams, 2005; Stegmann, 2009; Neander, 2013; Martinez, forthcoming). Nonetheless, the most popular version is something very close to Millikanian teleosemantics, which for simplicity I will call 'standard teleosemantics'.

In a recent paper, Shea (2007) has developed in detail an objection to this standard version of teleosemantics that was originally (but briefly) stated by Godfrey-Smith (1996). The objection is supposed to show that teleosemantics renders explanations of successful behavior in terms of true belief circular. According to Shea, this problem shows that teleosemantics needs to be supplemented with an informational input condition. Thus, he puts forward a new version of teleosemantics that he labels 'Infotel-semantics'. In this paper I will argue that standard versions of teleosemantics can provide a satisfactory reply to this objection. Furthermore, I will show that, if teleosemantics suffers from the circularity problem, probably Infotel-semantics does as well. Finally, I will argue that Infotel-semantics faces additional problems on its own, so that this

original proposal is not better off (and probably worse) than standard version of teleosemantics.

The paper is organized in four main sections. First of all, I present the standard version of teleosemantics, which is the focus of Godfrey-Smith and Shea's criticisms. Then, I describe the circularity objection in some detail. Afterwards, I present Shea's alternative view (Infotel-semantics) and raise some objections to it. In the last section, I provide my own reply to the circularity problem, on behalf of standard teleosemantics. The main goal of the paper is to solve an important problem that has not been yet adequately addressed in the literature and to gain a better understanding of the consequences of teleosemantics with respect to the explanatory import of content attributions.

2 Teleosemantics

A first approximation to the teleosemantic framework requires an explanation of two key notions: *function* and *sender-receiver structure.*

On the one hand, teleosemanticists usually rely on an *etiological* definition of function, according to which the function of an item is the effect that explains why that item was selected for (usually by natural selection). For instance, etiological theories hold that the function of kidneys is to filter wastes from blood because filtering wastes is the effect that explains why kidneys were selected for over evolutionary time. Functions are selected effects (Millikan, 1989; Neander, 1991; Griffiths, 1993).

The second important notion is that of a sender-receiver structure (Lewis, 1969; Skyrms, 1996, 2010). Standard teleosemantics claims that representations are intermediate states between two systems, a sender and a receiver (Millikan1984; Godfrey-Smith, 1996). Senders (also called 'producers') are systems that take certain external input and produce the representation as output. Receivers (also called 'consumers' or 'interpreters') take this representation as input and generate certain activity as output (usually some behavior).[1]

Teleosemantics puts together the notions of etiological function and sender-receiver structure in order to describe the kind of system that generates representational states. Representations are states that stand between a sender and a receiver, which must be endowed with certain etiological functions. The function of the sender is to produce a state (the *representation*) when another state obtains (the *representatum*). The function of the receiver is to act in a certain way when the representation is produced. Very roughly, this is the essential structure that according to teleosemantics gives raise to representations.

Now, what determines the content of representation R? Roughly, standard teleosemantics claims that C (the state represented by R) is the condition that explains why receivers have historically acted successfully. In other words, C is the success condition of the behaviors prompted by R. So if we want to know

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[1]Some teleosemanticists do not mention the sender-receiver structure in their accounts (i.e., Neander, 2013), athough their proposals often seem to be compatible with this idea. Only few of them explicitly reject this framework (Stegmann, 2009; Cao, 2012).

what a given state represents, we just need to look at the evolutionary past and consider the state of affairs that explains why the activities generated by R were successful. This state of affairs is the condition represented by R.

Let me illustrate this theory with an example. Like many other birds, the white-browed scrubwren (*Sericornis frontalis*) produces a trill call when a predator is a approaching, which helps other scrubwrens escape from danger (Leavesley and Magrath, 2004). Here the sender is the white-browed scrubwren sending the trill call (or some mechanism within the scrubwren that is responsible for trill call); the receivers are the rest of scrubwrens (or some mechanism within scrubwrens that is responsible for the interpretation of the trill call); finally, the representation is the call itself. In this case, the function of the sender is to produce a trill call (that is, the representation R) in certain circumstances and the function of the receiver is to help scrubwrens escape from danger. Since escaping from danger was only successful when there was danger around (when there was no threat, escaping was just a waste of time and energy) this is the success condition of the behavior prompted by Rs. Consequently, the trill call means something like *there is danger around*.

More precisely:

TELEOSEMANTICS

A representation of type R has content C iff[2]

(a)   Rs are intermediate in a system consisting of a producer (P) and a consumer (C) cooperating by means of a range of mediating representations (all specified non-intentionally).

(b)   The function of producer P is to produce R when the state C obtains.

(c)   C is the evolutionary success condition, specific to Rs, of the behavior of the consumer prompted by Rs.

Of course, this is only a rough approximation to the teleosemantic framework. There are many details that this simple schema leaves out, which I cannot develop here. Nonetheless, I would like to mention one of these complexities, because it will be important in some of the arguments of the paper: productivity.

By 'productivity' I mean the capacity to produce representations with a *new* content, that is, a content that no representation produced by any organism belonging to the same lineage has ever generated. Millikan's favorite example is that of honeybees. Honeybees perform a range of body movements ('waggle dances') when they return to the hive in order to inform others about the position and quality of the source of nectar. This communication system turns out

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[2]Modest versions of teleosemantics hold that (a), (b) and (c) specify sufficient but probably not necessary conditions for a state to represent C (Sterelny, 1990; Godfrey-Smith, 1996). Nonetheless, most teleosemanticists prefer the stronger version, according to which these conditions are sufficient and necessary for representing (e.g. Millikan,1984; Neander, 1995; Papineau, 1993). This issue will come up in section 4.1.2.

to be extremely sophisticated. Two key elements in this structure that scientists have been able to identify are the direction of the waggle dance and the number of waggles. On the one hand, the average orientation of the bee's waggle run with respect to gravity indicates the angle one must fly relative to the sun to reach the food source. On the other, the number of waggles indicates the distance of the source of nectar (Rescorla, 2013, p. 90). Now, consider a particular dance produced by a current bee, say, bee dance no. 879. It might be the first time that this bee (or any bee[3]) performs this dance. Thus, condition (b) and (c) do not hold (because this particular R has never been produced before) and nevertheless we intuitively think this waggle dance is as contentful state. Consequently, productive mechanisms raise a problem for TELEOSEMANTICS.

The usual way teleosemanticists deal with this difficulty is by claiming that, properly speaking, in many cases evolution does not design a mechanism to produce a particular representation R when another state S obtains. What is selected instead is a mechanism that produces a range of states that are supposed to map onto another range of states according to a certain correspondence relation. In the case of productive mechanisms, there is not selection for a particular representation R, but for a particular *mapping* function between a system of representations and a range of represented states. Thus, the waggle dance mechanism was not selected for producing bee dance no. 20 or bee dance no. 345, but for producing a set of representations that were supposed to map onto a set of states in accordance with a certain (selected) mapping function.[4]

Of course, developing this idea in detail would require a long discussion. One should define mapping functions, explain how they evolve, introduce certain distinctions among etiological functions and modify TELEOSEMANTICS in certain respects. Since that would lead us far away from our main project here (and given that Shea and Godfrey-Smith seem to focus their criticisms on something like TELEOSEMANTICS) I will leave the complex details of such an account aside.[5] Thus, in the rest of the paper I will mainly be assuming that TELEOSEMANTICS is a good approximation to the main claims of standard versions of teleosemantics.

Let us move now to the circularity objection.

3   Circularity

Originally, Godfrey-Smith raised the problem of circularity as follows:

> For correspondence to have a real role in the production and explanation of success, it must be conceptually distinct from the fact of suc-

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[3] Indeed, it would be enough to suppose that dance no. 879 has been performed only rarely. What is important here is to suppose that this particular type of dance has been performed in so few occasions that condition (b) and (c) of TELEOSEMANTICS are not fulfilled.

[4] Notice that productive mechanisms (in the sense intended here) are extremely common. Indeed, Millikan has often suggested that probably all representations exhibit some productivity in this minimal sense, since many of them represent time and place. Alarm signals, for instance, usually mean something like *there is danger around now.*

[5] For some interesting attempts to clarify these issues, see Millikan (1984) and Shea (2013).

> cess. Success-linked theories threaten this independence. (Godfrey-Smith, 1996, p . 192)

Let me carefully spell out the ideas contained in this succinct quote. In general, an adequate way of explaining a successful behavior is by appealing to the fact that a subject had true representations. The fact that John had a true belief about there being a beer in the fridge explains why he went to the fridge, opened it, took a beer and thereby satisfied his desire for beer. That looks like a satisfactory (even if partial) explanation of how he managed to achieve his goal.

Now, the worry Godfrey-Smith is pointing out is that it seems that teleosemantics has the consequence that attributions of true representations do not provide any substantial explanation of why a certain behavior was successful. Shea (2007) makes a parallelism with Dr. Pangloss in Moliere's *Le malade imaginaire*. When asked about why a certain pill causes people to immediately fall asleep, Dr. Pangloss mentions the fact that it has a dormitive virtue, which is another way of saying that it has the disposition to cause people fall asleep. But, of course, an explanation in terms of dormitive virtue does not look like an explanation at all. Similarly, Godfrey-Smith and Shea argued that, according to teleosemantics (and, more generally, according to any theory that bases content on success), the fact that a representation has an accurate content is explained by the fact that this condition prompted successful behaviors; but then, as in the dormitive virtue example, it seems that an explanation of a given successful behavior in terms of having a true belief is not explanatory at all.[6]

The problem can be traced back to success semantics. Success semantics typically defines the content C of a belief R as that condition that accounts for the success of the behaviors prompted by R (White, 1990). Since, according to these theories, R is defined by appealing to success, it seems that the presence of R cannot explain why the behavior was successful. One cannot explain the success of a behavior B by appealing to the content of a true representation R, and then explain the fact that R has the content it has in virtue of causing the success of B. Indeed, Shea (2007, p. 430) argues this problem is a particular version of a general worry about functionalism: if one defines a state R by appealing to a set of effects of R, one cannot explain these effects by appealing to R. If one defines *being in pain* as the state that causes certain avoidance behavior, one cannot explain avoidance behavior by appealing to pain.

Interestingly, Shea (2007, p. 413) admits that if the goal is to explain the successful behavior of a particular subject, mentioning the fact that he has a true representation R with content C has some explanatory import. For instance, it excludes the possibility of this behavior succeeding due to another agent or due to mere luck. However, he argues that this is only *thinly* explanatory: it merely subsumes the behavior of a particular agent under a regularity.[7] It does nothing to explain why having a true representation led to success.

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[6] It is worth mentioning that this is an objection not only against Millikan's version of teleosemantics but also against other versions, such as Dretske's (1988, p. 85).

[7] Millikan (2007, p. 438) agrees with Shea that, when explaining the successful behavior of a particular organism, appealing to its having true content excludes it being caused by other

Now, Godfrey-Smith and Shea think that standard versions of teleosemantics faces this problem of circularity:

> Teleosemantics too makes a definitional connection between representing truly and succeeding, and the fact that the definitional connection relates only to past episodes of behavior does not make the explanation of the success of current behavior any more substantial (Shea, 2007, p. 415).

In order to address the objection in detail, let us formulate Shea's argument more precisely. Here is a way of cashing it out:

1. According to TELEOSEMANTICS, having a true belief is explained by appealing to successful behavior prompted by these states.

2. If true belief is explained by appealing to successful behavior, true belief cannot explain success.

3. According to TELEOSEMANTICS, true belief cannot explain success (by 1 and 2)

4. True representations are relevant to explaining the success of behavior they cause. (Having true beliefs is 'fuel for success')

∴ Therefore, TELEOSEMANTICS is false.[8]

I have already justified premises 1, 2, and 3, so let me make a short comment on premise 4 and the conclusion.

Premise 4 states that having a true representation is a 'fuel for success' (using Godfrey-Smith's expression). However, the idea that semantic properties are not really explanatory is also an old one (Field, 1978). So one might try to block the argument by simply denying 4 and granting that, according to his theory, attributions of true content are not explanatory. What is wrong with this straightforward reply?

There are various reasons that advise against this line of response. First of all, there would be a strong tension between the efforts that teleosemantics puts in accounting for representational content and their assumption that semantic properties are not really explanatory. Secondly, as many people have pointed out, the idea that semantic properties are explanatory is extremely plausible in

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things. However, she replies that this kind of explanation is not as thin as Shea suggests.

It is hard to know how to settle this dispute. In any event, for the sake of the argument, I will to grant that these explanations are too thin for being substantive.

[8] In his paper, Shea focuses on claims 1, 2, and 3. Nonetheless, I think there are good reasons for explicitly including the last two claims in the argument. First of all, he clearly accepts 4 (indeed, 4 is required for Shea's argument to raise an objection at all) and it is a claim that some people deny (see below). On the other hand, the conclusion makes clear that he argues against a specific version of teleosemantics (which I label 'TELEOSEMANTICS'). Obviously, Shea does not think teleosemantics as such is flawed (he himself is a well-known teleosemanticists – see section 4). His argument is supposed to raise an objection against TELEOSEMANTICS, not against the teleosemantic project. I want to thank Manolo Martinez and an anonymous referee for their suggestions and comments on this argument.

itself (it is part of what philosophers call 'folk psychology '). Thirdly, teleosemantics could be accused of offering an ad hoc solution to the circularity objection. These reasons strongly suggest that teleosemantics should hold premise 4 and look for another kind of answer.

Finally, notice that the conclusion of the argument is that a specific version of teleosemantics (i.e. the one I described in TELEOSEMANTICS) is wrong. So, if one is convinced by this argument, there are two options available. The first one is to reject the whole teleosemantic framework, which is probably a disproportionate response that Shea himself would not recommend. The second option is to modify the standard version of teleosemantics in order to accommodate the explanatory import of belief ascriptions.

Shea pursues the second strategy. More precisely, he thinks that this argument shows that TELEOSEMANTICS needs to be supplemented with an informational input condition. That is the reason he develops his Infotel-semantic account. He argues that, once we add the condition that a true representation must carry information about the state it represents, explanations in terms of true representations become much more explanatory. Let me now describe and discuss his Infotel-semantic theory, before directly addressing the circularity objection to TELEOSEMANTICS.

4   Infotel-semantics

In order to flesh out Shea's proposal, we need two things: first, we have to define the relevant notion of information and, secondly, we need to specify how it should be included into a teleosemantic account.

Interestingly enough, Shea employs a notion of information that resembles very much Millikan's notion of 'locally recurrent natural information' (Millikan, 2004, ch.3; Shea. 2007, p. 420). According to Shea:

INFORMATION R carries the correlational information that condition C obtains iff for a common natural reason within some spatio-temporal domain D, chance (C | R is tokened) > chance (C | R is not tokened)

Basically, a state R carries correlational information about C iff in some domain D the presence of R increases the probability of C obtaining and there is some common natural reason (often some kind of causal relation) that underpins these probabilities.

Notice that, in this sense, information does not require the existence of a natural law (in a strong sense) between R and C, since the kind of correlation required by INFORMATION is relative to a certain spatio-temporal domain (Cf. Fodor, 1990). This is probably a reasonable assumption given that, very often, the correlation between signs and what they signify obtain only in a very restricted domain. For instance, the alarm calls and avoidance behavior of city birds strongly correlate with the presence of cats (*Felis catus*), while calls of members of the same bird species that habit rural areas correlate much better with sparrowhawks (*Accipiter nisus*) (Moller and Ibáñez-Àlamo, 2012). Like

representing, carrying information seems to be determined by features holding within certain spatio-temporal domain. Furthermore, there are no laws between individuals, so requiring a strict natural law between representation and representatum would preclude the possibility of representing individuals (Millikan, 2004). The appeal to 'common natural reasons within some spatio-temporal domain' is supposed to point at the set of relevant situations and causal underpinnings that determine these correlations.

The idea, then, is to supplement the standard teleosemantic account with an informational condition that is able to account for the explanatory import of intentional explanations. Thus, Shea develops what he calls 'Infotel-semantics', according to which:

INFOTEL-SEMANTICS A representation of type R has content C if:

(a)   Rs are intermediate in a system consisting of a producer and a consumer cooperating by means of a range of mediating representations (all specified non-intentionally), in which every representation in the range also satisfies (b) to (d);

(b)   Rs carry the correlational information that condition C obtains.

(c)   An evolutionary explanation of the current existence of the representing system adverts to Rs having carried information about C; and

(d)   C is the evolutionary success condition, specific to Rs, of the behavior of the consumer prompted by Rs (Shea, 2007, p. 418-9)

Conditions (a), (d) and partially (c) are intended to capture the standard teleosemantic claims, which I set up in TELEOSEMANTICS. The key innovation is condition (b) and part of (c), which supplements standard teleosemantics with an informational condition.

In a nutshell, the strategy for solving the circularity problem is to include an informational input, which is not defined in terms of a success condition but in terms of mere correlation. According to Infotel-semantics, a state R carries content C only if R carries information about C. Hence, the fact that a state R represents C is not only explained by the fact that C is R's success condition (i.e. condition (d) above) but also by the fact that C correlates with S (condition (b)). Since the fact that a state has a certain content is not only explained in terms of success conditions but also in terms of carrying certain information (which, in turn is defined in terms of correlation), the claim that a subject truly believes such and such provides a substantive explanation of its success. The informational bit is supposed to make the crucial contribution; since it is not defined in terms of success, it renders a circular explanation into a non-circular one.[9]

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[9] It is worth mentioning that, although the details of Shea's proposal and his motivations are certainly original, the idea of combining teleosemantics with some sort of informational theory is not a new one (e.g. Dretske,1995; Prinz, 2002, ch 9; Neander, 2013)

Interestingly enough, this idea was already pointed out (but not developed) by Godfrey-Smith (1996, p.184):

> Dretske's theory, because of its residual appeal to indication, does have the potential to preserve more of the idea that truth is a fuel for success than the other theories discussed in this section.

In the next section I will address Shea's Infotel-semantics. I will present two objections that show that INFOTEL-SEMANTICS is not better (and probably worse) than TELEOSEMANTICS. Afterwards, I will argue why, despite the plausibility of the analogy with Dr. Pangloss, TELEOSEMANTICS is really explanatory.

4.1 Problems with Infotel-semantics

In what follows, I will raise two objections against INFOTEL-SEMANTICS. First, I will discuss whether INFOTEL-SEMANTICS can satisfactorily solve the circularity problem and, secondly, I will show that Shea's cannot account for productive representational systems.

4.1.1 Is Information sufficient?

First of all, if we grant for the sake of the argument that TELEOSEMANTICS suffers from the circularity problem, it is not clear that Shea's weak notion of information suffices for his theory to avoid this difficulty. If TELEOSEMANTICS renders explanations in terms of true representations circular, I think it is not unreasonable to think that INFOTEL-SEMANTICS falls prey to the same objection. Let me elaborate on that point.

Note that, in general, carrying information (in the sense of INFORMATION) is very cheap. Any given representation carries a large amount of information about a wide range of entities. For instance, fin whales (*Balaenoptera physalus*) perform low frequency calls that correlate with breeding season, with the presence of a whale male (only males perform these calls), with seasonal migration, with the absence of sea ice concentrations in the area and with many other facts (Watkins et al, 1987; Croll et al, 2002; Sirovic et al. 2004). Merely increasing the probability of another event occurring in a certain domain due to some natural reason is not very hard to satisfy.

Of course, in contrast to other accounts (e.g. Dretske, 1981; Neander, 2013) the fact that representations carry information about many states of affairs does not imply that Shea's theory of *content* has indeterminacy problems, because he also adopts the main insights of a teleosemantic account (specially the appeal to consumer systems). The teleosemantic component of Infotel-semantics has the consequence that most of the entities a state correlates with do not figure in its content. However, the fact that any state correlates with a great amount of features threatens his solution to the circularity problem, because the weak correlation between representation and representatum is supposed to make all the explanatory work that teleosemantics by itself is unable to make. While (a) to (d) are required for a state to be endowed with representational content,

(b) is the condition that is supposed to account for the explanatory import of teleosemantic explanations.[10] But can this weak notion of correlation by itself turn a non-explanatory attribution into a fully explanatory one? Again, a discussion on whether an explanation is thick or thin is hard to settle. Nonetheless, there are a couple of reasons for thinking Shea's notion is inadequate for the task at hand.

First of all, a representational state can carry information about the represented state of affairs but also about a possible defeater. For instance, think about fireflies of the species *Photinus.* Females of this species emit flashes at a certain frequency in order to attract and mate with males of the same species. However, fireflies of the species *Photuris versicolor*, which prey on *Photinus* fireflies, have acquired the ability to imitate this signal in order to lure males and devour them. Given this scenario, when a male of the *Photinus* species perceives a signal, its brain state carries information (in Shea's sense) about the presence of a female willing to mate but also about predators, since the activation of the brain state increases the probability of both states of affairs. Now, can the fact that these brain states carry correlational information explain the success of its behavior? Probably not, because this representational state carries information about its successful condition but also about a defeater. This example is supposed to illustrate that, in general, Shea's notion of information might be too weak for turning a non-explanatory attribution into a fully explanatory one.

There is a related worry. According to INFORMATION, states carry correlational information in virtue of the fact that certain statistics hold (due to some underlying reason), so if true representations carry correlational information about a state C, so do false representations. That is, both true and false representations carry exactly the same information. So why should we think that the fact that a state has information explains the *success* of a particular behavior?[11] Perhaps carrying information can explain why I act as I do, but the circularity problem concerned *successful* behavior. Shea's argument is not intended to show that teleosemantics renders explanations of behavior in terms of content non-explanatory. The objection had to do with the explanation of success; and if true and false representations both carry information, it is unclear to what extent carrying information can explain success.[12]

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[10] Notice that condition (c) of INFOTEL-SEMANTICS ('An evolutionary explanation of the current existence of the representing system adverts to Rs having carried information about C') cannot be appealed to in order to solve this circularity problem. If Shea relied on condition (c) in order to increase the explanatory value of the notion of information, he would incur in exactly the same problem as teleosemantics: the explanatory role of information would depend on its figuring in an explanation of the selection of the representational mechanism, that is, it would depend on information having played a role in accounting for successful behavior.

[11] In that respect, there is a key difference, for instance, between an appeal to information and an appeal to causal relations. The fact that my representation R has been caused by C can (partially) explain why my behavior was successful. After all, C can cause R only if C is the case. However, the fact that R carries information about C does not entail that C is the case, so it is hard to see why it should contribute to an explanation of success (for more on causal theories of information, see footnote 12).

[12] A reviewer suggested that a possible reply would be "to say that only true tokens carry information while false ones do not (although they still belong to informational types)". This

Therefore, there are some reasons for thinking that the notion of correlational information included in INFOTEL-SEMANTICS might be too weak to supplement the explanatory value that is allegedly missing in TELEOSEMANTICS.

4.1.2 Productive Representations

Secondly, by requiring R to correlate with S in order for one to represent the other, INFOTEL-SEMANTICS loses any chance of providing an account of the productivity of some representational systems. As I pointed out in section 2, there might be many contentful representations that are tokened just once (e.g. a particular bee waggle dance indicating nectar at 235m or Hume's famous missing shade of blue). Since they are just produced once, they lack the statistical correlation that is required for satisfying INFORMATION, so they are rendered contentless by INFOTEL-SEMANTICS. Consequently, INFOTEL-SEMANTICS cannot accommodate the capacity of many organisms of producing new contentful representations.

Shea could reply that even representations that are tokened just once can carry information, because his weak notion can be satisfied by two states that have correlated only once in a very specific environment. Unfortunately, this reply will not solve the worry, because a contentful representation can be tokened just once and furthermore be *false*. Suppose it is the first time a bee performs the waggle dance no. 876, which indicates *nectar at 235m in such and such direction* and suppose it turns out to be false (there is no nectar at that location). As a result, there is no correlation between the dance and the source of nectar, so the state does not satisfy condition (b) and (c) of INFOTEL-SEMANTICS. Consequently, INFOTEL-SEMANTICS entails this dance is a contentless state.

Note that this is a general result: any representational mechanism that exhibits productivity will give rise to some states that seem to be perfectly well formed and contentful, but which would be rendered contentless by INFOTEL-SEMANTICS. By adding an informational input condition, this approach is unable to account for productivity.[13]

reply suggests a dilemma for Shea. If he adopts some statistical notion of information (as in INFORMATION), then surely some false representations carry information. After all, if the probability required for carrying information is less than 1, there will be some cases in which a false representation carries information. If, on the contrary, he wants to maintain that only true representations carry information (as the reviewer suggests), then he is requiring a correlation of 1 between representation and representatum. The problem with this horn of the dilemma is that it makes misrepresentation impossible. Here is the reason: one of Shea's *conditions* for a state to be a contentful representation is that it carries information; but, on this strong interpretation, only true representations carry information. Thus, only true representations satisfy Shea's requirements for a being a contentful representation. As a result, there cannot be false representations. This is the classical problem for theories of content that rely on a strong notion of information (Dretske, 1981; Adams and Aizawa, 2010).

[13]Shea (2007) claims on footnote 19 that he is restricting his attention to 'representation in simple organisms'. Nevertheless, he explicitly states that he wants to account for the representational abilities of bees, among others, so he is supposed to deal with some productive representational systems. Furthermore, remember that probably most signals are productive in the sense defined here (see footnote 4). Think, for instance, about the frog's brain states, which represent something like *there is a fly around now*. It is very implausible that the

Consequently, Shea's approach loses much of its plausibility when we focus on complex representations. Indeed, INFOTEL-SEMANTICS would probably lead us to a 'splitting account' of representation, according to which the representations of simple organisms are different in kind from the representations of more complex organisms (see Shea, 2007, p. 419; 2013). Some people might be happy with that result (Burge, 2010; Rescorla, 2013), but most teleosemanticist would strongly disagree with it (Millikan, 1984; Neander, 2013; Papineau, 1993; Price, 2001).

I think the two problems I raised can be overcome by TELEOSEMANTICS. On the one hand, teleosemantics is not threatened by the second drawback because it is not based on any kind of correlation between representations and representata. The proposal of standard teleosemantics, which appeals to mapping functions, was sketched in section 2. On the other, I think Shea's objection can be met by TELEOSEMANTICS, so in fact there is no circularity problem and an appeal to information is not required. Let me show why I think the worry of circularity is unfounded.

5   Solving the Circularity Problem

First of all, it is important to notice that premises 1 and 2 of Shea's argument can be interpreted in two ways, and each of these interpretations raise a different problem for teleosemantics.

Those are the two premises of his main argument:

(1)   According to Teleosemantics, having a true belief is explained by appealing to successful behavior.

(2)   If true belief is explained by appealing to successful behavior, true belief cannot explain success.

On one interpretation, the circularity problem concerns the fact that a state has a certain content. In other words, Shea could be arguing that, according to teleosemantics:

(Circularity Content) Having a *belief about C* is explained by appealing to successful behavior, so the content of a belief cannot in turn explain successful behavior.

An alternative interpretation is that premise (1) concerns *true* beliefs, rather than mere beliefs. The claim, then, would be:

(Circularity True Content) Having a *true belief about C* is explained by appealing to successful behavior, so the content of a belief being true cannot in turn explain successful behavior.

A defense of TELEOSEMANTICS requires a reply to these two challenges.

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representational state carries correlational information of that particular time and place, for instance.

5.1 Circularity of content

There are three ways in which content attributions according to teleosemantics are much more explanatory than the ascription of properties of the dormitive-virtue type. I will present them separately, since I think each one probably suffices as a reply to Shea's and Godfrey-Smith's concerns. But if they are put together, the provide strong support for the view that TELEOSEMANTICS is perfectly compatible with content attributions being explanatory.

5.1.1 Backward-looking Properties

The circularity objection assumes strong similarities between attributions of semantic properties according to teleosemantics and dispositional properties such as the property *having dormitive virtue* ('having dormitive virtue' refers to the dispositional property *being disposed to cause people fall asleep*).[14] More precisely, Shea claims that both properties include the particular instance they are explaining in the definition of what having the property is.

However, there is a crucial difference between attributing a dispositional property like fragility, fitness or dormitive-virtue and attributing a semantic property according to teleosemantics. Fragility is (roughly) the propensity to break under a wide set of circumstances and fitness is sometimes defined as the propensity to survive and leave a certain amount of offspring (Rosenbrg and Bourchard, 2008). They are, so to speak, *forward-looking* properties. In contrast, according to teleosemantics semantic properties depend on what has already happened, so they are *backward-looking* properties. The attribution of semantic properties exclusively hangs upon (very complex) *past* facts.[15]

Why should we think this apparently minor difference is so important? In this debate the appeal to history makes a crucial difference, because when defining the fact that R means C we are not including the actual situation we are seeking to explain. TELEOSEMANTICS does not define content attributions by appealing to what the organism can do in the present situation. It is, so to speak, blind with respect to the present. In contrast, dispositions are typically sensitive to what is actually the case. No one has the disposition to cook dodos, because there are no dodos any more (Millikan, 2004). Now, the circularity problem arises when one includes the particular cases one is trying to explain in the definition of what it is to have a mental state with a certain content. So this is certainly a difficulty for success semantics, but not for a theory that exclusively relies on past facts, such as TELEOSEMANTICS. If R is defined (constitutively) as the entity that caused in the past b_1, b_2, b_3,... b_n, there is no reason why a token of R cannot explain its successfully causing b_{n+1}.

Let me present the argument in a different way. Biologists usually distinguish *being an adaptation* from *being adaptive* (Sober, 1984, p. 120). The adaptive-

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[14] It is worth pointing out that Shea's objection is not against all dispositional properties, since he admits that dispositional properties are sometimes explanatory. Rather, his objection to TELEOSEMANTICS is that the kind of facts mentioned in the definition of this dispositional property *includes the fact* that it causes successful behavior.

[15] Of course, demonstrative and indexical expressions are exceptions.

ness of a trait depends on the extent to which a phenotype fits its local ecological niche. Accordingly, saying that organisms with a certain trait survive better in a given environment because this trait is adaptive is only thinly explanatory. This is an explanation of the dormitive-virtue type, because in order to ascribe adaptiveness one is already considering the current situation. In contrast, a trait is an adaptation when it is the result of a process of selection. An adaptation must have been adaptive, but might not be adaptive in the current environment. Tusks are probably adaptations of elephants, but they are not adaptive any more: every year thousands of elephants are being hunted because of the ivory. Now, TELEOSEMANTICS does not claim that representational systems are adaptive; it only states that they are adaptations. And since the ascription of content does not take the present circumstances into account, having a certain content can be fully explanatory of success in the current situation.

Indeed, this backward-looking aspect of the theory is rooted on the notion of 'etiological function' that is essential to teleosemantic theories. On the etiological understanding of function, whether a trait has a function depends on the *past performances* of traits of the same type, not on any feature that this particular trait does or has the capacity to do. One virtue of this account is that it can attribute the function F to a trait even if this particular trait is unable to perform F (after all, a malformed heart is still heart that has the function of pumping blood). Similarly, it seems that we can satisfactorily explain why a particular heart pumps blood by mentioning its function. The fact that it has a function does not presuppose or entail that it will pump blood now.[16]

This backward-looking aspect of teleosemantics is a fundamental feature of the theory. It shows that the facts in virtue of which teleosemantic theories attribute functions are very different from the facts in virtue of which we attribute dispositional properties to entities. Again, this idea was hinted at by Godfrey-Smith (1996, p.182)

> (...) the success used to determine meaning in these theories is past success, and we assume here that we are trying to explain a present episode- an episode occurring after the inner states have acquired a truth-condition. Teleonomic theories do not, strictly speaking, assert any relation between truth and present success.

Let me move to the second reply available to the teleosemanticist.

5.1.2 Multiple causes

Shea thinks the teleosemantics suffers from the circularity problem because of its functionalist dimension. If one defines property R by appealing to the fact that it causes (or it is disposed to cause) B, then one cannot *explain* the occurrence

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[16]This backward-looking feature of teleosemantics has also originated some of the most serious objections, like Swamp-cases: according to teleosemantics, any trait with the wrong history cannot have functions and, hence, its states cannot be representations. This is a difficulty that, for instance, dispositional or counterfactual theories can easily deal with (Abrams, 2005; Fodor, 1990; Nanay, forthcoming)

of B by appealing to R. If, for instance, one defines *being in pain* as the property that causes certain avoidance behavior, one cannot explain someone's avoidance behavior by saying that she is in pain. Shea adds that a standard move on behalf of functionalism is to specify the property using multiple dispositions. For example, if one says that pain is not just the disposition to produce certain avoidance behavior, but it is also caused by bodily damage, leads to anxiety and so on, then instances of the disposition can be picked out without observing the effect one is trying to explain. Accordingly, if one defines pain by using a complex network of causal connections and dispositions, the claim that someone is in pain can provide a more substantive explanation of a particular manifestation, like avoidance behavior.

Shea claims this is precisely what his theory does. By adding an input condition, he argues that his theory solves the circularity problem because a semantic property is now ascribed by appealing to multiple features. Since carrying content C is defined by a complex property that includes many different conditions (including its carrying information), by mentioning this complex property one can provide an explanation of one of the manifestations of one disposition.

But this kind of response seems also to be available to standard teleosemantics. According to teleological theories, content depends not only on producing successful behaviors; there are many other conditions involved. There must be two systems (producer and consumer), which must be endowed with certain etiological functions, they must have co-evolved as cooperating systems, and so on. Again, there is a significant difference between traditional forms of success semantics and the elaborated conditions that teleosemantics requires in order to carry certain content. Hence, when a semantic property is attributed to a certain state, one is implicitly assuming that many other facts and conditions (besides usually leading to successful behavior) obtain. That confers a very important explanatory value to content attributions.

5.1.3 Productivity

Finally, I think Godfrey-Smith and Shea's objection clearly fails when we focus on a version of teleosemantics that be able to account for productive representations (as suggested in section 2). The circularity argument simply collapses when we think about productive representational systems. According to standard teleosemantics, asserting that bee dance no. 873 is true is not merely to subsume this bee dance under a pattern of content-constituting situations, because probably no bee dance has previously had this content. The fact that this particular bee produces a true representation of that specific state is a notorious achievement. It means that certain mechanisms that often enough led to true representations in the past have produced a true representation in that occasion. So when a teleosemanticist claims that a representation caused a successful behavior it says much more than 'the current case falls into the same pattern as the past cases that were content-constituting' (Shea, 2007, p. 12).[17]

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[17] Shea is right that, according to teleosemantics, an attribution of a semantic property *entails* an attribution of certain dispositional properties and its subsuming under a certain

In that respect, Godfrey-Smith and Shea have probably been mislead by the simplified version of teleosemantics usually discussed and described in TELEOSE-MANTICS, and have not addressed more complex versions that can accommodate productive representational systems. Since they have not considered the phenomenon of productivity, they have not noticed that this is both a problem for infotel-semantics (see 4.1.2) and one of the reasons why teleosemantics does not fall prey to the circularity problem.

In conclusion, the fact that teleosemantics can account for new contentful representations clearly illustrates that attributing a true representation cannot be the same as saying that a certain representational state that used to occur in the past also occurs now. In many cases, teleosemantics attributes (true or false) contentful representations even if no representation with that particular content has ever existed.

5.1.4 Solving the Circularity Problem

If we put these three aspects together (the backward-looking dimension, the appeal to multiple causes and the version of teleosemantics that accounts for productivity), we can easily see why the semantic properties attributed by teleosemantics are really explanatory. By ascribing a semantic property, we are assuming that a whole range of facts obtain (related to systems, etiological functions, coevolution...) and, crucially, among them the success of the actual behavior is not included. These different features show that teleosemantics is perfectly compatible with content ascriptions being really explanatory.[18]

Summing up, TELEOSEMANTICS does not render explanations of successful behavior in terms of having certain contents circular. TELEOSEMANTICS certainly entails that the fact that an organism has a belief with a certain content is partially explained by appealing to successful behavior. But the relevant behavior is that of one's *ancestors*, and the fact that a given state has a certain content is not based on whether it will lead to successful behavior in the current situation. Moreover, an ascription of a mental state with a certain content assumes a whole range of issues concerning the existence of an adequate system, its functions, etc. Finally, if we consider the standard version of teleosemantics

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regularity. But the key question is whether these are the facts that determine content, and I have argued that they are not. Indeed, notice that *any* theory of content has the consequence that by ascribing a belief that C, one is thereby attributing certain dispositional properties (e.g. that one is disposed to act successfully if certain normal conditions obtain) and subsume this belief under a regularity (e.g. the belief-type C).

[18] One might object that this reply fails if we focus on certain explanations of past success. In particular, we also want to be able to say that *in the evolutionary past* the fact that certain organisms had beliefs partially explained their successful behavior. But (the objection runs) according to teleosemantics, the semantic properties of *past* instances of a given representation are determined by the successful output of *past* representations, so at least in this respect, circularity threatens. Fortunately, the answer I provided for current situations can also be employed in these other cases. At any time t, the fact that the system produces a representation of a certain state of affairs is determined by certain facts that happened before t. So at any time t, when we explain the organism's success by appealing to its representational capacities, we are not considering the probability of succeeding at t, but something that occurred before t.

that is able to account for the productivity of certain systems, its explanatory import is even more obvious. Therefore, if Shea's objection is interpreted as involving a Circularity of Content, the conditional in premise (2) of his argument turns out to be false: having a belief can be explained by appealing to (past) successful behavior and nevertheless it can satisfactorily explain (current) success. As a consequence, premise (3) ('according to Teleosemantics, true belief cannot explain success') turns out to be false, and the argument does not go through.

5.2   Circularity of True Content

Let us now consider the second way of interpreting the objection: the Circularity of True Content.[19] Prima facie, if there is no circularity in appealing to beliefs in order to explain successful behavior, there is no reason why *true* beliefs should fail to be explanatory either. So, if our previous response to the circularity of content is on the right track, there is no reason why the attribution of true beliefs should be problematic.

In that respect, note that the *truth* of a representation is not explained by successful behavior (past or present); not even in teleosemantics. Teleosemanticists usually adopt a correspondence theory of truth (as Shea does), according to which (roughly) a representation is true iff the represented state of affairs obtains. So, strictly speaking, premise (1) of Shea's argument ('having a true belief is explained by successful behavior') is only right to the extent that having a belief is partially explained by past successful behavior, and we just saw in the last section that this is not objectionable. Since the fact that a representation is true is not explained by actual or past behavior, it should be clear that Circularity True Content does not threaten TELEOSEMANTICS.

Indeed, it could be argued that even if there were some circularity in the definition of belief (i.e. if Circularity Content were right) the claim that a belief is true could provide a substantive explanation according to TELEOSEMANTICS. After all, the claim that John has a true belief that p is just the claim that John believes p and p obtains. Its being a true representation is explained by the fact that (1) the organism has a representation with a certain content in virtue of the selective story of its ancestors and (2) the content is satisfied. So, surely, the fact that an organism *currently* has a true belief is not explained by the fact this organism *currently* behaves successfully. Consequently, even if the ascription of content involved some circularity, its truth would have a significant explanatory value.[20]

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[19] This interpretation is suggested by quotes like the following: 'The issue is rather whether *true representation* can explain success (...) That is, the question is whether statements of the following form can explain successful behavior of a system S: 'p and S represents that p". (Shea, 2007, p. 415. Emphasis in the original)

[20] Shea seems to be considering a similar sort of response in the following quote:

> The putative explanatory connection would go as follows: all of the past cases of acting on R led systematically to survival and reproduction only if R represented truly that C (constitutively), and the current case is relevantly similar to those cases. So the fact that the behavior was caused by a true representation says

5.3 Conclusion

In conclusion, I think Godfrey-Smith and Shea's argument against standard versions of teleosemantics is flawed. TELEOSEMANTICS does not render explanations of successful behavior in terms of true content circular. Furthermore, I have argued that INFOTEL-SEMANTICS fares no better (and probably worse) than teleosemantics. So I think Godfrey-Smith and Shea's circularity challenge to standard versions of teleosemantics has been met.

Acknowledgments

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> something. It says that the current case falls into the same pattern as the past cases that were content-constituting. However, being caused by a true representation does nothing further to explain why acting on R in that way leads to survival and reproduction- it just did in the past, and it does still. (Shea, 2007, p.12)

The expression 'all of the past cases of acting on R led systematically to survival and reproduction only if R represented truly that C (constitutively)' is misleading. For one thing, the fact that R *truly* represents C at t does not depend on the fact R led to survival; it depends on C obtaining at t. On the other, the fact that R *represents* C at t constitutively depends on the fact that the type of *mechanism* producing R at t led to survival and reproduction before t, and this mechanism might never have produced representations of type R. Furthermore, the existence of this representational mechanism also depends on many other things and it is blind with respect to the present situation C. Hence, the claim that a given behavior was caused by a true belief that C says much more than just that the current case falls into the same pattern as the past cases that were content-constituting. Certainly, a *consequence* of TELEOSEMANTICS and the belief ascription is that the state happens to fall into a pattern, but that is not the fact the attribution of content and truth relies on (see footnote 17).

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