

## ARTICLE

# Normal-proper functions in the philosophy of mind

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**Abstract**

This paper looks at the nature of normal-proper functions and the role they play in theories of representational content. More specifically: I lay down two desiderata for a theory which tries to capture what's distinctive of normal-proper functions and discuss two prominent theories which claim to satisfy them. I discuss the advantages of having normal-proper functions ground a theory of representational content. And, I look at both orthodox and heterodox versions of such theories.

## 1 | INTRODUCTION

When we say things like: “the function of the heart is to pump-blood”, or “the function of a corkscrew is to remove corks”, we are not only attributing a function to the heart or corkscrew, but we are also using that function attribution to specify what those entities are *supposed* to do. Let us call the functions invoked in such statements “normal-proper functions”. Functions of this kind have gotten a lot of play in the philosophy of mind in the last 40 years or so (mostly) due to their promise to ground a theory of representational content—a theory of how our mental states can represent the world as being a particular way.

How can one provide a precise characterization of normal-proper functions? What are the benefits of having such functions ground one's theory of representational content? And, what are some different ways in which one may go about developing such a theory? These are the three main questions addressed in this paper.

In Section 2, I present some examples of normal-proper functions, lay down two desiderata for a theory which tries to capture what's distinctive of these functions, and discuss two prominent theories of normal-proper functions. In Section 3, I formulate and discuss a generic, orthodox theory of representational content which makes use of normal-proper functions. In Section 4, I discuss how the notion of a normal-proper function can be used in less orthodox frameworks by looking at some recent work of Burge (2003, 2010) and Schellenberg (2018). I briefly compare these heterodoxies with the orthodox.

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## 2 | NORMAL-PROPER FUNCTIONS

Our first order of business is to get clear on what normal-proper functions are. To begin, let us look at some statements which express normal-proper function ascriptions:

- (1) The function of the heart is to pump blood.
- (2) A function of a bird's beak is to enable preening.<sup>1</sup>
- (3) The function of a corkscrew is to remove cork.

To get a feel for what makes (1)-(3) statements which capture the normal-proper function of an entity we can contrast them with statements that, despite also making use of functional language, *are not* capturing the normal-proper function of an entity:

- (4) The heart functioned as a diagnostic aid.
- (5) The corkscrew functioned as a door stop.

We can imagine circumstances in which both (4) and (5) are true. With respect to the former, if one's heart were making an abnormal thump-thump noise at a physical examination, the doctor could use it to diagnose a heart disease. Likewise, with respect to (5), we could imagine a situation in which we have company over and decide to hold open the door by wedging a corkscrew underneath it. Despite this, the following statements are (plausibly) false:

- (6) The function of the heart is to aid in diagnosing illnesses.
- (7) The function of a corkscrew is to keep doors open.

One reason why we should consider (1) and (3) true and (6) and (7) false, in line with our earlier gloss on normal-proper functions, is that only the former captures what hearts and corks are supposed to do, or what they are *for*. On the other hand, what is captured by (4) and (5) is that there are circumstances in which an entity *e* can have a useful effect in virtue of performing an activity  $\phi$  even if  $\phi$ -ing is not what *e* is supposed to do. More specifically, the fact that a corkscrew can be used as a door stop or that a heart can be used as a diagnostic aid is fortuitous. So, when we say that a normal-proper function of an entity *e* is to  $\phi$  we are saying something stronger than: there are some circumstances in which  $\phi$ -ing is useful (for the system in which it is embedded). Rather, we are saying that  $\phi$ -ing is the way in which *e* is supposed to be useful. A theory of normal-proper functions should capture this.

We can say that a theory of normal-proper functions does capture this if it satisfies two desiderata. First, given what was just discussed, a theory of normal-proper functions should recognize that not all potentially useful activities of an entity are functions of that entity – it should recognize that some of those activities would only be useful by accident. Let us call this the *function-accident* desideratum. And second, a theory of normal-proper functions should leave open the possibility of malfunctioning entities. These would be entities which are incapable of performing their functions. So, for example, if a token heart is unable to pump-blood, a theory of normal-proper functions should classify that heart as malfunctioning rather than not having the function to pump blood. Let us call this the *function-malfunction* desideratum.

Let us move on to seeing some theories of function which, at least *prima facie*, satisfy these desiderata. One important class of theories that is able to do so are *etiological theories* of functions (see, among others, Garson, 2017; Godfrey-Smith, 1994; Griffiths, 1993; Millikan, 1989b; Neander, 1991, 1995; Wright, 1973).<sup>2</sup> Roughly speaking, according to such views, the function of a type of entity *e* is that activity  $\phi$  which explains why entities of that type are present (or have been maintained) within some class of systems. This theory is historical because it ascribes functions by appeal to the past activities of entities which are of the same type as the entity in question. For example, the

function of the heart is to pump blood, on this view, because that is what token hearts have done in the past in, say, vertebrates which explains why hearts are still present in vertebrates today.

The theory respects a function-malfunction distinction because whether a token entity has a function in the here-and-now does not depend on what properties it has (and hence what effects it's capable of producing) in the here-and-now, but rather on the effects that entities of that type have produced —by performing some activity—over the course of some historical time period. The fact that a token entity's function depends on what other tokens of its type have done in the past allows for the possibility that an entity of type  $e$  has the function to  $\phi$  without being able to  $\phi$ . Further, an etiological theory can satisfy the function-accident desideratum by maintaining that only some activities will be relevant for explaining why some type of entity has persisted. So, for example, any etiological theory will claim that hearts have been maintained because of their ability to pump blood and not because they have the potential to be diagnostic aids.

The central way of making etiological theories precise is by appealing to well-understood selection processes, such as natural selection. For example, one may explain why hearts have been maintained in vertebrates by appealing to the fact that pumping blood had contributed to the overall fitness of vertebrates in the past, and that because of this, hearts were naturally selected for among vertebrates. Thus, for instance, Neander (1995, p.111) defines a normal-proper function in the etiological spirit as follows:

(N) Some [activity]  $\phi$  is the [normal-]proper function of some entity  $e$  in organism  $O$  iff the genotype responsible for  $e$  was selected for doing  $\phi$  because doing  $\phi$  was adaptive for  $O$ 's ancestors.

Neander's definition makes it sound like the only selection process possible is *natural selection*. But this is not true. Most, if not all, etiological theorists are willing to allow for other selection processes, such as intentional selection (which is how artifacts would get their functions on this view).<sup>3</sup>

Furthermore, it's important to mention that, even once artifacts have been put aside, etiological theories are not necessarily biological. For example, what many claim to be an early formulation of an etiological theory — viz., the one provided in Wright (1973, 1976) — makes no explicit reference to evolutionary theory (or any other biological notions for that matter):

(W) A function of an entity  $e$  is to  $\phi$  iff:

- (i)  $\phi$ -ing is a consequence of  $e$ 's being there
- (ii)  $e$  is there because it does  $\phi$ .

Furthermore, some authors, for example, Burge (2003, p.512 fn.8, 2010, p.320 fn.44), seem to think that Wright is more or less on the right track but deny that his theory of function needs to be cashed out further using biological terms. Put differently, according to some, Wright's account doesn't need to be explicated further using biological notions to remain respectable, whatever that may entail.<sup>4</sup>

As mentioned earlier, the etiological theory is historical, but, according to the standard iterations of this view, what history counts is recent history. If this were not so, then etiological views would fail to be descriptively adequate. This is because failure to formulate such theories in terms of the recent past would allow for entities that are vestigial to have normal-proper functions, such as the atrophied, useless eyes of cave-dwelling troglobites which were presumably selected for due to some effect they had produced for their ancestors (Griffiths, 1993, p.416).

It's important to note that some find the historical aspect of etiological views to be troubling in and of itself. This is because, according to etiological theories, function attributions are *necessarily* historical in so far that: if an entity has *no* selection history, then it has *no* functions.<sup>5</sup> To dramatize a bit, if it were to turn out that the world was created 5 minutes ago, it's plausible that no entities would have any functions according to any theory put forward in the

etiological spirit (Bigelow & Pargetter, 1987, p.188). This is counter-intuitive since it's plausible that hearts would still have the function to pump blood even if the world were created 5 minutes ago.

Although etiological views are in many ways the stock view of normal-proper function in the philosophy of mind, it's a mistake to think that etiological theories are the only theories of function capable of capturing what's distinctive of normal-proper functions. Another class of such theories are *typicality theories* (Boorse, 1977, 1997; Garson & Piccinini, 2014; Hausman, 2011, 2012).<sup>6,7</sup> These theories claim that the function of a type of entity  $e$  is the typical way in which entities of type  $e$  contribute to the survival and/or inclusive fitness of the organism (or system more generally) that the entity is a part. These theories are burdened with cashing out the term "typical". One way to do so is in probabilistic terms. So, to fix ideas, we can focus on a probabilistic version of this theory inspired by Garson and Piccinini (2014):

(B) A function of an entity  $e$  in an organism  $O$  is to  $\phi$  iff the probability that a token  $e$  contributes to  $O$ 's survival or inclusive fitness by  $\phi$ -ing given  $e$  is contributing to  $O$ 's survival or inclusive fitness is non-negligible.

(B) is meant to attribute functions to entity types. So, for example, if  $e$  in  $O$  has the function to  $\phi$ , then, according to (B), if we were to reach into the class of  $e$ 's, the probability that we would pick out one which contributes to  $O$ 's survival or inclusive fitness by  $\phi$ -ing, when  $e$  is contributing to  $O$ 's survival or inclusive fitness, would be non-negligible. Because of this, we can say that a token entity is malfunctioning just in case it is incapable of  $\phi$ -ing. And thus (B) obeys a function-malfunction distinction. Further (B) prevents fortuitous effects from being considered functions—the idea being that the likelihood that an entity contributes to the survival or inclusive fitness of the relevant organism by way of the would-be fortuitous effect is negligible. Note, however, that an immediate problem with a view of this kind is that it doesn't specify what counts as non-negligible (but see Boorse (2002, p.71) and Garson and Piccinini (2014, p.7, fn.8) for helpful discussion).

Theories of this kind are often confused for theories that claim that the function of an entity is "what it typically does" or "what it typically does to benefit the organism" (Garson & Piccinini, 2014, p.6). Such theories, if they were to exist, would be descriptively inadequate. Most notably, they wouldn't be able to predict that the sperm have the function to fertilize the ova, since sperm don't typically do so. However, theories built around (B), which is exemplary of the proper way to understand typicality theories, do predict that sperm have the function to fertilize the ova, since "the conditional probability that a sperm fertilizes an ovum, given that it is contributing to survival or inclusive fitness, is extremely high" (Garson & Piccinini, 2014, p.6).

Another advantage of typicality theories is that they are not necessarily historical. For example, according to (B), the heart would still have the function to pump-blood even if the world were created 5 minutes ago, since it would still be extremely likely that any given token heart would be contributing to the survival or inclusive fitness of the organism in which it is a part by pumping-blood given it were contributing to the survival or inclusive fitness of the relevant organism in that scenario.

Further, note that the supporter of a typicality theory does not need to reject the claim that hearts are selected for by natural selection because they pump blood—they simply claim that this fact is not constitutive of an entity's function, unlike etiological theorists. The a-historicity of such theories does not come without a cost, however. For example, suppose that (B) predicts that an entity  $e$  at time  $t$  has the function to  $\phi$ . It could turn out, however, that every  $e$  suddenly becomes incapable of  $\phi$ -ing at a  $t'$  later than  $t$ . It's unclear whether (B) predicts that each  $e$  is malfunctioning or whether  $e$ 's no longer have the function to  $\phi$ . Opting in for the former disjunct would appear to bring in history through the back door, but some may find opting in for the latter to be counter-intuitive. An adequate typicality theory should address this dilemma.

Last, it's worth noting that theories of this type are not necessarily biological either. To generalize (B), one may replace "an organism  $O$ " with "a system  $S$ " and "survival or inclusive fitness" with some other possible, non-biologically understood goal-states that an entity  $e$  may contribute to by performing some activity  $\phi$  in order for  $\phi$  to qualify as a function of  $e$  (cf. Boorse, 2002, p.70f.).

### 3 | NORMAL-PROPER FUNCTIONS AND REPRESENTATION: THE PROBLEM AND THE ORTHODOXY

A dominant theory in the philosophy of mind is the *representational theory of mind*. This theory starts with Brentano's (1874) observation that paradigm mental states such as beliefs, desires, and perceptions are *about* things. For example, my belief that it's raining now is about rain, the current weather and so on. Perceptual states are also paradigm cases —my current percept of a beer bottle is *about* the beer bottle in front of me. According to the representational theory of mind, paradigm mental states are about such-and-such in virtue of *representing* such-and-such. So my belief that it's raining now is about rain, the current weather and so on, because it represents my current environment as rainy. What a state represents is (or is constitutive of) its *content*. The content of a mental state, then, specifies a particular way the world might be.

Now, a central question for the representational theory of mind is:

(Q) In virtue of what does a representational state represent what it does (rather than something else)?

One can attempt to answer this question by appeal to normal-proper functions. The orthodox way of pursuing this line is to engage in the project of trying to answer (Q) by appeal to notions which are *non-representational* in nature. Thus, they try to shed light on the nature of representational content in a non-circular fashion. Indeed, many versions of the orthodoxy are presented as reductive theories. They take the notion of function to be specifiable in non-representational terms and argue that this notion, along with other non-representational notions, are equipped to reduce the relation of *representing* to those notions (see, among others, Dretske, 1986, 1988; Millikan, 1984, 1989a; Neander, 1995, 2017; Papineau, 1987; Shea, 2018).

To fix ideas let us work with a vastly simplified theory of this type:

(S) States of type *I* represent a property *F* iff it's the function of *I* to carry information about *F*s.<sup>8</sup>

I won't go into great detail about what it is for one state to carry information about another, but the current orthodoxy is to define the *information carrying* relation as follows: a state *A* carries information about a state *B* iff the objective probability that *B* obtains given *A* obtains is not equal to the objective probability that *B* obtains (cf. Ganson, 2021, p.686f.; Scarantino, 2015; Shea, 2018, p.75ff.; Skyrms, 2010, p.35f.; Stegmann, 2015). So, *A* carries information about *B* because the objective chance of *B* obtaining either decreases or increases if *A* obtains. For example, smoke carries information about fire because the probability that there is a fire at a location *I* would be greater if there were smoke at *I* than if there were no smoke at *I*.<sup>9</sup>

It's important to note that (S) is defined over types. Because of this, it allows us to distinguish between a token state's *representing correctly* and a token state's *representing incorrectly*. A token state which represents incorrectly is, of course, misrepresenting. It represents the world as being some way it *isn't*. Say that a state *I* *represents correctly* iff *I* is tokened because of, or in the presence of, that property which it represents; and, thus, *represents incorrectly* otherwise. Note that it's crucial for a theory of representational content to allow for misrepresentation, since supporters of the representational theory of mind will want to explain things like false beliefs and perceptual illusions in terms of states which are misrepresenting. Indeed, as will become clear, a central advantage of any normal-proper function based theory of representational content is that it allows for misrepresentations to come about in a variety of ways.

One way in which a misrepresentation may arise, according to (S), is if the relevant internal state *I* (or the realizer of that state) is itself defective, either because of damage to a sensory organ or neural region, a congenital disorder, or senescence (Ganson, 2017, p.1707). To see what I have in mind here, suppose, as is plausible, that there is a mental state *I*, present in normal human subjects that carries information about the property *red-surface* (cf. Matthen, 1988). Further, let us grant that this provides reason for thinking that the function of *I*, is to carry information about red-surfaces, and hence, that states of type *I*, represent red-surfaces. So: *I*, will represent correctly iff it is tokened because

of, or in the presence of, a red-surface. We can imagine a case in which a subject (call them “Invert”) suffers damage to some part of their retina which causes their  $I_r$  to be tokened only because of green things, but not red things (cf. Dretske, 1988, p.67). Because of this, every time Invert tokens their  $I_r$  they misrepresent.<sup>10</sup> Plausibly, Invert has a malfunctioning  $I_r$ , so misrepresentations may arise due to a malfunctioning internal state.

Moreover, an internal state may be prone to misrepresentation if it is tokened outside of normal conditions (Ganson, 2017, p.1707). For example, suppose that there is an internal state  $I_d$  present in normal human subjects that carries information about the property *depth*. If a subject A is looking through a stereoscope, where the viewing conditions depart from those which are present in a normal human environment, A's  $I_d$  may be tokened *because* of some magnitude which is not oriented in depth. We may consider A's  $I_d$  to be malfunctioning when it's tokened in such conditions because it's unable to do what it's supposed to do under such conditions. That is, the objective probability that a magnitude in depth is present is the same regardless of whether A's  $I_d$  is tokened when A is looking through a stereoscope. So, this is another kind of case in which a malfunctioning internal state would give rise to misrepresentation.

The above examples of misrepresentation deal with malfunctioning internal states. It's a mistake, however, to think that (S) only recognizes misrepresentations due to malfunctioning internal states. In particular (S) leaves open the possibility that a mental state  $I$  with the function to carry information about  $F$ s can be tokened in a subject  $S$  because of something which is not  $F$ , even if  $I$  is not malfunctioning. This is important because such cases are deemed actual. For example, it's nomologically possible that a red light may illuminate a white surface, in a subject's normal environment, such that a subject B mistakes that surface for one that is red, despite having an  $I_r$  which is capable of carrying information about red surfaces (Matthen, 1988, p.12f.). In this case, the idea is that B's  $I_r$  is tokened in the service of attributing the property red to a surface despite that surface being white. And, as the story goes, B's  $I_r$  is still capable of carrying information about red things and there is no reason to think that it has been tokened in abnormal viewing conditions —making it wrongheaded to claim that B's  $I_r$  is malfunctioning.<sup>11,12</sup>

Note that this last kind of misrepresentation is not allowed for by theories which implicitly appeal to the notion of normal-proper function. For example, it's not open to theories which claim that states of type  $I$  represent  $F$ s iff tokened  $I$ s carry information about  $F$ s under normal conditions, where *normal conditions* are understood as conditions in which the relevant perceptual system is not malfunctioning and is in its normal environment. This is because, in the above case with the red illuminate and white surface, conditions were normal and a misrepresentation still occurred.

Before moving forward, it's essential that we touch base on the indeterminacy problem for reductive function based theories of content like (S). Roughly put, the worry is that normal-proper functions do not cut finely enough to determine what property an internal state is representing. A standard example will help make things clear: does the internal state in toads that is tokened when in the presence of small-dark moving objects,  $I_p$ , represent *flies*, *food*, or *small-dark moving object*? What makes the question difficult is that (i) it could be the function of  $I_f$  to carry information about either flies, food, or small-dark moving objects since the  $I_p$ , plausibly, does carry information about all three properties in the toad's normal environment, and (ii) each candidate content ascription predicts misrepresentation in different places. For example, if we were to opt in for the content *food*, then  $I_f$  would misrepresent when tokened because of a non-nutritious small-dark moving object, but wouldn't misrepresent if we opt in for *small-dark moving object*. The problem is general because there will be many cases which resemble the toad-fly case. The challenge to theories like (S), then, is to provide a principled way of adjudicating between content ascriptions when there are many plausible candidates.

## 4 | THE EMERGENCE OF HETERODOXY

As stated earlier (S) is representative of a reductive theory of representational content. Although this is sometimes understood as a non-negotiable feature of such a theory (see, e.g. Fodor, 1984), some find such “reductive enterprises [...] to be more exercises in ideology than contributions to knowledge and understanding” (Burge, 2003, p.510).

That said, it will be helpful to look at some non-reductive, and on the whole less orthodox, views of representational content which appeal to the notion of normal-proper function. To do so, I will focus on the two most well-developed theories of this kind presented by Burge and Schellenberg. These views are best developed with respect to perceptual representations, so that is what I will focus on it what follows.

According to Burge, “[a] primary function of a perceptual system is to perceive. Perception is veridical representation. Failure to produce veridical representation is a failure to fulfill that function” (2010, p.310). The functions Burge is speaking of are irreducible representational functions. Roughly, these are states and systems which function to represent veridically, where “represents veridically” is taken as a primitive —what it is for a state to represent correctly is not reduced to something else as it is in (S) —and the relevant theory of normal-proper functions, as mentioned earlier, is an etiological one not to be cashed out in biological terms.

Since Burge is not trying to reduce representational content, we can understand him as taking it to be a brute fact that there are creatures that have perceptual systems, which have the function to represent veridically, that produce perceptual states which also have the function to represent veridically (2010, p.379). It may be helpful to understand Burge as saying that perceptual systems produce perceptual states that each purport to attribute some property  $F$  to individuals in the distal environment such that: if a perceptual state  $I$  were produced which purports to attribute  $F$ 's, then it would purport to represent some individual as being  $F$ . And, because of this,  $I$  would have the content  $\langle F \rangle$ . Such states would fail to fulfill their functions, and hence would represent incorrectly, when and only when they do not accurately attribute  $F$  to the relevant individual.

It's worth noting that Burge argues that the perceptual sciences (vision science, etc.) are implicitly committed to the fact that perceptual states have representational functions. That is, according to Burge, perceptual science provides reason for thinking that there are perceptual states which function to represent veridically (Burge, 2010, ch.8). Burge's argument for this point is subtle and complex so I won't go into the details here. But, it's worth mentioning that one could always deny that the perceptual sciences do commit one to the existence of representational functions in the way Burge needs to make his view plausible (Springle, 2019).

Let us move forward. Schellenberg takes the mind to consist of a number of different perceptual capacities which *function* to single out and discriminate elements in the distal environment. According to Schellenberg, in virtue of employing a perceptual capacity  $c$ , a subject is put in a mental state that is characterized by what  $c$  functions to single out and discriminate. For example, if a subject employs a capacity that has the function to single out and discriminate particulars of a certain kind, then that subject will be in a perceptual state with the content  $\langle a \rangle$ , where  $a$  is a particular of the kind that the capacity functions to single out and discriminate. A perceptual capacity fulfills its function when and only when it's employed because of (or in the presence of) that which it functions to single out. Perceptual error is explained by appeal to unsuccessfully employed perceptual capacities, that is, perceptual capacities which fail to fulfill their functions.

Schellenberg's project is closer to views which are formulated by appeal to something like (S). However, she seems to be less enamored with analyzing the natural functions of mental states (or, more precisely, perceptual capacities) on close analogy with paradigm physiological entities, like hearts and kidneys, which is rampant among those sympathetic to a theory like (S). Rather, the normal-proper functions of Schellenberg's perceptual capacities may be further understood on analogy with mathematical functions —namely, we may think of them as input/output devices. Each capacity is selectively responsive to a range of inputs — for example, property-instances that are of the same type — and these capacities output mental states with particular contents that reflect those inputs. One thing that needs to be the case with respect to Schellenberg's view, however, is that perceptual capacities need to be trigger-able by things which are not of the kind which the capacity functions to single out and discriminate. Otherwise perceptual capacities couldn't be employed unsuccessfully. Thus, Schellenberg may only require that some of the elements that can be taken as input be of the kind that the capacity functions to single out and discriminate. Last, it's important to note that Schellenberg does not claim to be reducing representational content to something else, but is rather better understood as explaining representation in terms of singling out and discriminating (Schellenberg, 2018, p.49ff.).

Although I won't go into detail here, it's important to note that the views of Burge and Schellenberg are designed to allow for misrepresentations in much the same way that (S) was shown to allow for misrepresentations. That is, both appear to agree that “[m]ost failures [for perceptual states to be accurate] will be [the result of] mere malfunctions in the animal's perceptual apparatus”, but agree to the possibility of “brute errors: errors that are compatible with the animal's perceptual apparatus' operating as well as it can” (Burge, 2003, p.518), and suggest that error may arise when an organism is outside of its normal environment (Burge, 2003, p.518., see also, p.533f.; cf. Schellenberg, 2018, p.42ff.).

Burge (2010) and Schellenberg (2018) present new ways of putting normal-proper functions to work in the philosophy of mind and their views should be lauded for doing so. However, a serious question which arises is how to adjudicate between the heterodox theories presented by them and the more orthodox theories that resemble (S) –especially in light of the fact that all three allow for misrepresentations in much the same way. I couldn't possibly discuss all the relevant points of disagreement here, but I will briefly touch upon some in closing.

One advantage of an orthodox view and Schellenberg's view, over a view like Burge's, is that they “aim to explain representational content in terms of something that does not already appeal to representation” (Schellenberg, 2020, p.757). As Schellenberg expands, “it's explanatorily unsatisfying to analyze representational content in terms of capacities to represent” and, by parity of reasoning, representational functions (Schellenberg, 2020, p.757).

That said, one common complaint against theories like (S), and perhaps even Schellenberg's, is that they over-generalize. For example, Burge (2010) criticizes Millikan's (1989a) orthodox view for predicting that “bacterium represents oxygen poverty” because “[b]acteria have sensors that respond to magnetic fields”; the function of which “is to enable the bacterium to move toward oxygen-poor locales” (Burge, p.300). Burge's solution to the over-generalization problem is to reserve representational states to creatures which have sensory systems capable of attributing the same property  $G$  to an individual  $F$  over a range of viewing conditions  $C_1, \dots, C_n$  despite  $F$  presenting a different pattern of sensory stimulation to the creature's sensory receptors in each  $C_i$ . These are referred to as perceptual constancies (Burge, 2010, chs.8 and 9).<sup>13</sup> However, it remains plausible that other, more orthodox theories can adopt a similar line in order to prevent their theories from over-generalizing.

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## ENDNOTES

- <sup>1</sup> This is expressed using the indefinite article because a bird's beak has other normal-proper functions, such as to aid it in foraging (Friedman et al., 2019).
- <sup>2</sup> This claim has been questioned by Davies (2000), but see Sullivan-Bissett (2017) for reply.
- <sup>3</sup> See Garson (2017) and Shea (2018, ch.3) for helpful discussion on what other selection processes etologists may evoke in formulating their theories.
- <sup>4</sup> Presumably, however, some modification to Wright's account will need to happen as it's generally agreed to be inadequate as it stands.
- <sup>5</sup> What counts as a selection history, in this context, is subject to considerable debate. See McLaughlin (2001, pt.3) and Shea (2018, ch.3) for helpful discussion.
- <sup>6</sup> See Griffiths and Matthewson (2018) for criticism of such views.
- <sup>7</sup> There are other theories as well that I won't have space to discuss here, such as the life chances theory of Bigelow and Pargetter (1987), Nanay's modal theory (2010), and Mossio, Saborido and Moreno's organizational account (2009, 2011). It's worth noting that Bigelow and Pargetter's (1987) theory is quite similar to typicality theories, and some have argued



that organizational accounts bear substantive similarities to etiological accounts (see, e.g., Artiga and Martinez (2016), and Mossio and Saborido (2016) for a reply).

- <sup>8</sup> This would be an example of a low-church, informational teleosemantics. What makes it “informational” is the fact that it makes explicit appeal to an internal states carrying information when reducing the *represents* relation. And, it’s “low-church” because it does not make explicit appeal to a system which uses the representation in order to fulfill it’s normal-proper function (what is known as a “consumer”) when doing so. The high-church/low-church distinction cross cuts the informational/non-informational distinction insofar that one can appeal to both information carrying internal states and consumers when reducing the *represents* relation (see, for example, Shea, 2018), although such a theory would not be as high-church as one that does not make explicit appeal to an internal states carrying information when doing so. My goals in this section could have been reached using a higher-church version. This distinction matters when adjudicating between possible content attributions, such as in the toad-fly case (discussed briefly below) and Pietroski’s (1992) Snorf case.
- <sup>9</sup> A supporter of (S) may reach for a different account of what it is for one state to carry information about another. For example, Neander (2017) argues that, at least with respect to perceptual representations, a “simple causal analysis” of information will work, according to which “one event carries information about another if the second causes the first” (Neander, 2017, p.142). Ganson (2021) argues that Neander’s simple theory is inadequate even when restricted to perceptual representations.
- <sup>10</sup> A more realistic case of this kind can be found in Neander’s (2013, p.33) discussion of neurologically defective toads.
- <sup>11</sup> Whether theories like (S) can handle cases of normal, *systematic* misrepresentation, however, is a serious and open question. See, Mendelovici (2013) for critical discussion, and a reply from Artiga (2013). See also McLaughlin (2016) and Green and Rabin (2019) for a discussion of how widespread normal and systematic misrepresentations are. Further, Ganson (2017) has argued that theories like (S) have no obvious way to accommodate the fact that perceptual accuracy is often traded off for other virtues (like speed or energy).
- <sup>12</sup> Some may want to dispute that Matthen’s case constitutes a genuine case of misrepresentation. See Gauker (2011, p.204f.) and Ganson (2017) for some potential reasons why.
- <sup>13</sup> See Schulte (2021) for a general discussion of perceptual constancies.

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