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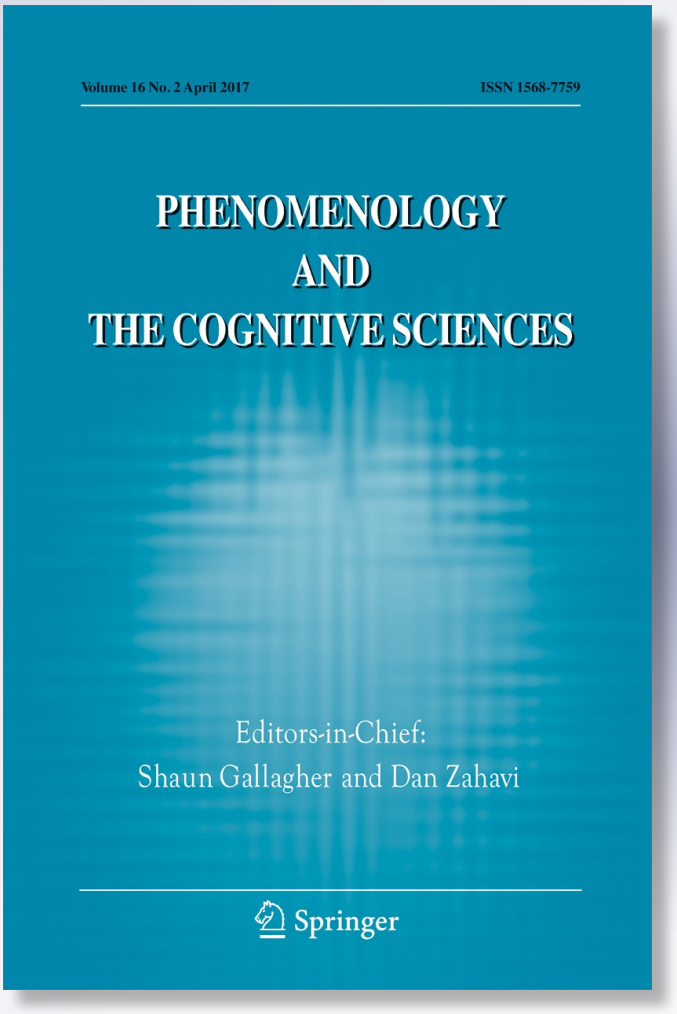

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Functions and mental representation: the theoretical role of representations and its real nature

Miguel Ángel Sebastián[1]

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Abstract Representations are not only used in our folk-psychological explanations of behaviour, but are also fruitfully postulated, for example, in cognitive science. The mainstream view in cognitive science maintains that our mind is a representational system. This popular view requires an understanding of the nature of the entities they are postulating. Teleosemantic theories face this challenge, unpacking the normativity in the relation of representation by appealing to the teleological function of the representing state. It has been argued that, if intentionality is to be explained in teleological terms, then the function of a state cannot depend on its phylogenetical history, given the metaphysical possibility of a duplicate of an intentional being that lacks an evolutionary history (Swampman). In this paper, I present a method to produce, according to our current knowledge in genetic engineering, human-like individuals who are not the product of natural selection in the required sense. This variation will be used to shed light on the main replies that have been offered in the literature to the Swampman thought experiment. I argue that these replies are not satisfactory: representations should better not depend on natural selection. I conclude that a non-etiological notion of function is to be preferred for characterizing the relation of representation.

Keywords Teleosemantics · Biological function · Mental content · Representationalism · Bidimensionalism · Swampman

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Representations are not just part of our folk-psychological explanations of behaviour but are also fruitfully postulated in cognitive science and elsewhere to explain our behaviour, cognitive abilities and language competence. However, many have worried about the nature of the representation relation because it seems mysterious. Naturalist theories of mental content such as teleosemantics do not take representations as fundamental. Such theories seek to provide a different explanation—one that is compatible with materialism. They ask: in virtue of what does the representation relation hold between a representational vehicle and its object?

The paper is organized as follows: Section 1 presents the relation between functions and representations, as well as the theoretical position that will be targeted in this paper, what I will call 'evo-etiological theories'. Section 2 introduces one of the main objections to these theories—the case of Swampman—and a variation thereof based on our current genetic knowledge. Section 3 discusses two arguments against these theories and the replies that have been offered in the light of the presented variation. I argue that these replies are not satisfactory and conclude that evo-etiological theories should be rejected.

1 Functions and representation

In the last thirty years there has been a renewed interest in the philosophy of mind in functions and functional explanation with the hope that the notion of biological function would contribute to an account of mental content. For example, Dretske connected the idea of representation with that of information and in Dretske (1988), he maintains that a representing system is one that has the *function of indicating*[1] that *such-and-such* is the case, *such-and-such* being the intentional content.

It is widely acknowledged that indication alone cannot do the job.[2] A mental state M indicates many things; and so, we don't want to maintain that M represents all the things indicated. The partition between correct cases and incorrect cases is done by the function of M: cases of misrepresentation (incorrect cases) are cases in which M indicates something different from what it has the function of indicating.[3]

[1]The notion of indication can be spelled out by means of conditional probabilities: M indicates C iff P(C|M) > P(C). Dretske (1981) demanded in turn that P(C|M)=1; but in this case there would be no room for misrepresentation. To solve this problem, Dretske distinguishes a learning period where this condition is satisfied from a later one where the conditional probability can be lower. However, faced with several problems (see Millikan (1984) for some of them) he alters his view in later work (Dretske 1988; 1995) favouring arguments that appeal to a natural selection process. The problem I want to discuss in this paper does not depend on the way indication is spelled out. The one above is presented for illustration purposes and links the idea of representation with that of (mutual) information: if there is not malfunction, the state carries information about its object.

[2]Cf. Skyrms (2010). Skyrms suggests that an account of representational content just in terms of information can be provided. Shea (forthcoming) convincingly argues that representation is "not just a matter of information of the right kind." (ibid. p 12)

[3]Telesemanticists are aware that not every content can be naturalized this way. The complications they introduce to solve this problem are irrelevant for my current purposes.

The mainstream answer to the problem of normativity[4] is to appeal to a teleological notion of function or *proper function* as Millikan (1984) calls them. The proper function of a function bearer should be identified with the reasons for the existence of the trait (Ayala 1970; Wright 1976). In the case of artifacts we appeal to the intentions of the designer as reasons for the trait's existence: the function of my computer's fan is to lower the CPU's temperature, because that's the reason why the designer placed the fan in the CPU—the fan was *selected for* lowering the temperature of the CPU. In the case of biological traits, it is typically appealed to natural selection instead of a designer: the function of my kidneys is to filter blood because filtering blood is what kidneys have been *selected for* in evolution.

According to these etiological theories, the proper function of a trait depends on its causal history and past *selection for* traits of that type.[5] So, representational states are those that have been *selected for indication*.

In this paper I want to focus exclusively on etiological theories that appeal to natural selection to offer a theory of mental content, independent of the particular details. I will use the term 'evo-etiological' to refer to these theories. It is important to remark that evo-etiologists are not committed to the claim that *all* contentful mental states are the product of natural selection; i.e. to claim that only those traits that have been selected for in evolution have a proper function. For example, Millikan (1984) defends that some states, which have not been selected for F, have F as its *derived proper function* in virtue of being the product of a device that has been selected for F: non-selected states might have proper functions derived from the one of the device that produce them. The view I am targeting at is one that maintains something along the following lines:

Evo-etiological Necessarily, some contentful states (of the kind we have, which are required to explain our behaviour, cognitive abilities and linguisitc competence) require that (i) the state has been selected for indication in evolution or (ii) that it is the result of a device that has been selected for indication in evolution.[6]

[4]I take the main challenge for a naturalistic theory to be that of explaining in virtue of what a state has correctness conditions. Having correctness conditions is a feature allegedly shared by my belief that dogs are mammals, my concept DOG and certain patterns of brain activity including cells in V1, V2 and V4—which are said to represent the color of the stimuli. In what follows I will work on the assumption, shared by most naturalistic theories of mental content, that the relation that holds between the vehicle and its object in cases like those just presented is of the same kind; namely, that of representation.

[5]This requires an explanation of what makes it the case that a trait is a token of a certain type. Millikan (1984) appeals to a causal process of copying. Tokens of a type are similar—they have some relevant properties in common—because they are the result of a process of copying. In the case of artifacts because they are produced from a common model (for example, fans are produced following the attempt to reproduce certain properties of the prototype, which was designed to cool the CPU); in the case of natural selection, roughly, genes are reproduced from the ancestor's genes. See also Hull et al. (2001).

[6]It might be worth stressing that the rejection of this principle does not commit one to the claim that we have the representations that we have in part as the result of evoution. The claim under dispute is whether there are representational abilities that necessarily depend on selection in evolution.

Evo-etiological theories have been endorsed in some form or other by Cao (2012); Dretske (1995); Martinez (2013); Millikan (1984, 1989),[7] Neander (1996); Papineau (1993); Price (2006); Shea (2007); Tye (2002), etc.

Evo-etiological theories might acknowledge that there are alternative selection processes that give rise to a proper function. For example Hull et al. (2001) provide detailed characterization of a selection process and it follows from it that states that result from some learning processes would count as *selected for* and hence have proper function. Papineau (1993) also suggests that learning might give rise to proper function in some cases. Etiological theorists who want to give up natural selection (those who do not endorse an evo-etiological theory) would have to provide alternative selection processes *for all mental states*—the claim that all contentful mental states result from a learning process seems implausible, see Kingsbury (2008) for discussion. I would like to remain neutral on whether and how this can be done, focusing on evo-etiological theories.

A classical objection to these evo-etiological theories is precisely that the traits of an individual outside the phylogenetical order, who is not the copy of any individual inside of it, would thereby lack proper function and so, she would lack contentful mental states—beliefs, desires, perception, etc. Here is where *Swampman* enters into play.

2 Swampman and randoman

According to evo-etiological theories, a trait has a function only if it (tokens of its type) has been selected for in evolution. When a trait appears for the first time in the phylogenetical chain it lacks proper function. Some authors find this result counterintuitive. For example, Boorse (1976) invites us to imagine a population of rabbits, call them Swamprabbits, accidentally coming together into existence. According to Boorse, we would be able to ascribe functions to the Swamprabbits' traits even if they lacked any selection history.

Davidson (1987) popularized a philosophical character, Swampman, to show the relevance of causal history for reference. Davidson introduced Swampman as follows:

> Suppose lightning strikes a dead tree in a swamp; I am standing nearby. My body is reduced to its elements, while entirely by coincidence (and out of different molecules) the tree is turned into my physical replica. My replica, Swampman, moves exactly as I did; according to its nature it departs the swamp, encounters and seems to recognize my friends, and appears to return

[7] Millikan denies that there can be selection for indication. However, positions like hers can be easily accomodated into evo-etiological views by modifying (ii) by something like:

> (ii*) that it is the result of a device that has been selected for producing states that map onto certain states of affairs.

I will continue talking in terms of indication for the sake of simplicity in the exposition.

> their greetings in English. It moves into my house and seems to write articles on radical interpretation. No one can tell the difference. (ibid, p.19)

Evo-etiological theories are committed to the claim that Swampman's traits lack any proper function because he lacks an evolutionary history and is not a copy (in the sense mentioned in fn.5) or the product of any intentional creation. The similarity between Davidson and Swampman is nothing but a stupendous coincidence.

Teleosemantic theories that embrace an evo-etiological theory of function are committed to denying that Swampman has any mental content. He would not have any beliefs or desires. It would not be appropriate to say, for example, that he believes that Washington D.C is the capital of the United States because, lacking intentional states, he does not believe anything.

Philosophers like Millikan (1996); Neander (1996) have claimed that objections based on intuitions about the Swampman's case cannot prove teleological theories wrong because they miss the point of these theories, which is to offer a real-nature theory. On a preliminary examination, they point out that we should dismiss intuitions based on fanciful thought experiments because the aim of the theory is to offer an account of how the norms of representation arise in the *natural world*—more on this below—and Swampman is not part of it. For a first approximation, I would like to present a case against evo-etiological theories, which is not based on exotica but rather on the current state of the art of our genetic science. This case is interesting for at least two reasons. The first one is that it clearly presents a possible scenario in the actual world and the second is that it is a case much closer to ours. This, I hope, will make the rejection of the intuition far less palatable as I will try to show.

2.1 Randoman

Genetic engineering makes it possible to create individuals whose traits have not been selected for indication. DNA consists of two long polymers of simple units called nucleotides, with backbones made of sugars and phosphate groups. Attached to each sugar there is one of four types of molecules called "bases" — Adenine (A), Thymine (T), Guanine (G) and Cytosine (C).

Having a map of Davidson's DNA, it is possible to create a DNA duplicate in the laboratory. This chain would then be introduced in a cell with the basic proteins to express this genome, a totipotent stem cell.[8] If the conditions for its reproduction are guaranteed, then some months later Dollyman would be born. Evo-etiologists are not committed to the claim that Dollyman's states would lack intentionality. As we have seen, one can appeal to the fact that he has been copied from Davidson for holding that Dollyman's mental states exhibit intentionality. Contrary to Swampman, who is not a copy of Davidson but the product of mere randomness, Dollyman inherits Davidson's historical properties. His mental states are of the same type as Davidson's and have functions in virtue of his being a copy of Davidson.

[8]Totipotent stem cells can be differentiated into embryonic and extraembryonic cell types. Such cells can construct a complete, viable, organism and are produced from the fusion of an egg and sperm cell.

In order to have an objection against theories of mental content that rest on an evo-etiological notion of proper function we need to get rid of the process of copying: we need a being that is the result of a random process—as Swampman is. Furthermore, we want a *real-nature* example; ideally we want the process to be nomologically feasible so that we can really test our intuitions. The process will take place in the following four steps:

1. Take a random number generator that generates a sequence of 0s and 1s.
2. Use a computer to code pairs of numbers such as: A (00), T (01), G (10) and C (11).
3. Connect the computer to a DNA synthesizer. The DNA synthesizer receives the sequence from the computer and converts it into a molecule.
4. Group these fragments of DNA randomly and introduce them into a cell with the basic required proteins. The introduced genome is completely random and lacks any history.

The vast majority of the resulting combinations won't give rise to organisms; others will give rise to an organism but they will be unable to survive. However, the process might give rise to dinosaur-like organisms, orangutan-like organisms and human-like organisms. Let me call 'Randoman' to the first human-like individual that results from this process. Randoman lacks representations according to evo-etiological theories, he is not the copy of a human but the result of a random process and his traits have not been selected for indicating anything.

One might object that Randoman is not completely outside the evolutionary order, because, for example, a totipotent cell is required in the previous process and this cell is the result of selection in evolution. Thus, it is not clear that—leaving aside alternative *selection for* processes—Randoman's traits lack proper function. In reply, it should be stressed that it is not just selection what is required in order for a trait to have F as a proper function, but *selection for F* (or in the case of derived proper function being the result of a process that has been *selected for F*). In the particular case of representations what is required is *selection for indication.* But, indicating something seems not to be what, for example, totipotent cells have been selected for—they do not have this proper function—and hence, say, brain processes in Randoman's brain do not have the (derived) proper function of indicating anything. More generally, although there are some epigenetic factors involved in the process of generation of Randoman that one might reasonably claim are "copied" from an individual inside the phylogentic order, these factors do not suffice for claiming that Randoman's traits are "copied" from such an individual, because the DNA information is a necessary condition for the required specialization.[9] An analogy might help to illustrate my reasoning:

Imagine that a lightning strikes several paint cans that happen to be close to a canvas and, by entire coincidence, a replica of Picasso's *Guernica* appears. The replica is not a copy of the original painting in the same sense as Swampman is not a copy of Davidson. If, on the contrary, we study *Guernica* and produce a list of the strokes

[9]Furthermore, these factors can also be produced *mutatis mutandi* by a random process.

required to reproduce the painting, give them to a device that performs these actions and guarantee the adequate conditions, we will get a replica of *Guernica*. But, say, the head of the horse in the resulting painting will be a copy of the one in the original, in a similar sense in which Dollyman's traits are a "copy" of Davidson's. Now, consider that what we give to the device (the proteins, most of them enzymes required to express the genome) to paint the canvas (the totipotent cell) is a list resulting from a random combination of strokes and colors (the random DNA) and that we guarantee the adequate conditions (other epigenetic factors, like pressure, temperature, etc.). The vast majority of the resulting paintings will be a ludicrous set of coloured lines, but the result might—just a matter of probability—be a replica of Kahlo's *The two Fridas*, *Pollock's Number 1A*, or Picassso's *Guernica*. In the latter case, the horse head in the painting is not a copy, in the required sense, of the original. And similarly, Randoman's traits are not the copy of anyone's. If this is right, then the theories we are considering are committed to the claim that Randoman lacks (at least some) representations.[10]

On the assumption that materialism is true, we have no reason to deny that Randoman's brain and body would develop as those of any normal human baby and that his brain and body would have similar causal powers to ours and hence that Randoman would have the same behavioral disposition. But Randoman is supposed to lack some of the cognitive capacities that account for such behavioral dispositions, because he lacks the representational capacities on which they depend upon. For example, Randoman might speak before being two years old, go to school and even get a PhD for his work on non-etiological theories of function. Communicating with others and getting a PhD are the kind of thing that seems to require mental representations.[11] But Randoman lacks required representational capacities according to evo-etiological theories of mental content.

Something similar can be said in the appropriate Swampman's case, and one might wonder why my opponent should be interested in this new case. Randoman is interesting, I think, for at least two reasons.

The first one is that Randoman is clearly nomologically possible—possible according to the actual laws of nature. One might try to resist intuitions about Swampman by maintaining that evo-etiological theories are theories about the actual world (one possible way of understanding the claim about a *real-nature theory*. I will elaborate on this reply in Section 3.2). Following this route, one would attempt to deny that Swampman is nomologically possible. Although I don't know of any law of physics that prevents such possibility, one might try to appeal to thermodynamics and the

[10]Different evo-etiological theories might present different commitments regarding the representational abilities that Randoman cannot have. The important point for current purposes is their common commitment to the claim that representing certain features of the world or the body (whether all or just a subset thereof depends on the details of the theory) necessitates an evolutionary history. A fortiori, the cognitive abilities that rely on such representational abilities necessitate an evolutionary history.

[11]There is a growing literature in philosophy of mind that denies this and defends that cognition is not necessarily representational—at least when construed as mental representations. In this paper I assuming that the mind is a representational system.

amount of energy (and its particular vectorial configuration) that would be required for the reorganization of the particles in a human-like configuration (clearly a lightning strike won't do it!) to cast reasonable doubts on the nomological possibility of Swampman. But Randoman is nomologically possible and we have a process from which it might arise.[12]

The second one is that Randoman is a case much closer to ours and hence provides a better context for intuition. I do not want to claim that this is due to the fact that the possibility of Randoman resulting from the previous process is *so many* orders of magnitude higher than that of Swampman—assuming that the later is nomologically possible—because I do not think that it is the probability of an event what should guide our intuitions: we do not seem to have different intuitions about the mental states of an actual person and, say, a possible girl whose parents (assuming the essence of origins) would only meet if one of them wins the lottery 10 years in a row. The difference between Swampman and Randoman is not just a difference in degree but a difference in kind: i) we have a mechanical process that, according to our current science might give rise to a being who is as genetically determined as we may be, and ii) such a being has a developmental history similar to any of ours.

In the next section, I will review the replies to two objections that originate in Swampman and analyze them with the help of Randoman's example when it is required. The first one is an objection that rests on the intimate relation between our conscious experiences and intentionality.[13] In reply some philosophers have bitten the bullet and denied that Swampman would entertain experiences. I will argue that the case of Randoman presents a pill much harder to swallow for defenders of evo-etiological theories. The second objection is independent of the relation between consciousness and intentionality and is based on the explanatory role that representations are supposed to play. I will consider and dismiss what I think that is the most promising line of replying to cases like Swampman or Randoman. Such a reply is based on an elaborated articulation of what is meant by a *real-nature theory*, which distinguishes the theoretical role of representations from its real-nature.

[12] I would like to remark that the term 'might' here just expresses the fact that probability of the event is different from 1 in the actual world, as in the 'the coin might land heads-up'. Although the probability of the Randoman resulting from the above described procedure is very low indeed, we are just about to see that probability is not what determines its relevance.

[13] If my arguments in the second objection are sound, they would, by themselves, defeat evo-etiological theories. However, I have proceeded in two steps, considering first the relation between consciousness and intentionality because of the relevance of representationalism in philosophy of mind—although obviously not only representationalist theories are targeted by it, just consider someone who believes that visual experiences always represent but not that all experiences do. Representationalism is a very attractive and popular theory (the most popular according to the survey on philpapers—http://philpapers.org/surveys/results.pl), especially in the project of naturalizing consciousness, on the assumption that the relation of representation can itself be naturalized. For this later purpose, representationalists typically appeal to teleological theories of mental content (See Dretske (1995); Kriegel (2009); Prinz (2012); Tye (1997, 2002); for an exception see Carruthers (2000a)). The first argument attempts to show that such theories should not rest on a theory of teleological function that depends on natural selection.

3 Problems for evo-etiological theories

3.1 Phenomenology and intentionality

Our mental states, like perceptions and thoughts, are often phenomenally conscious: there is *something it is like for us* to be in these mental states. Furthermore, these mental states very often are intentional states: they represent the world as being a certain way. Consider for example an experience with a *reddish character* like the one we typically have when we look at a ripe tomato or the Chinese flag. When we undergo this kind of experience it seems to us that there is something red, this experience represents the world as containing a red thing. This is an intentional state about red objects and, as a matter of fact, it is appropriate to evaluate it as correct (when it is caused by, say, a red apple) or incorrect (when the state is caused by, say, LSD consumption). It is hard, if possible at all, to consider an experience with a reddish character, which does not represent the world as containing a red thing. Similarly with other kinds of experiences. When I have a stomachache or I feel pain in my finger, the pain is about my stomach and my finger respectively. These states have correctness conditions and in phantom limb syndrome, for example, when the subject feels a pain in her amputated limb we talk of a malfunction of the damage detectors.

This suggests an intimate connection between intentionality and consciousness and traditionally the study of consciousness and intentionality has gone together. Philosophers from Decartes and Locke to Brentano and Husserl have typically treated them as a single topic. Although in the second half of the last century the dominant tendency was to offer an independent analysis (Chalmers 2004), few have rejected such a connection. In the last years there has been a renewed interest in focusing on the representational content of experience, the higher-order representation of mental states, the phenomenology of thoughts (cognitive phenomenology) and the emergence of theories that attempt to ground consciousness in intentionality,[14] typically combined with the view that intentionality can be explained in terms compatible with materialism to provide a materialistically acceptable explanation of consciousness.

Now, many philosophers find it plausible that internalism is true in the case of consciousness; i.e. that the supervenience base of a conscious experiences of a subject S at time t is constituted by the inner physical properties of S at t. And some of those who deny internalism about consciousness, like direct-realists (see for example Hinton 1973; Martin 2004), maintain that an actual perceptual relation suffices for the experience.

This poses a problem for defenders of evo-etiological theories. Imagine that Swampman comes into existence at time t. At this moment, he is a microphysical

[14] Also theories that attempt to ground intentionality in consciousness like Searle (1990); Horgan and Tierson (2002); McGinn (1988). A full defense of the strong relation between consciousness and intentionality and an analysis of this relation is beyond the purpose of this paper—see for example Byrne (2001); Chalmers (2004); Harman (1990); Tye (2002)—but I take the intuitive force of the examples at the beginning of this subsection and the fact that nowadays it seems fairly uncontroversial to be sufficient to secure the philosophical interest of my assumption at this point.

duplicate of Davidson. Thus, if internalism about consciousness is true or some kind of actual perceptual relation between the subject and the object suffices for the experience (as some direct realists maintain), he would thereby enjoy the same experiences as Davidson does. If Davidson was looking at a red apple at t and thereby having an experience with a reddish character then Swampman would equally be in a state with a reddish character. However, according to evo-etiological theories, this state (as well as all the others) would lack proper function, for it has not been selected for indicating anything, and hence it does not represent anything. The problem is that it is hard to see how Swampman could have an experience with a reddish character without it thereby seeming to him that there is something red.

3.2 Objection and rejoinder

Defenders of evo-etiological theories have three possible replies. They can deny that Swampman would undergo phenomenally conscious states; or argue that those particular representations do not depend on selection for in evolution; or accept that he would have experiences, but deny that those states are intentional.

The first reply rejects both consciousness internalism and direct realism. We can find support for this claim in representationalism, a widely held view in philosophy of mind, according to which consciousness supervenes on intentional content. Some philosophers go a step further and claim that phenomenally conscious states are representational states of a certain kind. Independently of the kind of representational state required by the particular theory,[15] representationalist theories agree that certain representational abilities are necessary for entertaining conscious experience. If Swampman lacks representational abilities, as evo-etiological theorists claim given that he lacks an evolutionary history, then he lacks phenomenal consciousness. This kind of reply has been endorsed for instance by Dretske (1995).

Although it seems counterintuitive that Swampman would lack beliefs and desires and even more counterintuitive that he would lack phenomenal consciousness, one might resist any conclusion from such an overimaginative thought experiments and maintain that Swampman's case is so far away from anything we can really take in, that our intuitions about him can hardly show anything about our concepts. At this point the case of Randoman might be useful.

Being able to produce creatures relevantly similar to us who lack phenomenal consciousness is a tremendously interesting project. Many would agree with the idea that

[15] Different representational theories make very different commitments in this regard. Just compare first-order representationalist theories such as those offered by Tye (1997, 2002) or Dretske (1995) with higher-order (Rosenthal 2005; Carruthers 2000b; Gennaro 2012) or same order theories (Kriegel 2009; Sebastian 2012). However, they all agree that our capacity for having conscious experiences is grounded on our representational abilities. This is the claim that combined with an evo-etiological theory of mental content (a combination explicitely rejected by some theorist like Carrutheres but endorsed by others like Drestske) gives rise to the objection I am discussing.

if a zombie creature[16] lacks phenomenal consciousness then all kinds of experiments on her should be allowed. Zombies do not feel any pain when the lancet cuts their skin or feel miserable about the way scientists treat them. Investigation on zombies would surely lead to plenty of benefits for human kind. We would get the advantages of the investigation in humans avoiding most of the ethical reasons for not doing it. If evo-etiological theories were true, Randoman would be a zombie and the genetic process in the previous section provides a mechanism that might give rise to him.

Whereas some can bite the bullet and deny that Swampman lacks phenomenal consciousness, I think that few would be willing to accept that Randoman lacks conscious experiences and support the project of generating these human-like organisms for experimental purposes. If this is so, then Randoman puts additional pressure on those willing to maintain that phenomenal consciousness constitutively depends on selection for in evolution and, I believe, makes their proposal unpalatable.[17]

Interesting as the case of Randoman might be, it opens the door to a possible reply not available in the case of Swampman because Randoman has a developmental history. Those willing to deny that Swampman has conscious states but moved by the presented example can try to exploit this fact. This would require to provide an alternative selection for process that is not grounded on selection for in evolution. If traits that result from learning can count as selected for independently of evolution, then learning might be a promising place to look. Evo-etiologists willing to explore this route would be committed to the claim that one can have an experience only after a learning period and would have to provide a non ad-hoc justification of why conscious states, but not other representational states, do not depend on evolution. I don't know of any articulated proposal in this direction and the evaluation of a future attempt will depend on its details.

Finally, one might agree that it is implausible to maintain that individuals resulting from such genetic project lack consciousness but resist the conclusion that this defeats an evo-etiological understanding of intentionality by denying the intimate relation between consciousness and intentionality—see Millikan (2013); Papineau (1987); Papineau has changed his view in Papineau (2001). There is few I can add against this position beyond remarking that even anti-representationalists like Block (1996, 1998) do not deny that phenomenal states have intentional content—they do not deny that when one has an experience with a reddish character it seems to one that there is a something red—, what they deny is the fact that intentional content exhausts the phenomenal character; in other words, they maintain that there is more to phenomenology than representation. For the sake of the argument, in the next

[16]The term 'zombie' is technical and was introduced by Chalmers (1996). A zombie is not a reanimated corpse, nor a human being who is controlled by someone else through the use of magic, nor the victim of a government's experiment causing a weird pandemic. A zombie looks and behaves like you and me. However, a zombie lacks any phenomenally conscious experiences.

[17]This reasoning relies on the force of the intuitive idea that Randoman would entertain conscious experience together with an inference to the best explanation given the behavioral and physical similarities between Randoman and us. One might always dispute which is the best explanation as well as the role that intuitions might play in our reasoning. My impression is that research on consciousness has to rely to some extent on them given our lack of direct access to the conscious experiences of others.

section I will concede that consciousness is independent of intentionality and leave aside consciousness to argue against evo-etiological theories.

3.3 *Real nature* theories and what randoman thinks

I take Randoman's thought experiment to offer a case more worth considering when evaluating our intuitions and theories. In this section I will follow a different route. I will analyze the requirements of a theory of mental content to present a different objection—independent of the relation between consciousness and intentionality—against evo-etiological theories of mental content.

After reading 'The Conscious Mind', Randoman claims that he is not a zombie, that he undergoes phenomenally conscious experiences. Let's accept he does, leaving aside the relation between consciousness and intentionality. One day Randoman is walking down the street with his boyfriend and he sees a fruit shop. He stops by and a minute later, when he comes back, his boyfriend asks him about what he did in the fruit shop. Randoman replies: "I was feeling like eating strawberries, you know I love them. I saw a box of delicious strawberries inside the shop and I came in to buy it. However, they were not strawberries but raspberries. So, I decided to buy these peaches". They both go home sharing a peach.

As any of us would do, Randoman explains his own behaviour appealing to what he calls "beliefs", "desires" and "perceptions".[18] These seem to be intentional states; in fact, he claims that his perception was *wrong* and he mentions his misperception of the box of raspberries as a box of strawberries as the *reason* for his entering in the fruit shop. Furthermore, he seems to manage to communicate with colleagues using a natural language. However, his traits have not been selected for in evolution and hence lack proper function. According to the teleosemantics theories we are considering, this is a necessary condition for semantic properties; i.e. for having representations.

(This is not completely right. Evo-etiologist can distinguish two kinds of representations, if they argue that there is an alternative *selection for* mechanism that is not grounded in *selection for* in evolution. However, what is relevant for my purposes is that they agree that not all our representations are the result of this later process—or processes. In the sequel, by 'representations' I will mean exclusively those representations that, evo-etiologists claim, require natural selection—independently of whether all our contentful mental states do or just a subset).

Representations are not only used in our folk-psychological explanations of behaviour—explanations in terms of beliefs and desires as in some of the examples I have presented in this paper—, they are successfully postulated in cognitive sciences. Cognitive sciences attempt to explain how our cognitive system works, how we manage to navigate the world. The mainstream view in cognitive sciences maintain that our mind is a representational system. Adherents of this view claim that the best way to explain cognition is to posit the construction of internal representational

[18] Millikan (1993) denies that the tool we use for behavioral prediction in social interaction is that of theory of belief-desire, but rather the method of "brute-correlation". I make use of a belief-desire explanation of behaviour for the sake of simplicity in the exposition. I do not need to rest my case on a demand of this kind of folk-psychological explanation for Swampman or Randoman as it will become clear later.

models. This popular view requires an understanding of the nature of the entities they are postulating: representations. Teleosemantics is one of the most promising family of theories in this endeavour. However, representationalism about the mind is not the only game in town, and some cognitive scientists are attempting to explain how, at least some, cognitive faculties work, without postulating representations. This debate hinges importantly upon the nature of representations.

Randoman's behaviour, cognitive abilities and linguistic competence demand a full-blown explanation. By a full-blown explanation I mean one at all levels of explanation that our case requires—though such an explanation might be provided in different terms.[19] And it might include the conjunction of some of the levels of explanations that cognitive science, neuroscience, linguistics or folk psychology attempt to provide. In doing so, we will not be able to ascribe Randoman (at least certain) representational states, if evo-etiological theories of mental content were true. We would need a different explanation not only to the ones that he himself offers but also to the one provided by, say, mainstream cognitive sciences. So, Randoman poses the following dilemma:

According to the first horn, if we can offer a full-blown explanation of Randoman's behaviour, cognitive capacities and ability to use the language without postulating states that have semantic properties, without intentional states, then so will be ours. Enactivist theories (Hutto and Myin 2013; Noe 2012; Stewart et al. 2010; Varela et al. 1991), for example, might be an interesting place to look for such an explanation.

(Consistent with this horn of the dilemma, one might resist becoming an eliminativist about representations while acknowledging that semantic properties are not really explanatory (Field 1978) or that although a full-blown explanation of our behaviour, cognitive abilities and language competence do not require an appeal to semantic properties, there are some explanations that would do.[20] However, this would be in strong tension with the effort that teleosemanticists put in accounting for representational content (Artiga 2014) and render the project of naturalizing mental content much less interesting)

Some might reasonably doubt that this project is going to succeed if it is presented as a project about all cognitive processes: it is highly implausible that we can get rid

[19] Some defenders of representations acknowledge that there is a complete causal description of our behaviour that does not mention semantic properties at all. However, they also acknowledge that such causal description would not count as a full-blown explanation. As Shea (2013) points out:

> What adverting to content does achieve, however, is to show how the system connects with its environment: with the real-world objects and properties with which it is interacting, and with the problem space in which it is embedded. The non-semantic description of the system's internal organisation is true of the system irrespective of its external environment. Content ascriptions help explain how it interacts with that environment. (ibid. p. 498)

He remarks that, since the cognitive revolution, representational realism rather than mere ascriptionism—the view that "content is no more than a useful notation that makes the system comprehensible to the interpreter, with no further reality in the system." (ibid. p.498)— is widely accepted in cognitive science, experimental psychology, and other sciences of brain and behaviour.

[20] I think that these two options are pretty much in line with what Shea (2013) calls "ascriptionism", see fn.19.

of semantic properties in explaining *all our cognitive capacities*. For example, many people think that we cannot understand natural language without representations, for they are required to understand semantic meaning. Furthermore, language seems to play a fundamental role in at least some other cognitive abilities. This might be a reason for restricting the scope of the enactivist project—Hutto and Myin (2013), for example, acknowledge that we might have representations but concentrate on whether our basic cognitive abilities require them. So, our theories would still need to postulate representations to provide a full-blown explanation of our behaviour, cognitive abilities and language competence.[21]

If, on the other hand, we cannot get rid of these representations to fully explain Randoman's behaviour, cognitive abilities and linguisitc competence, then Randoman has intentional states inspite of the fact that their states lack an evo-etiological function There are plenty of properties that the states of Randoman share with ours: all the properties that do not depend on selection for in evolution. And such properties would suffice for having representations. So, we either give up tele-semantics and look for a different account of representation in the case of Randoman or we look for a different account of proper function, one that do not depend on having an evolutionary history—see for example Abrams (2005); Mossio et al. (2009); Schroeder (2004).

In any case evo-etiological theories of mental content should be rejected: if we do not have to appeal to the evolutionary history of a trait to unpack the normativity in the relation of representation for Randoman—either because we can do it without appealing to a process of *selection for* in evolution or because we can get rid of semantic properties in a full-blown explanation of his behaviour, cognitive abilities and linguisitic competence—then there is no need to appeal to it in our case either.

3.4 Objection and rejoinder

In reply to the former objection, there is one strategy that one might try to follow in order to save evolutionary accounts by avoiding ascribing intentionality to Randoman's states. I will first present this strategy and then show why it does not solve the problem.

What explains my entering the fruit shop and buying strawberries is my desire to eat strawberries and my belief that they sell strawberries in the fruit shop; a belief that is based on my perception of what seems to be a box of strawberries inside the shop. This kind of explanation requires my mental states to be about strawberries.

[21] Maybe a combination of enactivist ideas with representations whose possession do not require evolutionary selection for in evolution will do it. If that were the case, this would be a good reason for rejecting evo-etiological theories, because the entities they postulate would not be required in an explanation of our behaviour, cognitive capacities and linguistic abilities either.

There is a representational relation between my perceptual state and strawberries. One could claim that a parallel explanation is valid in the case of Randoman. Those who endorse this reply would allow Randoman's explanation of his own behaviour to be correct but deny that their words refer to the same kind of states as ours: *what a representation is is not just determined by its theoretical role*. They would concede that when Randoman says that he believes that they sell strawberries in the fruit shop, his state is about strawberries but they would deny that the relation that hold between strawberries and Randoman's (quasi-)belief is that of representation, but representation* instead. Let me explain the strategy to block the objection with a bit more of detail by considering the analogy with *a posteriori* necessities as in the well-known case of water.

Consider *Twin Earth* (Putnam 1975), a planet that is identical to Earth, including duplicates of Earth inhabitants, except that in Twin Earth there is no H_2O but XYZ, a substance with different microstructure but with similar observable properties. On Twin Earth, the colourless, odourless and potable substance that fills up lakes is XYZ and not H_2O. If our term 'water' fixes its reference through a description like "the colorless, odorless and potable substance that fills up lakes", we would identify different chemical substances as water depending on our actual environment: if the actual environment is like Earth then water is H_2O; however, if the actual environment were like Twin Earth, then water would be XYZ. It is a commonly shared intuition that if one assumes that the former is the actual environment then one will judge that water is essentially H_2O in all counterfactual circumstances; if one assumes that it is the latter then one would judge that water is essentially XYZ. This shows that judgments about possible worlds considered as counterfactual reflect the theoretical criterion we accept after we have learned the relevant empirical facts about our actual environment. These judgments might contrast with judgments that we make when we only consider the reference fixing mechanisms. It is an epistemic possibility for a sufficiently clueless speakers, although fully competent, about empirical matter (like someone lacking chemical knowledge), that water is not H_2O. And the reason is that other substance might have the observable properties of water, the properties that fix the reference of 'water'. But this substance would not be water, for water is H_2O; in other words, it is not metaphysically possible that water is not H_2O.

The kind of reply I am considering here extrapolates this case in defense of an evo-etiological understanding of functions in teleosemantics. This seems to be what Millikan and Neander really have in mind when they claim that the role of teleosemantics is *to offer a real-nature theory,* as it is expressed by Neander (2012) in reply to the Swampman's case:

> Swampman intuitions cannot show that teleological theories are incorrect because they are irrelevant. They are, it can be argued, not to the point if a teleological theory is offered as a *real-nature theory* (Millikan (1996), Neander (1996))...the decision about Swampman's intentionality should be driven by the

> theory of content that best accounts for the real kind. That in turn should be driven by other considerations, such as which theory delivers correct content ascriptions for us and other existing creatures. (my emphasis).

The idea is that "along similar lines [as those presented in the case of 'water'], it can be argued that it is only an epistemological and not a genuine metaphysical possibility that Swampman might have intentionality."(Neander 2012) A similar point is raised by Papineau (2001):

> I take the central core of teleosemantics to be the claim that the belief and desire roles are realized by selectional states in the *actual* world. This claim is perfectly compatible with the idea that those roles might be differently realized in other possible worlds, and that in those worlds we would then care about something other than selectional states. (ibid. sec 6, his emphasis)

According to these philosophers, our theoretical considerations regarding representations should be guided by "the real kind", by beliefs and desires as they are in "the actual world".

There is one reading of these claims that we already know would not get off the ground. Focusing on Papineau's claim, he invites us to worry exclusively about the "intentional states" as they are in the actual world, but this leaves it open whether we should only consider the beings that inhabit it *now* or beings that inhabit it at some time. This is relevant because it is unclear why shouldn't we "care about", as Papineau puts it, beings that have inhabited it in the past or will inhabit it in the future—similarly, in the case of Neander, one might ask which individuals constitute the "real kind" and what justifies this claim. The way in which we can evaluate what future inhabitants we might have is by anwering the question about which beings are possible according to the current state and laws of our world. In this case, although one might doubt that Swampman might come into existence given this laws and initial conditions, Randoman is a possible inhabitant of the actual world and hence something to guide our theoretical considerations.

But there is a much more interesting reading of the claim. According to it, we start by considering the intentional states of beings that inhabit the actual world *now*. These inhabitants constitute "the real kind"—leaving aside how this claim is justified. We study the nature of their intentional states and then, on this basis, we determine whether other beings have the same kind of states. This is where the analogy between 'water' and 'representation' becomes relevant. The theoretical role of our representations only fixes the reference of the term 'representation'. My opponent argues that a posteriori investigation on the nature of representation, as the relation that holds between our states and objects in the world, shows that representations depend on selection for in evolution and therefore that the relation that holds between our states and their objects and the one that hold between Swampman's and Randoman's and theirs are different in nature. Just as it is only an *epistemic possibility* that XYZ falls under the extension of the term 'water', the possibility that the mental states of Swmapman and Randoman fall under the extension of the term 'representation', required for the full-blown explanation of our behaviour, cognitive abilities and competence in the use of natural language, remains a mere *epistemic possibility.* If we

call 'representations*' to Randoman's states,[22] then we can say that representation and representation* are different kinds of states, just as H_2O is not XYZ.[23]

This kind of reply, however, does not withstand further scrutiny. Granting the metaphysical difference between representations and representations* to my opponent, the problem is that Randoman's states and ours share many properties; in particular all the properties that do not depend on a causal evolutionary history. And the same kind of relation that holds between Randoman's states and strawberries, also holds between our mental states and strawberries; in other words, we also have representations*. With this clarification in hand, let's come back to the dilemma with more detail:

The first horn of the dilemma, remains as it was. If we can offer a full-blown explanation of Randoman's behaviour, cognitive abilities and linguistic competence, without appealing to semantic properties, so can ours be explained. We could get rid of representations in our theories or at the very least the project of offering a theory of mental content would lose most of its interest, as we have seen.

In the second horn of the dilemma we accept that we cannot get rid of semantic properties. However, my opponent would argue that Randoman's behaviour, cognitive abilities and linguistic competence is explained by means of representations*, not representations. The problem is that if representations* suffice for a full-blown explanation in the case of Randoman, they suffice for a full-blown explanation in our case too. There is no need for having an evolutionary history for a mental state to represent*, say, strawberries and representation* is all that is required for the kind of explanation in which we postulate representations, as in cognitive sciences. Hence, we can get rid of representations embracing the first horn of the dilemma, or maintain that representations are representations* and get rid of evolutionary history explanations which are not necessary in our theory, thereby embracing the second horn. The difference between these two options seems to be purely linguistic and either way, evo-etiological theories are jeopardized.

In summary, I have argued that the analogy with the case of water is insufficient for offering a reply to the case of Swampman/Randoman. I have conceded Neander's point that what a representational state is is not determined by its theoretical role—just as what water is is not determined by its observational properties—; I have acknowledged that a methaphysical distinction can be drawn between us and beings like Swampman and Randoman and that there are states that we have, and Swampman and Randoman lack, namely those states that have been selected for indicating in evolution. There are, nonetheless, states that we share with Randoman, states whose individuation depends on internal organization and ontogenesis, and I have called them 'representations*'. My point is that making a metaphysical

[22] At this point of the discussion, where the nomological possibility of Swampman plays no role, I do not think that Randoman's case is significantly different than that of Swmapman and I take it to be merely an interesting alternative. Nonetheles, I will focus on Randoman's states because they are more similar to ours, in particular they also have a complete developmental history, which Swampman's lack, and this suffices for my purposes.

[23] In other words, for those familiar with two-dimensionalism, our term 'representation' and Randoman's one share their first intension but not their secondary intension.

distinction between representations and representations* is of no help for the evo-etiologist. The reason is that *if representations**—states we do have—*satisfy the theoretical role of representations then they are representations*: they are the states we are interested in a theory of mental content. And, *ex-hypothesi*, representations* do not require an evolutionary history.

4 Conclusions

Teleological theories of mental content unpack the normativity in the relation of representation by appealing to the teleological or proper function of the trait: a state M represents such-and-such if and only if M has the proper function of indicating that such-and-such is the case. The desired notion of function is not one that tells us what the state does but what the state should do.

Etiological theories of function satisfy this desideratum. According to them, the function of a trait depends not only on its causal role but also on the causal history of tokens of this type. In particular, the most popular one maintains that the relevant causal history depends, one way or other, on natural selection.

In this paper I have tried to show that such an account is not tenable. Genetic engineering makes it feasible to produce human-like individuals that are the result of a random process. Intuitively, such individuals would undergo conscious experiences and so have intentional states, if we belief that in having, say, an experience it seems to one that the world is a certain way. Evo-etiological theories have to deny that and I have tried to show that this is not a palatable option. More interestingly, even if one is willing to resist the intimate connection between consciousness and intentionality, a problem remains: if on the one hand, semantic properties are not required to explain the behaviour, cognitive abilities, and linguistic competence of Randoman then we can get rid of representations for explaining ours; if, on the other hand, we had a theory that satisfactorily attributes content to Randoman states then this theory would also explain the intentionality of our mental states, given that Randoman has both, the same kind of internal structure and developmental history that we have.

Alternative theories of proper function are available on the market. On the etiological side, Papineau (1984) has proposed that function attributions depend on a learning process and similarly Dretske (1986) appeals to functions that depend on recruitment by conditioning, but as Kingsbury (2008) argues it is doubtful that learning can account for all the required cases. On the non-etiological side, alternatives have been offered by Abrams (2005); Schroeder (2004); Mossio et al. (2009); it is nonetheless controversial whether these notions of function can satisfactorily unpack the normativity in the relation of representation.[24]

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References

Abrams, M. (2005). Teleosemantics without natural selection. *Biology and Philosophy*, *20*, 97–116.

Artiga, M. (2014). Teleosemantics, info-teleosemantics and circularity. *International Journal of Philosophical Studies*, *22*(4), 583–603.

Ayala, F.J. (1970). Teleological explanations in evolutionary biology. *Philosophy of Science*, *37*(1), 1–15.

Block, N. (1996). Mental paint and mental latex. *Philosophical Issues*, *7*, 19–49.

Block, N. (1998). Is experiencing just representing? *Philosophy and Phenomenological Research*, *58*(3), 663–670.

Boorse, C. (1976). Wright on functions. *The Philosophical Review*, *85*, 70–86.

Byrne, A. (2001). Intentionalism defended. *Philosophical Review*, *110*(2), 199–240.

Cao, R. (2012). A teleosemantic approach to information in the brain. *Biology and Philosophy*, *1*, 49–71.

Carruthers, P. (2000a). *Phenomenal Consciousness: a naturalistic theory*. Cambridge: Cambridge University Press.

Carruthers, P. (2000b). *Phenomenal consciousness: A naturalistic theory*, 1st edn: Cambridge University Press.

Chalmers, D.J. (1996). The conscious mind. In *Search of a fundamental theory*. 1edn. USA: Oxford University Press.

Chalmers, D.J. (2004). The representational character of experience. In Leiter, B. (Ed.) *The future for philosophy* (pp. 153–181): Oxford University Press.

Davidson, D. (1987). Knowing one's own mind. *Proceedings and Addresses of the American Philosophical Association*, *60*(3), 441–458.

Dretske, F. (1981). *Knowledge and the flow of information*. Cambridge: MIT Press.

Dretske, F. (1986). Misrepresentation. In Bogdan, R. (Ed.) *Belief: Form, content and function*. New York.

Dretske, F. (1988). *Explaining behavior: Reasons in a world of causes*: MIT Press.

Dretske, F. (1995). *Naturalizing the mind*: MIT Press.

Field, H. (1978). Mental representation. *Erkenntnis*, *13*, 9–18.

Gennaro, R. (2012). *The consciousness paradox: Consciousness, concepts, and higher-order thoughts*: MIT Press.

Harman, G. (1990). The intrinsic quality of experience. *Philosophical Perspectives*, *4*, 31–52.

Hinton, J. (1973). *Experiences*. Oxford: Clarendon Press.

Horgan, T., & Tierson, J. (2002). The intentionality of phenomenology and the phenomenology of intentionality. In Chalmers, D. (Ed.) *Philosophy of mind: Classical and contemporary readings*: Oxford University Press.

Hull, D.L., Langman, R.E., & Glenn, S.S. (2001). A general account of selection: Biology, immunology, and behavior. *Behavioral and Brain Sciences*, *24*, 511–573.

Hutto, D., & Myin, E. (2013). *Radicalizing enactivism: Basic minds without content*. Cambridge: The MIT Press.

Kingsbury, J. (2008). Learning and selection. *Biology and Philosophy*, *23*, 493–507.

Kriegel, U. (2009). *Subjective consciousness: A self-representational theory*. USA: Oxford University Press.

Martin, M.G. (2004). The limits of self-awareness. *Philosophical Studies*, *120*, 37–89.

Martinez, M. (2013). Teleosemantics and indeterminacy. *Dialectica*, *67*(4), 427–453.

McGinn, C. (1988). Consciousness and content. *Proceedings of the British Academy*, *74*, 219–239.

Millikan, R. (1996). On swampkinds. *Mind and Language*, *11*(1), 70–130.

Millikan, R. (2013). An epistemology for phenomenology? In Brown, R. (Ed.) *Consciousness in and out: Phenomenology, neuroscience, and the nature of experience*: Springer.

Millikan, R.G. (1984). *Language, thought and other biological categories*: MIT Press.

Millikan, R.G. (1989). Biosemantics. *Journal of Philosophy*, *86*, 281–97.

Millikan, R.G. (1993). Explanation in biopsychology. In Heil, J., & Mele, A.R. (Eds.) Mental Causation: Oxford University Press.

Mossio, M., Saborido, C., & Moreno, A. (2009). An organizational account of biological functions. *British Journal for the Philosophy of Science*, *60*(4), 813–841.

Neander, K. (1996). Swampman meets swampcow. *Mind and Language*, *11*, 70–130.

Neander, K. (2012). Teleological theories of mental content. In Zalta, E.N. (Ed.) *The stanford encyclopedia of philosophy*. http://plato.stanford.edu/archives/spr2012/entries/content-teleological/.

Noe, A. (2012). *Varieties of Presence*. Cambridge: The MIT Press.
Papineau, D. (1984). Representation and explanation. *Philosophy of Science*, *51*, 550–572.
Papineau, D. (1987). *Reality and representation*: Blackwell.
Papineau, D. (1993). *Philosophical naturalism*: Blackwell.
Papineau, D. (2001). The status of teleosemantics or how to stop worrying about swampman. *Australasian Journal of Philosophy*.
Price, C. (2006). Fearing fluffy: The content of an emotional appraisal. In Macdonald, G., & Papineau, D. (Eds.) *Teleosemantics: New philosophical essays*: Oxford University Press.
Prinz, J. (2012). *The conscious brain*: Oxford University Press.
Putnam, H. (1975). The meaning of 'meaning'. *Minnesota Studies in the Philosophy of Science*, *7*, 131–193.
Rosenthal, D.M. (2005). *Consciousness and mind*: Oxford University Press.
Schroeder, T. (2004). New norms for teleosemantics. In Clapin, H. (Ed.) *Representation in mind*: Elsevier.
Searle, J. (1990). Consciousness, explanatory inversion and cognitive science. *Behavioral and Brain Sciences*, *13*, 585–642.
Sebastian, M.A. (2012). Experiential awareness: Do you prefer "it" to "me"? *Philosophical Topics*, *40*(2), 155–177.
Shea, N. (2007). Consumers need information: supplementing teleosemantics with an input condition. *Philosophy and Phenomenological Research*, *75*(2), 405–435.
Shea, N. (2013). Naturalizing representational content. *Philosophy Compass*, *8*(5), 496–509.
Shea, N. (forthcoming). Neural signalling of probabilistic vectors. *Philosophy of Science*.
Skyrms, B. (2010). *Signals: Evolution, learning & information*. Oxford: Oxford University Press.
Stewart, J., Gapenne, O., & Di Paolo, E.e. (2010). *Enaction: Towards a new paradigm for cognitive science*. Cambridge: The MIT Press.
Tye, M. (1997). *Ten problems of consciousness: A representational theory of the phenomenal mind*: The MIT Press.
Tye, M. (2002). *Consciousness, color, and content*: The MIT Press.
Varela, F.J., Thompson, E., & Rosch, E. (1991). *The embodied mind: cognitive science and human experience*. Cambridge: The MIT Press.
Wright, L. (1976). *Teleological explanations*: University of California Press.