Constructive Empiricism and the Closure Problem

There is a tension in Bas van Fraassen's work between the way he often lays out the implications of accepting a theory and his agnosticism towards the unobservable entities that are postulated by our scientific theories. In the *Scientific Image*, for example, he claims that to accept a theory "involves as belief only that it is empirically adequate" (van Fraassen 1980, 12) and that to believe that a theory is empirically adequate is to believe "that what the theory says *about what is observable* (by us) is true" (van Fraassen 1980, 18). However, he also claims that what our theory says about the observables implies that there are specific unobservable entities and properties. Therefore, given that our beliefs are closed under known implications, the acceptance of a theory must also involve the belief that what the theory says about what is unobservable is also true. Now this is inconsistent.

I shall call this the closure problem. Michael Friedman (1982) has introduced it in the literature and it has been controversial ever since. Here are a few contentious examples.

1. (Lipton 2004, 146) A table is a swarm of electrons, protons and neutrons. Therefore, there are electrons, protons and neutrons.
2. (Muller 2004, 640) Today at such-and-such place-time on the face of the planet Earth a gigantic, continuously exploding Hydrogen-bomb is visible. Hence, there are atoms of hydrogen.
3. (van Fraassen 1992, 14) Phlogiston is escaping. There is phlogiston.
4. (van Fraassen 1980, 81) This is a VHF receiver. So there are high frequency electromagnetic waves.

Taking (3) aside, the first sentence of each example is meant to represent what our current theories have to say about the observables (what we should believe is true according to a constructive empiricist) and the second one is meant to represent a known consequence of those sentences.

Of course, those examples would not be problematic if the belief that a theory is empirically adequate was the belief that what the theory says about what is observable, *and only* about what is observable, is true. But this stronger restriction on the notion of empirical adequacy would quickly lead to a dead-end since we do not seem to be able to formulate what many theories have to say about the observables *only*. For example, sentences such as

The gigantic, continuously exploding Hydrogen-bomb is visible and *The Sun is visible* are equivalent descriptions of the world as far as our current theory in physics is concerned. Thus, it appears that a constructive empiricist would have to be agnostic about everything that such a theory has to say because we cannot express its observable content in a way that our expressions do not imply the existence of specific unobservable entities and properties.

This problem is slightly different from the closure problem. The former implies that the scope of the constructive empiricist's agnosticism is wider than it should be, whereas the latter implies that the scope of her beliefs is wider than it should be. However, both of them stem from the fact that our theories often say much more than we want to. My solution to the closure problem shall consist in showing that this is not a reason for a constructive empiricist to believe anything more than she wants to, but it also implies that it this is not a reason for her to believe anything less than she wants to. Therefore, I shall focus solely on the closure problem.

Now, there are a few ways one can try to solve this problem. Rejecting the idea that our beliefs are closed under known entailment, for example, is an obvious option. But the challenge is to find a solution that would concur with van Fraassen's own views according to which it is always possible to 'bracket' the ontological implications of our theoretical discourse (van Fraassen 1980, 81). I find that Stephen Yablo's recent study of closure puzzles (2009) can provide the appropriate solution. In the following sections, I shall thus articulate a fictionalist interpretation of van Fraassen's 'bracketing metaphor' and put forward a solution to the closure problem. [1] In the first section, I will explain how we can partition the content of a proposition and show how this can shed some light on closure puzzles. In the second section, I am going to show the relevance of this result.

1. Content Parts and Closure Puzzles

In a recent paper, Yablo suggests that we define the partial truth of a proposition p as the truth of some of its parts. According to him, these parts must be implied by p and all of their truthmakers (the reasons why they are true) must be implied by at least one of p's

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[1] One might argue that the closure problem is in fact a pseudo-problem since it presupposes a syntactic view of scientific theories –a view that is explicitly rejected by van Fraassen. Although this might be true, I wish to remain neutral on that issue. What I am proposing on the other hand is a solution for the proponents of a syntactic view that is in line with van Fraassen's metaphor. In other words, I want to show that the closure problem is not a sufficient reason for a constructive empiricist to adopt a semantic view of scientific theories.

truthmakers.[2] As such, *The grass is green or snow is white* is not a part of *The grass is green*. Although the first sentence is implied by the second one, it is not the case that all of the first sentence's truthmakers are implied by any of the second sentence's truthmakers. However, *The grass is green* is a part of *The grass is green and snow is white* because the reason why the latter can be true implies the reason why the former can be true.

Parts of a proposition *p* are particularly helpful to the extent that they can express the true content of *p* even when it is false. Here is one of Yablo's examples. Assuming that there are no numbers, *The number of dragons is 0* is strictly speaking false. None of its truthmakers obtain. However, the truthmaker for one of its parts can obtain (*e.g.*, the fact that there are no dragons). Thus, it might be possible to express its true content with a proposition whose truthmakers (there is arguably only one in this case) are implied by truthmakers of *The number of dragons is 0* (again, there is arguably only one).

In this case, that proposition is simple and easy to express: *There are no dragons*. But for various pragmatic reasons, it can be very useful to express a partially true sentence instead of its true content. For example, assuming that we know that there are no such things as numbers and functions, we would still use the language of mathematical physics, short of having another way to express properly the partial truth of mathematical physics. We would use it *as if* it was wholly true because it is a very useful type of discourse.

But closure puzzles can be the result of such a practice. When we assert *p* but do not accept one of its known logical consequences *q*, it can be because we do not assert the full content of *p* but only a part that can, *in principle*, be expressed by a sentence all of whose truthmakers are implied by a truthmaker of *p*. Consequently, closure puzzles can occur when we do not realise that someone is adopting, for pragmatic reasons, a fictionalist attitude toward *p*, which consists in asserting *p as if* it was wholly true.

2. The Closure Problem

Now the main thesis of this paper consists in saying that the closure problem stems from a similar confusion. The idea is that some have failed to understand that a constructive empiricist can adopt a fictionalist attitude toward any theoretical descriptions of the observables. They have failed to appreciate the fact that a constructive empiricist can assert

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[2] Yablo also mentions the falsemakers of *p*, but we do not need to get into this detail for the aim of this paper.

only a part of what her theory has to say about the observables while using that theory *as if* it was wholly true.

Part of the reason why such a mistake arose in the first place could be attributed to a misconception about fictionalism itself. The fact is that van Fraassen (i) fails to believe that the unobservable entities postulated by our theories are fictions (he is an agnostic); (ii) he wants to construe scientific theories literally; and (iii) he fails to believe that our theories are false (he is an agnostic). But a fictionalist can easily accommodate all of the above.

The type of fictionalism that is mentioned here is a linguistic thesis, not an ontological one. The ontological version would imply that the entities that are postulated by a scientific theory are fictional. But the linguistic version merely says that we can use the language of the theory *as if* it was true. Now when we talk about unobservable entities *as if* they existed, it does not follow that we believe that they do not exist. We can be agnostics about their existence while talking like a scientific realist.

Moreover, when we use a theory *as if* it was wholly true, it does not follow that we believe that our theory is not capable of being true or false. One can be a fictionalist and believe, *pace* some logical positivists like Moritz Schlick, that our theoretical statements are genuine propositions and not simply rules of inference 'which allow us to draw inferences from observation statements to other observation statements' (Brown 1977, 23). This is in fact essential for a fictionalist position like Yablo's who wants to claim that we can be fictionalist about a discourse D while believing that it is partly true.

Furthermore, it is not because we use our theories *as if* they were true that we believe that two empirically equivalent theories say the same thing about the world. *The number of dragons is 0* is empirically equivalent to *There are no dragons*. But if we believed that both statements are thus saying the same thing, then it would be useless to adopt a ficitonalist attitude towards the first claim. Thus, a constructive empiricist can be a fictionalist and 'rule out those forms of anti-realism known as positivism and instrumentalism' (van Fraassen 1980, 10).

Finally, to have a fictionalist attitude towards a certain discourse D does not imply that we believe that D is false. It simply means that we use D without endorsing the truth of D. Thus, it is possible to be a fictionalist constructive empiricist. A constructive empiricist can believe that all the observable conditions that are necessary to make a part of her theory true obtain and remain agnostic about whether or not the other truthmakers for the other

parts of her theory obtain. In other words, a constructive empiricist can 'bracket' the ontological implications of her theory by asserting only the part of what her theory has to say about the observables that concerns the observables uniquely.

As I have mentioned before, there might be no adequate way to express a proposition that sums up what our theory has to say about the observables only. Or, we might even want to use a different theory to describe the observables in order to facilitate the communication with scientists who are currently working with an incompatible theoretical framework (example 3 on page 1 could have been used in such a way). But regardless of the pragmatic reasons behind our theoretical descriptions of the observables, the point is that we do not need to assert the whole content of a proposition. We can simply use a proposition *as if* it was wholly true and assert only a part of it.

Conclusion

In sum, I have given a fictionalist solution to the closure problem. Following Yablo, I have defined the parts of a proposition *p* as the propositions *q* that are implied by *p* and such that all of *q*'s truthmakers are implied by a truthmaker of *p*. I pointed out that these parts can express the content of *p* that we wish to assert even when we know that a part of *p* is false, or when we wish to remain neutral about the truth of a part of *p*.

But the main idea that I borrowed from Yablo consists in saying that in cases where it is impossible or impractical to express any of those propositions *q*, we can still make use of *p* without endorsing its whole content. We can simply use it *as if* it was wholly true and only assert a part of its content. Relying on this thesis, I claimed that a constructive empiricist does not need to believe that what her theory has to say about the unobservables is true even if she cannot (or does not) express what it says about the observables only. She can assert only a part of what her theory has to say about the observables (the part that concerns the observables uniquely) while using that theory *as if* it was wholly true.

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Acknowledgements

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