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EXPANDING THE EMPIRICAL REALM: NO THREAT TO CONSTRUCTIVE EMPIRICISM

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ABSTRACT

In his recent "Expanding the Empirical Realm: Constructive Empiricism and Augmented Observation" (2024), Finnur Dellsén recalls a quite famous case that Gideon Rosen put forward against manifestationalism thirty years ago, and maintains that an analogous argument might be presented against Bas van Fraassen's constructive empiricism. This study is meant as a response to Dellsén: while the idea behind his paper is sound, I do not think it actually works. In brief, the reason is that we do not have God's point of view and thus are in no condition to know whether a certain scientific theory is empirically adequate, let alone true. Once again, perhaps constructive empiricism still represents the best compromise so far presented between strict empiricism and the acknowledgment of the rationality of science.

Keywords: constructive empiricism; Dellsén; manifestationalism; observability; van Fraassen

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RESUMEN

En su reciente artículo "Expanding the Empirical Realm: Constructive Empiricism and Augmented Observation" (2024), Finnur Dellsén recuerda un caso bastante famoso que Gideon Rosen presentó contra el manifestacionalismo hace treinta años, y sostiene que se podría presentar un argumento análogo contra el empirismo constructivo de Bas van Fraassen. Este estudio pretende ser una respuesta a Dellsén: si bien la idea detrás de su artículo no carece de fundamento, no creo que se sostenga realmente. En resumen, la razón es que no tenemos el punto de vista de Dios y, por lo tanto, no estamos en condiciones de saber si una determinada teoría científica es empíricamente adecuada, y mucho menos verdadera. Una vez más, tal vez el empirismo constructivo siga representando el mejor compromiso encontrado hasta ahora entre el empirismo estricto y el reconocimiento de la racionalidad de la ciencia.

Palabras clave: Dellsén; empirismo constructivo; manifestacionalismo; observabilidad; van Fraassen

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RESUMO

Em seu recente "Expanding the Empirical Realm: Constructive Empiricism and Augmented Observation" (2024), Finnur Dellsén retoma uma questão relativamente famosa que Gideon Rosen levantou trinta anos atrás contra o manifestacionismo e afirma que um argumento análogo pode ser apresentado contra o empirismo construtivo de Bas van Fraassen. O objetivo do presente estudo é fornecer uma resposta a Dellsén: a ideia que está por tras de seu artigo não é desprovida de fundamento, ainda assim acredito que não funcione. Em poucas palavras, o motivo é que não temos um ponto de vista divino e, por conseguinte, não estamos em condição de saber se uma certa teoría científica seja de fato empíricamente adequada; muito menos se a mesma seja verdadeira. Mais uma vez, provavelmente o empirismo construtivo ainda represente o melhor compromisso encontrado até agora entre un empirismo rigoroso e o reconhecimento da racionalidade da ciência.

Palavras-chave: Dellsén; empirismo construtivo; manifestacionismo; observabilidade; van Fraassen

In his recent "Expanding the Empirical Realm: Constructive Empiricism and Augmented Observation" (2024), Finnur Dellsén retakes a quite famous case that Gideon Rosen submitted against manifestationalism thirty years ago and maintains that an argument analogous to Rosen's might be put forward against constructive empiricism.

This work is meant as a response to Dellsén's, which is a contribution to the book *Scientific Theories and Philosophical Stances: Themes from van Fraassen* (Beisbart & Frauchiger, Eds., 2024). Dellsén thinks that not only manifestationalism, but also constructive empiricism, fails to make sense of science—or, at least, of a constitutive feature of science, namely, the continuous effort to (allegedly) expand the limits of what can be observed. If Dellsén were right, of course Bas van Fraassen, the originator of constructive empiricism, would be in trouble, for making sense of science is the aim of his empiricist/antirealist stance (Buekens & Muller, 2012, p. 94).

My opinion is that Dellsén's argument is sound, but does not work in the actual world. One of the great merits of van Fraassen's rehabilitation of empiricism in a time when some thought it was irremediably dead (van Fraassen, 1980, p. 4) and that only scientific realism would be a suitable position in the philosophy of science, was to remember us that "we are only human"—as some pop singers sang in the same decade. We must take this into account in talks about science, which despite its pretensions of objectivity is a human activity.[1] I take it that the same goes for talks about stances in the philosophy of science: we should bear in mind that a philosophical scrutiny of the scientific enterprise is a human activity—and one that deals with a human activity as well.

1. Constructive empiricism and scientific realism

Constructive empiricism and scientific realism are very familiar stances in the philosophy of science. The debate about the two views of science and its aim, which according to Anjan Chakravartty (2007) ultimately concerns the possibility of having knowledge of the unobservable (p. xiii), has been

1 Had not Kant already warned us about our human condition a couple of centuries earlier?

uninterruptedly at the center of the stage for the last forty years or more—since constructive empiricism was born. For the sake of completeness, a brief recall of what they are about is in order.

According to constructive empiricism, the stance introduced by van Fraassen (1980) in his seminal book *The Scientific Image*, "*science aims to give us theories which are empirically adequate; and acceptance of a theory involves as belief only that it is empirically adequate*" (p. 12; emphasis in the original). Roughly speaking, a theory is empirically adequate if what it says about the observable things and events in this world is true; in other words, if it "saves the phenomena" (van Fraassen, 1980, p. 12).[2] In the same book, van Fraassen offers the following characterization of scientific realism: "*science aims to give us, in its theories, a literally true story of what the world is like; and acceptance of a scientific theory involves the belief that it is true*" (1980, p. 8; emphasis in the original).[3]

This paper will not deal with the controversy between the two stances—at least not directly—but rather with a new objection that Dellsén raised against constructive empiricism earlier this year of 2024, thirty years after an analogous argument was put forward by Rosen against a stricter version of empiricism: manifestationalism.

2. Manifestationalism and its refutation

The term *manifestationalism* was coined in 1989 by Peter Railton. In his "Explanation and Metaphysical Controversy," the American philosopher explained that manifestationalism is a very strict form of empiricism—actually a fictional one—whose adepts believe only in that part of a theory they accept that describes *observed* states of affairs, whether past, present, or future. According to this stance, the aim of the scientific activity is to give us "manifestationally adequate" theories, as Rosen (1994) has it: "The manifestationalist holds that acceptance of a scientific theory involves only the belief that it is adequate to the

2 "The rest need no matter", added van Fraassen in 2005 (p. 111).

3 As it seems, this formulation is considered satisfactory by most scientific realists (an exception can be found in Sicha, 1992, p. 522).

actually observed phenomena, past, present and future, and that science aims to produce theories that possess this feature" (p. 161).

There are no manifestationalist scientists or philosophers, however.[4] Manifestationalism is but a piece of philosophical fiction for academic purposes, especially mentioned in talks about constructive empiricism (see for example Rosen, 1994; Alspector-Kelly, 2001; Ladyman, 2004; to name just a few). The point seems to be that if epistemic modesty is what motivates one to adopt van Fraassen's constructive empiricism rather than scientific realism,[5] then why not being even more modest, while not betraying the spirit of empiricism, "... and advocate the weakest assertion consistent with the observed evidence, namely, the observed evidence itself, and refuse to endorse anything beyond what has been or will be in front of our eyes"? (Alspector-Kelly, 2001, p. 416; see also Ladyman, 2004, p. 757).

In "What is constructive empiricism?", Rosen (1994) allegedly proved that manifestationalism cannot make sense of one of the most prominent features of the scientific activity, namely, the generation of new phenomena to be saved by our theories. Rosen thinks that, according to this stance, there is no reason for an archeologist to search for new evidence, if the theory they hold has not proven to be "manifestationally inadequate" up to that moment.

Since making sense of science is surely no less important than keeping an epistemically modest profile, van Fraassen takes profit from Rosen's work and in a paper co-authored with Bradley Monton asserts that constructive empiricism represents the best compromise so far suggested between strict empiricism and the acknowledgment of the rationality of science, while manifestationalism fails to grasp what it means to do good science (Monton & van Fraassen, 2003, p. 407).

This seems to have settled a question that was only academic, for there are no manifestationalists around. But Dellsén (2024) reckons that an argument analogous to Rosen's one against manifestationalism might apply to constructive

4 Jamin Asay and S. Seth Bordner published "A modest defense of manifestationalism", in 2015. I do not think they see themselves as manifestationalists, though.

5 In The Scientific Image, van Fraassen (1980) defends that constructive empiricism "makes better sense of science, and of scientific activity, than realism does and does so without inflationary metaphysics" (p. 73).

empiricism itself. In brief, "the objection is that constructive empiricism cannot make sense of the scientific impetus to expand the limits of what can be observed, since such expansions only risk turning empirically adequate theories into inadequate ones" (p. 127).

In what follows I will try to show that Dellsén's argument does not represent a real threat to van Fraassen's antirealist stance, for we do not have God's point of view. Before dwelling on Dellsén's main challenge to constructive empiricism, however, I will tackle the first objection presented in his text, which is directed to van Fraassen's notion of observability, and provide an answer to it.

3. Dellsén's case against van Fraassen

Observability is a key concept for constructive empiricism, which notoriously relies on the existence of a suitable distinction between observable and unobservable states of affair.[6] Dellsén highlights three features of how van Fraassen interprets observability: (i) the "able" in "observable" is indexical: "observable" is actually short for "observable-to-us". In other words, what counts as an observable phenomenon is a function of what the epistemic community is—the human race being what we consider at present as the epistemic community we belong to (van Fraassen, 1980, pp. 18-19 and 2005, pp. 111-112); (ii) "observable" is a vague predicate, though it has clear cases and clear counter-cases and therefore is usable (van Fraassen, 1980, p. 16); (iii) where one draws the line separating the observable from the unobservable is arbitrary. The point of empiricism is not lost, however, unless such line drawing is considered irrelevant to our understanding of science (van Fraassen, 2008, p. 110).

The vagueness of the predicate "observable" of course depends, among other things, on the fact that the epistemic community is subject to constant change[7] and thus the limits of what we can perceive via unaided observations can also

6 "To explain my view of what science is, and specifically what is its aim, I need a feasible distinction between what is observable and what is not" (van Fraassen, 2004, p. 1).

7 *πάντα ῥεῖ*!

change.[8] Dellsén dwells on two ways in which observability can be extended: *epistemic immigration* and *epistemic upgrading*. The first process considers the case that we admit as part of our epistemic community beings which can perceive phenomena not directly accessible to us—that van Fraassen would call unobservable; the second one deals with the possibility that members of the epistemic community increase their observational capacities (Dellsén, 2024, p. 133).[9] Dellsén stresses the fact that these two ways of extending the limits of observability have not been clearly distinguished in the literature on this topic and considers it important not to confuse the two (2024, pp. 133-134). The reason is that, according to him, van Fraassen's answer to objections about the first case is sound, but the same is not true when we deal with upgrading.

Within epistemic upgrading, Dellsén makes another distinction, which he borrows from Paul Humphreys (2004), between *observational extrapolation* and *observational augmentation*. We have extrapolation when we extend the values of a property whose values are already observable, such as when we measure the size on an object using a microscope: size is a property with already-observable values; by using the microscope we just expand their range. In the augmentation case, on the other hand, we increase the number of properties whose values can be observed; the spin of an electron being an example of a property otherwise unobservable *tout court* (Dellsén, 2024, pp. 135-137). According to Dellsén, a simple and straightforward reply that the empiricists have at their disposal is that what scientists actually do when they claim they are observing the electron spin is but looking at the output of their instruments, using their normal observational capacities. If this is a plausible answer to the claims of augmentation, however, Dellsén thinks it does not apply to extrapolation.

This is quite surprising, for Dellsén's allegations meant to defend the idea that in some cases one does actually perform an observation even when the

8 It is worth remembering that, to van Fraassen, observation is unaided perception (1980, pp. 15-16 and 2008, p. 93, among others). Then again, even if we admitted instrument-mediated detections as instances of observations, a change in the epistemic community might still change the scope of the predicate "observable".

9 Put it this way, of course the risk of begging the question is very high, for how can we know that, say, cats and dogs can see in the UV spectrum? This question will be left aside, though.

detection is instrument mediated are no new at all, though less sophisticated than the old ones, and van Fraassen has already answered to them—some years ago, by the way. Dellsén (2024) writes: "What we observe when we use a microscope, for example, doesn't seem to be the image on the end of the microscope's eyepiece; rather, it seems more plausible that we use the microscope to observe what is placed under it" (p. 135). This claim is strikingly similar to "the phenomenological objection" raised more than twenty years ago by Paul Teller (2001) against van Fraassen's stand on microcopes: in short, Teller claims that a microscope detection *is* an instance of observation, contrary to what the author of *The Scientific Image* maintains (Teller, 2001, pp. 132-133).[10]

Van Fraassen's reply is well known: what one sees through microscopes are images, that could very well be images of something real, but this does not matter. The "phenomenologically irresistible" sense that one is observing an object, and not an image, would evaporate as soon as we connected the microscope to a projector and saw the image on a wall (van Fraassen, 2001, pp. 157-158). Dellsén does not stop there, though, and insists, à la Grover Maxwell (1962), that when it comes to devices such as eyeglasses or hearing aids the refusal to consider the detections mediated by them as instances of genuine observation is difficult to accept; adding that, all things considered, "one will surely start to wonder whether a notion of "observation" that works in this way could be the notion that is most relevant to an understanding of science" (Dellsén, 2024, p. 136).[11]

10 Marc Alspector-Kelly (2004) claims that even Ian Hacking, in his 1983 and 1985 works, pointed out that familiarity with microscopes gives one a "dramatic sense of the reality" of what they (apparently) see when they look through them (p. 332) and added: "the sense that one really is looking at something real when one looks through the microscope at a cell remains phenomenologically irresistible" (p. 336). Along the same lines, Sara Vollmer (2000) wrote: "even acknowledging these limits the empiricist premise places on knowledge, it still isn't clear just how the notion of experience is supposed to ground van Fraassen's epistemic distinction between observable and unobservable. Ordinary visual observation gives us experiential information [...]. But instrument-assisted observation can give experiential information, too" (p. 362).

11 Twenty years ago, Hasok Chang claimed that, despite van Fraassen's concept of observability being coherent and meaningful, it is possible to adopt a different notion, that considers historical contingency and scientific progress. In fact, according to Chang (2004b), van Fraassen's stand on the issue does not have much relevance for scientific practice (pp. 85-86).

Again, nothing new. One might even reply that, according to van Fraassen (1980), a look through a telescope at the moons of Jupiter represents "a clear case of observation, since astronauts will no doubt be able to see them as well from close up" (p. 16), which could be interpreted as meaning that, to him, an aided detection of an observable entity *is* an instance of observation.[12] But this is not really important, for Dellsén's main point is another one. To what we have seen in this section, suffices it to counter that Dellsén is well aware that van Fraassen admits the possibility that one draws the line separating the empirical from the non-empirical differently from how he draws it and that constructive empiricism can perfectly survive that shift (van Fraassen, 2008, p. 110):

> constructive empiricism doesn't need to draw the line between what's observable and what's not in any particular place (van Fraassen, 2001, p. 163; 2008, p. 110). All that's really required is that there be such a line to be drawn somewhere such that the line can plausible be considered to demarcate the 'empirical' from the 'non-empirical'. Thus, for example, a constructive empiricist could (without contradicting herself) hold that entities that can only be detected using microscopes are observable provided the microscopes are widely available and reliable.[13] In this sense, the distinction between observable and unobservable can be thought of as a 'free parameter' within constructive empiricism (Dellsén, 2024, p. 130).

My opinion is that van Fraassen's response works *tout court*—which makes Dellsén's distinction between epistemic immigration and epistemic upgrading unnecessary.[14] Moreover, there might be a reason why the two ways of extend-

12 This would mean that observability is logically prior to observation, but we are not going to dwell on this question here.

13 An example is Otávio Bueno, a self-declared and much esteemed constructive empiricist, who admits microscope detections, though not all, as observations. According to his proposal, observation is a matter of meeting the relevant counterfactual conditions rather than at-least-in-principle unaided perception (Bueno, 2011).

14 Of course, this applies to the distinction internal to epistemic upgrading as well, i.e. extrapolation/augmentation, and to the "extended mind thesis", also mentioned by Dellsén (2024) in support of his conviction that it is possible to observe through instruments (p. 136). To all this, we can reply: this does not matter. Van Fraassen is perfectly aware that constructive empiricism doesn't need

ing observability mentioned by Dellsén have not been clearly distinguished: because there might exist hybrid cases. If the human race is what we consider as the epistemic community we belong to, then of course we must take into consideration the fact that we as a species evolve and change, together with the possibility that someone with especially acute hearing or seeing capacities might exist in the future, or might have existed in the past: "we humans change too, not just our technology. Evolution has not stopped" (van Fraassen, 2005, p. 112).[15] How could we determine the scope of observability with "scientific precision" given that our species is in constant evolution and that "observability for one is observability for all" (Bourgeois, 1987, p. 307)?[16]

I have it that the birth of a human being with especially acute hearing capacities who after a brain operation increases them is a hybrid case. This is so because it represents both the expansion of the epistemic community to include a being who is observationally superior in some respect—unless Dellsén meant non-human beings, but this is not specified in his text[17]—and a case of an individual agent within the community who has increased her observational capacities.

Be that as it may, the main goal of "Expanding the Empirical Realm: Constructive Empiricism and Augmented Observation" is not to convince the reader that the limits of observability can shift and perhaps widen their scope, for this is quite obvious, and not even that van Fraassen's use of the predicate "observable"

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to draw the line between the observable and the unobservable in any particular place—and so is Dellsén, whose paper has in fact another goal and is not meant to convince anybody (or is it?) that when we use a microscope we can observe something. Why looking for trouble then?

15 We know that, according to our best theories, the "normal" hearing frequency range is between 20 Hz and 20,000 Hz. As we age, however, our sensitivity at high frequencies decreases. Should we trust children? Gender is also a factor that influences the range of hearing. If a baby girl can hear a sound at the frequency of 22,000 Hz, then it is observable for us all. Interesting questions about the epistemic-community-side of observability might be raised, but of course this is beyond the scope of this study.

16 See also van Fraassen, 1992, p. 18-19 and Seager, 1988, p. 181.

17 For a comprehensive response to how we should behave, given the possibility that in the future we admit non-human beings within our epistemic community, one should read van Fraassen's 2005 contribution to the book *Mistakes of Reason: Essays in Honour of John Woods*, called "The day of the dolphins. Puzzling over epistemic partnership".

is peculiar and he had better embrace a "more empirically adequate" one. Let us move to Dellsén actual case against constructive empiricism, then, that apparently stands whatever the line one wants to adopt and is the main point of his work.

4. Dellsén's case against constructive empiricism

In his 1994 study, Rosen provided a thought experiment which was meant to show that manifestationalism cannot make sense of the generation of new phenomena to be saved by our theories. "But one of the hallmarks of good scientists is that they perform experiments pushing beyond the limits of what has been observed so far. Manifestationalism fails to capture our idea of what it is to do good science", conclude Monton and van Fraassen (2003, p. 407).

Rosen agrees that manifestationalism involves less belief and is therefore more compatible with the letter of empiricism, if compared with van Fraassen's constructive empiricism, for it refuses to take into account the observable parts of reality that are never in fact examined. "However—he adds—it is also a revisionary stance" (Rosen, 1994, p. 162), for the reason mentioned above. Therefore, it cannot replace constructive empiricism as the minimum empiricist position capable of making sense of science.

Dellsén (2024) maintains that "a strikingly similar objection" can be raised against van Fraassen's stance: according to him, constructive empiricism cannot make sense of the scientific impetus to expand the limits of what can be observed, for such expansions might turn an empirically adequate theory into an inadequate one (p. 127). In the previous section we have seen that the scope of the predicate "observable" is subject to change together with the changes that the epistemic community suffers and that van Fraassen is obviously aware of that. He has never regarded the expansion of the limits of observability as a threat to his antirealist stance or as a challenge to the adherence of constructive empiricism to science. But Dellsén thinks it might constitute a thorn in van Fraassen's side. Let us try to understand why.

> The basic idea behind the argument is that constructive empiricism implies that expanding the limits of observability carries a kind of risk for scientists that their already successful (because empirically adequate) theories will become unsuccessful (because empirically inadequate). It carries such

> a risk because once the limits of observability have expanded [...] it is at least possible for some of the theories that were previously empirically adequate—given the previous limits for observability—to become empirically inadequate—given the new limits for observability (Dellsén, 2024, p. 137).

Since the aim of the scientific activity is, according to van Fraassen, to give us empirically adequate theories, i.e. true with respect to the observable part of the world, then Dellsén has a point: a theory which is empirically adequate at the present moment—July 15th, 2024—might not possess the same feature, say, on July 15th 2124. This could just happen because of evolution. However, some parameters are under our control, for the scope of the predicate "observable" is also a matter of stipulation (should we admit dolphins among our epistemic community? Should we consider microscope detections as instances of observation?... and so on). One then might think that a constructive empiricist should adopt a revisionary attitude and refuse, among other things, to admit any change in the epistemic community.

André Kukla raised this question in 1996, in his work "The Theory-Observation Distinction":

> what van Fraassen has to do in order to avoid the collapse of his antirealism is not allow any flexibility in the composition of the epistemic community. If you're in, you're in, and if you're out, you're going to stay out no matter what happens. That's the only way to assure there's going to be a class of claims that can never be believed, come what may (p. 208).

Kukla is worried about a possible slippery slope that, in his opinion, might endanger the existence of a suitable distinction between the observable and the unobservable and hence of constructive empiricism itself. Dellsén's preoccupation, instead, has to do with the success of the scientific activity: if giving us empirically adequate theories is the goal of science, then once we have reached it we should just try to preserve our achievement.

Still, Dellsén might very well borrow Kukla's words, for any change in the epistemic community is potentially dangerous for an empirically adequate theory: it might turn inadequate under the new limits of observability, in case they shift. Being so, one might be led to conclude that van Fraassen's notion of success in science implicitly recommends preventing any modification from materializing.

Yet, not only does the originator of constructive empiricism acknowledge that the very notion of human race somehow suffers constant changes, because of evolution, but also that "significant encounters with dolphins, extraterrestrials, or the products of our own genetic engineering may lead us to widen the epistemic community" (van Fraassen, 1985, p. 256).[18] This would very likely modify the limits of "observability-to-us" —and thus of the notion of empirical adequacy—, and yet not the aim of the enterprise of science, which would still be giving us empirically adequate theories.

Nor does van Fraassen, despite his quite radical position on instrumental detection, deny the importance of the use of devices such as the microscope for the activity of scientists. However, he notoriously offers an unconventional point of view on the matter—which is another well-known feature of his antirealism. According to van Fraassen, we usually see microscopes and other devices as windows upon the invisible world; but they might very well be conceived, in alternative, as "engines of creation". In fact, they create new observable phenomena, to be accounted for by our theories (van Fraassen, 2001, pp. 154-155; 2008, p. 101). Still, van Fraassen acknowledges the possibility that a constructive empiricist admits microscope detections as instances of observation (2001, pp. 162-163; 2008, p. 110).

In sum, borrowing Dellsén's distinction, van Fraassen is not afraid of epistemic immigration or epistemic upgrading, while perfectly aware of their consequences. Dellsén seems to suggest that perhaps van Fraassen has overlooked one important implication of the notion of successful theory entailed by constructive empiricism. In the next section I will try to show that it is Dellsén, and not van Fraassen, who has overlooked one important feature of science and its (philosophical) scrutiny, namely, that they are human activities.

18 Kukla (1996) highlights a purported contradiction in van Fraassen's (1985) view about the possibility that the composition of the epistemic community changes due to epistemic immigration, because of another passage from the same work—on the next page. Here are Kukla's words: "Van Fraassen's argument is that if the only part of your theory you believe in is the observational part, then you can never ascertain that beings outside of your current epistemic community actually observe anything. All you can tell is that they're reliable indicators of certain events, like the instruments that you use—and so you'll never encounter any reasons that rationally compel you to enlarge your epistemic community. So there's really no question that antirealists have to be inflexible about who gets into the epistemic club" (1996, p. 209). I have it that van Fraassen cleared his position on the matter in 2005, with the publication of "The day of the dolphins".

5. We are only human, after all

In the previous section, we have seen that expanding the scope of the predicate "observable" carries the risk of turning an empirically adequate theory into an empirically inadequate one. Thus, according to Dellsén, constructive empiricism allegedly implies that "scientists have an important scientific reason not to seek to expand the limits of observability" (Dellsén, 2024, p. 137). Failing to do so might put in danger any successful, i.e. empirically adequate, theory in our possession. In other words, admitting the possibility of shifts in the limits of observability would run counter to the pursuit of satisfaction of the criterion of scientific success. Does constructive empiricism really entail such a revisionary attitude?

If a theory is empirically adequate, then all the actual phenomena fit inside at least one of its models. Roughly and briefly, "what it says about the observable things and events in this world, is true" (van Fraassen, 1980, p. 12). Any change in the scope of the "observable" is therefore a potential risk for a successful theory, Dellsén has a point here. However, there is an important—and quite straightforward—objection to this argument that has been neglected in his work: we are in no condition whatsoever to know whether a certain theory is empirically adequate, let alone true. And never will be, of course.

It is worth remembering that not only is "observable" what will actually be observed in the future, e.g. the snow in Reykjavík next New Year's Eve, or was observed in the past, e.g. the eruption that destroyed Pompeii in 79 AD, but any phenomenon within our light cone, such as the impact of a meteorite on the surface of an extrasolar planet the day Socrates was sentenced to death.[19]

Now, if we had God's point of view, we could tell whether a certain theory is empirically adequate or not. We could even know if it is true, actually. But suppose

19 In "Empiricism in the Philosophy of Science", van Fraassen (1985) claims that observability presents *special limits* that are due to the physiology of the human species (our epistemic community). It is because of them that *observable* is an indexical term and that we cannot admit circumstances in which the constitution of the human species is modified. There are also *general limits*, that do not depend on the human physiology: these are spatial and temporal limits determined by Einstein's relativity theory. Interplanetary travels of human crews certainly fit within these limits and so there is no problem (?) in imagining contexts in which astronauts are in the vicinity of Jupiter or of an extrasolar planet.

we do have an empirically adequate theory and we know that. Then any shift in the limits of observability might put its status in danger: our successful theory could become a disposable one. We could even imagine that we know our theory is empirically adequate but not true. Thus, if empirical adequacy were the criterion of success, some might think that trying to prevent the scope of the predicate "observable" from changing, via epistemic immigration or epistemic upgrading, would be an understandable move. A few remarks are in order, though.

First of all, if a theory is indeed empirically adequate, then its empirical import will take into account even the observable consequences of the use of instruments, such as the output of a device interacting with a sample.[20] Suppose we have a theory about how hornets fly and are aware that if no instrument existed the theory would be empirically adequate—of course it takes God's point of view to know that. If a researcher examines a hornet's wing under a high-resolution optical microscope, what will she see? Given what he has written in "Expanding the Empirical Realm", I expect Dellsén to answer that the researcher will have the opportunity to see details of the wing's structure otherwise invisible to the naked eye. In other words, the microscope will allow the researcher to expand the limits of what is observable-to-her. But this might also make her realize that the theory which would be empirically adequate if no instrument existed is actually not, in case the details she detected are different from what the theory says. Hence the main argument Dellsén has presented in his work.

A constructive empiricist à la Bueno, *i.e.* who admits that in a situation like the one depicted above the researcher does observe details of the hornet's wing otherwise invisible to the naked eye, would give the exact same answer. What would van Fraassen say instead?

Van Fraassen would not consider the above-depicted detection as an instance of observation, that's crystal clear.[21] However, he would say that the microscope,

20 "The empirical import of a theory *T* is identified as its set of testable, or observational, consequences" (van Fraassen, 1980, p. 54).

21 Van Fraassen would have no problem in calling the interaction a detection, for he admits that we detect particles (van Fraassen, 1980, p. 17). According to him, however, *to detect* is to be distinguished from *to observe*: "Microscopes, cloud chambers, laser interferometers and other scientific instruments allow us to detect entities, but *detection* has to be carefully distinguished from

in its interaction with the hornet's wing, has produced an observable output that the theory must account for. If it fails to do so, as in the above example, then the theory will reveal its empirically inadequate nature. At the end of the day, where is the difference—one might wonder—if not only in the narrative? Leaving this question aside, the point here is that even if we humans had God's point of view, then none of the constructive empiricists among us would be afraid of using instruments in the scientific practice.[22] *Au contraire*, for among the observable consequences of a theory there are also the phenomena produced by them—including the phenomena produced by the devices that we, actual humans lacking God's point of view, have no idea will exist in the future. If a theory is empirically adequate, all these phenomena are (already) part of its empirical import.

Before moving to the second point, another quite straightforward objection that can be raised against Dellsén on the topic of instrumental detection is that his narration is very similar to others to which van Fraassen has already answered. In particular, to Paul Churchland's thought experiment about hominoid creatures with an electron microscope in place over their left 'eye' (Churchland, 1985, pp. 43-44), mentioned also in "Expanding the Empirical Realm" (p. 134). Dellsén (2024) correctly reports that van Fraassen has replied that if those humanoids are admitted among 'us' then what is observable to them will simply become observable to the whole epistemic community. As a consequence, of course, the limits of observability will change—but not the notion of empirical adequacy or the aim of the scientific activity. In "Empiricism in the Philosophy of Science" (van Fraassen, 1985), however, there is also the remark that the humanoids argument might be judged as question begging, for Churchland presents himself as an all-knowing and authoritative spectator, though we do not have a divine spectator who can tell us what actually goes on (van Fraassen, 1985, p. 257).[23] In more than one passage, Dellsén (2024) gives the impression

observation. A look through a microscope does not allow us to observe directly a paramecium; only to observe *an image* of a paramecium, or to *detect* a paramecium" (Contessa, 2006, p. 456). See also van Fraassen, 2008, p. 93.

22 If we had God's point of view, perhaps there would be no point in doing science at all.

23 This question is tackled and well explained by Filip Buekens (1999), who considers van Fraassen's reply to Churchland to be satisfactory (p. 23).

of presenting himself the way Churchland has been charged of doing by van Fraassen.[24] To put it another way, his writing gives the impression of not being neutral, but rather biased towards a realist perspective.

Be that as it may, and back to the real world, the second rejoinder is that we cannot know whether a certain theory is empirically adequate. Thus, there seems to be no reason for a constructive empiricist to resist making use of instruments in the scientific practice *tout court*, not only if we had God's point of view. Suppose we have a potentially successful—from a constructive empiricist point of view—theory about how hornets fly; *i.e.*, it has not proven empirically inadequate so far. If a researcher examines a hornet's wing under a high-resolution optical microscope, what will she see? Again, Dellsén would probably answer that the researcher will have the opportunity to see details of the wing's structure otherwise invisible to the naked eye. That is, the microscope will allow the researcher to expand the limits of what is observable-to-her. As before, the microscope detection might make her realize that the theory that she previously held as potentially empirically adequate is actually not, in case the details she detected were different from what the theory said.

Then again, even in this case a constructive empiricist who admits microscope detections as instances of observation would behave in the exact same way as a realist; while van Fraassen would say that the microscope, in its interaction with the hornet's wing, has produced an observable output that the theory must account for. If it fails to do so, then the theory will reveal its empirically inadequate nature. Nothing changes, not even in the real world where we lack omniscience and the most we can say about a certain theory is that it has not proven to be empirically inadequate—thus far.

Now, Dellsén (2024) maintains that a scientific realist would welcome new detections, obtained through new devices, for that "would increase our chance of obtaining true theories" (p. 138), though for a constructive empiricist, together with the chance of getting more empirically adequate theories, would come the risk that

24 "the resulting community can observe entities that were previously unobservable" (Dellsén, 2024, p. 133); "entities that have just become observable now that the limits of observability have expanded" (p. 137); "beings who could perceive electromagnetic fields in much the same way that we see ordinary light" (p. 138).

> a theory [...] that had been empirically adequate before—because correct about all the entities that were observable at the time—could become empirically inadequate afterwards—because incorrect about some new set of entities that became observable by virtue of the epistemic immigration or upgrading that would just have taken place (p. 138).

We have seen that, contrary to what Dellsén (2024) thinks, constructive empiricists of any sort are not afraid of the use of instruments in science, both in an ideal world where they have omniscience and in the real one, where the most they can have are theories apparently not empirically inadequate. His objection that constructive empiricism cannot make sense of the scientific impetus "to expand the limits of what can be observed" (p. 127) can be rejected, given that by "impetus to expand the limits of what can be observed"—leaving the realist bias of the expression aside—he clearly means both the use of instruments in the day-by-day scientific practice and the design and construction of new devices that: allow us to expand the limits of what can be observed, according to the scientific realists; create new observable phenomena that our theories must account for, according to van Fraassen and who shares his antirealism.

So much for the use of instruments in science, the boundaries of observability can actually broaden due to the birth of a person with especially acute sight or hearing sensitivity—evolution?—or because we admit non-human beings as part of our epistemic community. Dellsén does not really push this argument to the limit and avoids explicit suggestions, à la Kukla, that no flexibility in the composition of the epistemic community should be allowed (Kukla, 1996, p. 208).[25] Actually, commenting on van Fraassen's reply to Churchland, that in case of epistemic immigration the limits of observability would change but this does not constitute a real threat to constructive empiricism, Dellsén (2024) endorses it:

25 Besides denying to non-humans the admission to our epistemic community, would the constructive empiricist criterion of success in science also imply that we should prevent new humans (newborns) from being admitted as well, considering that some of them might present exceptional observation capacities that would broaden the actual limits of observability? And how should that be done?

> Van Fraassen's point here, I take it, is that the fact that the limits of observability can change doesn't mean that there is no line to be drawn between observable and unobservable; it just means that the line needs to be drawn *at a given time*. That much seems correct" (p. 134; emphasis in the original).

Still, he maintains that "there will be circumstances—however contrived and convoluted—in which constructive empiricism implies that epistemic immigration and upgrading should be avoided or even banned (at least in so far as we are seeking scientific success)" (2024, p. 139).

Now, it is true that, as Dellsén (2024) goes on, scientific realism is free from any implication of this sort, for if a theory is successful according to the realist criterion —namely, accurate about both the observable and the unobservable aspect of the world—then any shift in the limits of observability has no bearing on its status (pp. 139-140). However, we should not forget that constructive empiricism and scientific realism are stances about the actual scientific practice. True, admitting dolphins in our epistemic community might turn an empirically adequate theory into an inadequate one. But in the real world we are in no condition to know whether a theory is correct with respect to all the observable phenomena that fall under its domain and this explains why scientists and researchers do not stop when they have an apparently successful theory: they need to test its empirical adequacy, among other things. Using instruments too, for the empirical import of the theory includes the observable consequences of their use—and we have seen that this is compatible with both a realist and an antirealist account of the interaction among researchers, instruments, and samples.

Anyway, while scientists work and life goes on, the composition of our epistemic community changes, as everything else does. Some people die, others are born, there might even be cases of epistemic immigration. It would be quite extraordinary if the limits of observability did not change as well. How does constructive empiricism cope with that? Van Fraassen has given us the receipt: as long as a distinction between the observable and the unobservable can be drawn, his antirealist/empiricist stance can survive and provide a perspective on science and its aim.

Now, at some time , something very peculiar might have happened: a scientific theory in our possession was empirically adequate; but at a later time it was not anymore, because in the meantime the limits of observability have shifted.

Since we will never know, however, it would be a bizarre move to act or make decisions in accordance with the possibility that an apparently adequate theory could in fact be empirically adequate. If we had a true theory in our possession, then any new test or experiment would be useless. Does the scientific realist criterion of success imply that once we have reached the goal, the scientists have good reasons not to keep working with a successful theory anymore? The obvious reply is that we will never know whether a certain theory is true and that is why scientists and researchers keep testing theories and performing experiments. According to a characterization of scientific realism presented in a previous section of this study, the acceptance of a scientific theory involves the belief that it is true. Now, this stance seems to be quite popular among scientists, but to my knowledge no scientist has ever stopped testing a theory they have accepted because it had not proven false thus far and hence might be true—we expect the opposite instead! Are we allowed to talk about a tension between scientific realism and established scientific practice then? I would not say we are.

In "Expanding the Empirical Realm", Dellsén (2024) expresses the opinion that a scientist who follows constructive empiricism's advice would move on to researching other phenomena as soon as they are convinced that empirical adequacy has been achieved, while a realist-inclined scientist "might rationally choose to spend their time and resources on finding the true theory of a phenomenon for which they have already achieved empirical adequacy" (p. 139). A couple of comments are in order here too. First: being convinced that empirical adequacy has been achieved is one thing, having already achieved empirical adequacy is another, very different, one—as it should be clear at this stage. Perhaps in both cases Dellsén actually meant that the scientist formed a belief about the empirical adequacy of the theory and just forgot to add "they are convinced" before "they have already achieved empirical adequacy"; in this case, the second remark is that what goes for the constructive empiricist goes for the scientific realist as well: the same rationale suggests that as soon as they are convinced that truth has been achieved, realist-inclined scientists would move on to researching other phenomena. This is not what happens in the real world though. Why should Dellsén's argument stand for constructive empiricists but not for scientific realists?

Let us take stock. An empirically adequate theory in our possession might become inadequate due to a shift in the limits of observability. Since we will

never know if such an event——extremely unlikely to say the least—takes place, and we are aware of that, it is hard to see how we could consider it a genuine risk. On the other hand, *mutatis mutandis*, scientists could be testing a true theory and therefore wasting large amounts of taxpayer funds in vain. Since we will never know if such an event—as for the previous one, extremely unlikely to say the least—takes place, and we are aware of that, it is hard to see how we could consider it a genuine risk.

I am not suggesting that "a strikingly similar objection" could be raised against scientific realism too, but rather that we should never lose sight of the fact that science is a human activity and so is the philosophical discussion about it. Given our limitations, we cannot—and will never be able to—know whether a certain theory is empirically adequate, let alone true. Considering in addition that empirical adequacy is closer to a chimera than to an actually achievable goal, i.e., it is extremely unlikely that we will ever succeed in constructing an empirically adequate theory,[26] not to mention a true one, it is hard to see how any risk assessment or stipulation should be based on the possibility that some theories in our possession might be empirically adequate—or true.

Of course, in purely logical arguments we can rely on whatever we want: "if this theory on quarks is true, then we will be able to explain the composition of protons and neutrons"; "if general relativity is an empirically adequate theory, then one of its models will correctly describe the trajectory of a light ray emitted by the Sun in its journey to Uranus when Jupiter is almost aligned with them"; "if the Moon were made of cheese, then the candidate would never incite a riot" are all valid arguments. But when it gets to making decisions, we expect the premise to be true or at least very likely, among other things: "Since the new bridge has collapsed, drivers must make a detour and take the old road to the village"; "Given the weather forecast, schools will remain closed tomorrow". If the premise is false or very unlikely or bears no relation with the conclusion, we will judge the decision bizarre (or irrational): "since some 17,000 meteorites fall to Earth every year, the mayor has determined that the statue of Yuri Gagarin must

26 According to van Fraassen, "scientific activity is one of construction rather than discovery: construction of models that must be adequate to the phenomena, and not discovery of truth concerning the unobservable" (1980, p. 5).

be moved under a shelter"; "given that Jakarta is still the capital of Indonesia, Novak has decided to wear the yellow jacket instead of the blue one" are also valid arguments, yet one would hardly be satisfied with the reasons adduced for the decisions made by the mayor and by Novak or consider it a genuine risk that the statue of Yuri Gagarin might be hit by a meteorite.

"Since some of the theories in our possession might be empirically adequate then scientists have an important scientific reason not to seek to expand the limits of observability"; "given that this theory on dark matter might be true, then CERN should not spend 15 billions of Swiss francs to build the Future Circular Collider"; "Donald has signed a purchase contract for a ten million dollar home in Southern California because the lottery ticket Ivanka bought yesterday might be the winner one". Valid or not, these arguments present very weak reasons/evidence for their conclusion and hardly anyone would make decisions, considerations or dare recommend any course of actions to other people based on premises as such.

Dellsén (2024) maintains that "the implication from constructive empiricism that it would (at least sometimes) be unadvisable for scientists to allow epistemic immigration or engage in epistemic upgrading appears to be an awkward normative implication" (p. 140). Applying the same rationale, one might claim that the implication from scientific realism that it would (at least sometimes) be unadvisable for scientists to allow spending large amounts of time and money with epistemic upgrading appears to be an awkward normative implication as well. The opinion contained in "Expanding the Empirical Realm" is based on the possibility that some of the theories in our possession are empirically adequate; the symmetrical one about realism is based on the possibility that some of the theories in our possession are true. Borrowing Dellsén's words, since scientists themselves do not seem to recognize these as genuine risks—scientists do not hesitate to augment their observational powers whenever possible—, is one allowed to conclude that there seems to be a tension between these stances (constructive empiricism and scientific realism) and established scientific practice? Given how labile and implausible the premises are, for it is extremely improbable that we are or will ever be (or have been) in possession of an empirically adequate or true theory and that even if this happened we would never know, such a conclusion does not appear to be legitimate—or so I argue.

6. Conclusion

In this paper I have shown that Dellsén's objection against constructive empiricism, that its criterion of success implies that scientists might be motivated not to seek to expand the limits of observability, can be disputed. The very notion of "expanding the limits of observability" can be challenged, when it comes to the use of instruments in science, for while the scientific realists (and Dellsén?) maintain that a microscope allows us to see paramecia and therefore nowadays these entities are observable, while in the past they were not, van Fraassen replies that such devices create new observable phenomena, but the limits of observability have in fact not shifted.

Be that as it may, a shift in the limits of observability is likely to happen—and to have happened in the past as well.[27] The scope of the predicate "observable" could actually broaden and turn an empirically adequate theory into an inadequate one. But this is beyond our control and, most of all, we are in no condition whatsoever to know whether such a modification in the status of a theory has taken place. Dellsén thinks that the constructive empiricist criterion of success nonetheless implies that there might be circumstances in which scientists would have good reasons to trying to prevent any shift in the limits of observability from happening. In the previous sections I have tried to show that such reasons are actually so labile and based on possibilities so remote that they can (and should) be overlooked without pain of contradiction. Or else, scientific realism could also be charged with an analogous objection of not being accurate in trying to make sense of the scientific activity.

The main point is that it is virtually impossible to succeed in constructing an empirically adequate (or true) theory—while not at all irrational to have empirical adequacy or truth as guiding stars—, and perhaps even more difficult to know that a certain theory is empirically adequate (or true). We are only human after all. Borrowing Chang's words, "there is no anthropocentrism here [...], but only *humanism* in the form of a recognition that we cannot, and should not try to, get away from ourselves" (2004a, p. 883).

27 What if the limits shift and an empirically inadequate theory becomes an empirically adequate one?

As a result, perhaps we can say that constructive empiricism can still be considered the best compromise so far presented between strict empiricism and the acknowledgment of the rationality of science.

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