

This is a preprint of a paper forthcoming in *Filozofia Nauki*. Please cite the official version.

Constructive Empiricism and Logical Positivism: The Return of the Prodigal Son

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Abstract

Bas van Fraassen's Constructive Empiricism (CE) has been much discussed. There is, however, a curious feature of van Fraassen's writings that has been overlooked up until now. This is that he sometimes capitalises certain key terms, notably "Induction". This is done to differentiate a pragmatic small 'i' induction (which has epistemic import) from a rule-bound capital 'I' induction (which does not). In this paper, I argue that van Fraassen's small letter/capital letter distinction reveals an underlying dualism, one that is reminiscent of the notoriously problematic semantic dualism in Logical Positivism (between a theoretical language and an observation language). Despite partly developing CE to overcome Logical Positivism's kind of dualism, van Fraassen seems to have tacitly endorsed it anyway. If so, then CE requires revision. It is, however, not clear how to conduct such a revision. It is not clear what the way forward should be once CE is understood as innately dualistic.

Key Words

Bas van Fraassen; semantic dualism; stances; induction; abduction; explanation

Introduction

Empiricism in the philosophy of science is sometimes criticised for being inherently dualistic. Quine's (1951) critique of Logical Positivism's analytic/synthetic distinction is a famous example. One wonders whether a non-dualistic version of empiricism can be developed. In this paper, I argue that the most recognised version of empiricism in contemporary philosophy of science – Bas van Fraassen's Constructive Empiricism (CE) – aims, but fails, to escape Logical Positivism's dualistic legacy.

CE is standardly divided into early CE (CE_{EARLY}) (developed in van Fraassen 1980) and late CE (CE_{LATE}) (developed in van Fraassen 2002). I will suggest that there is a new incarnation – a third version of CE. I will call this CE_{DUAL} . CE_{DUAL} does not begin where CE_{LATE} ends. Rather, it is implicit in the often subtle ways that van Fraassen has developed CE over time.¹ CE_{DUAL} is especially noticeable in the way that he distinguishes between two kinds of induction: (1) a pragmatic small 'i' induction (which has epistemic import) and (b) a rule-bound capital 'I' induction (which does not have epistemic import). As we will see, van Fraassen draws similar distinctions between “abduction” and “Abduction” and between “language” and “Language”.

The evolution of CE_{EARLY} into CE_{LATE} has been discussed in the literature (see notably Okruhlik 2014 and Monton and Mohler 2021). However, commentators do not seem to have recognised CE_{DUAL} . CE_{DUAL} is not easily identifiable. It is implicit in van Fraassen's writings. We can think of CE_{DUAL} as being exemplified by a kind of semantic dualism that lies ‘beneath the surface’ of CE's superficial linguistic structure. Nonetheless, careful analysis of what is explicit allows us to ‘tease’ CE_{DUAL} ‘to the surface’, or so I will argue.

As we will see, CE_{DUAL} appears to undermine part of van Fraassen's original motivation for developing CE. CE_{DUAL} expresses a form of semantic dualism that encounters similar problems to those identifiable in Logical Positivism.

In section 1 of this paper, I briefly discuss Logical Positivism with an emphasis on its dualist aspects.

¹ In other words, I am presenting CE_{DUAL} as a follow-on from CE_{EARLY} and CE_{LATE} rather than as a separate epistemological position about science. Referring to these different incarnations of CE as “first”, “second”, and “third” is mostly a rhetorical convenience. I am not necessarily suggesting that there are clear demarcations between them.

In section 2, I briefly outline CE_{EARLY} and CE_{LATE} . I also list some notable criticisms of these views, specifically those that target dualistic aspects thereof.

In section 3, I discuss CE_{DUAL} . I focus on its tacit, yet identifiable, semantic dualism.

In section 4, I discuss various problems that result from CE_{DUAL} 's semantic dualism. Notable, is its subtle similarities to Logical Positivism's semantic dualism. If my argument is on point, then CE requires revision. I will, however, not advise on what such a revision should look like since it is unclear how to proceed in this regard.

A few provisos should be noted at this point.

Firstly, my argument might not be relevant to those who subscribe to versions of CE that deviate from van Fraassen's version. Kyle Stanford (2006), K. Brad Wray (2018), Darrell Rowbottom (2019), and Quentin Ruyant (2021) have developed noteworthy derivatives. Most versions of CE do, nonetheless, appear to contain some form of rudimentary dualism.² If so, then my argument may be obliquely relevant to non-van Fraassian CEists. In any event, I will focus exclusively on van Fraassen's CE. As such, "CE" here means "van Fraassen's CE".

Secondly, note that some (including van Fraassen at times) consider CE to be a thesis about the *aim* of science. However, it is not clear if and how science, rather than scientists, can aim at anything. Arguably, only agents have aims, and science is an institution or an enterprise rather than an agent (see Rosen 1994; Rowbottom 2014). As such, I take CE's central thesis to be epistemic. It relates to answering something like the following question: "What is the relationship between science and notions like knowledge, truth, and belief?" It is not unconventional in the topical literature to understand CE this way.

Lastly, it is important to note that CE_{DUAL} is not a view van Fraassen has outwardly expressed. My argument is not that van Fraassen thinks or says that CE contains semantic dualism. Rather, my argument is that semantic dualism is a logical consequence of the way that he formulates the view. In other words, my claim is not that van Fraassen's capital letter/small letter distinctions are an explicit expression of semantic dualism. Instead, my claim is that the capital letter/small letter distinctions are a superficial, but identifiable, manifestation of an implicit,

² See, for example, Arthur Fine's (2008) criticism of Stanford's distinction between (a) "strict and literal belief" and (b) "belief in reliability". See also Peter Vickers' (2020) criticism of Wray's distinction between (a) "classifications" (scientific representations that will be retained in the future) and (b) "theories" (scientific representations that will be discarded in the future).

underlying, and unexpressed semantic dualism. We might think of them as loose and visible threads in CE's outward linguistic fabric. Pulling at the thread unravels – it reveals – the semantic dualism that lies hidden beneath.

1. Logical Positivism and its Problems

In this section, I will briefly explicate Logical Positivism's semantic dualism. I then discuss two well-known problems with the view. I will call these the *self-refutation problem* and the *hidden-metaphysics problem*.

Logical Positivists (e.g. early Carnap 1936) attempted to reduce all statements (claims or sentences) about the external world to statements about what we observe. Statements that can be reduced count as meaningful, while those that cannot (e.g. metaphysical statements) are considered meaningless. Only empirically verifiable synthetic statements have meaning. Analytic statements (i.e. logical and mathematical statements) have meaning if they reduce to tautologies. There is no Kantian synthetic a priori knowledge. The Logical Positivists, thus, subscribed to the so-called *syntactic interpretation* of scientific theories. Scientific theories are composed of a list of sentences. These sentences are delineable into the theoretical and the observational. The former are, in principle, then formally reducible to the latter.

Most contemporary philosophers of science (and later Positivists) consider Logical Positivism's reduction project to have failed. Two well-known problems stand out:

1. *The self-refutation problem*: The meaning of Logical Positivism's prescription that "only observational statements have meaning" does not come from observation. This renders Logical Positivism, *qua* empiricist thesis, meaningless by its own lights.
2. *The hidden-metaphysics problem*: It is not at all clear how to tease apart strictly metaphysical statements from empirically testable statements. The project is hampered by tricky intermediary cases and Quinean indeterminacy (Quine 1960, ch. 2).

According to van Fraassen, Logical Positivism suffered a rather "spectacular crash"; it "left a large gap between the basis of 'observation' terms and theoretical terms, with no good handle on what the reference of the latter might be" (2019: 18; see also 1994). It is partly for this reason that van Fraassen favours the *semantic interpretation* of scientific theories over the syntactic interpretation. Rather than a list of potentially reducible sentences, the semantic interpretation takes a scientific theory to be a collection of structural models that can be mapped

onto observable phenomena.³ The semantic interpretation ostensibly allows one to circumvent the uninviting task of logically delineating and then reducing theoretical statements to observational statements.

2. CE_{EARLY} and CE_{LATE}

I now discuss the two standardly recognised incarnations of van Fraassen's view: CE_{EARLY} and CE_{LATE} . As before, I will stress various criticisms of CE_{EARLY} and CE_{LATE} 's dualist features.

Note that my aim is not to detail the intricacies of the ongoing debate between van Fraassen and his critics (see, however, Dicken 2010 and Monton and Mohler 2021). Van Fraassen has published responses to some of the criticisms that I outline. The reason I will emphasise the critics' arguments is that my goal in this section is to highlight prior charges that CE is innately dualistic. My goal is ultimately to discuss CE_{DUAL} in Section 3. Doing so will lend support to the criticisms outlined in this section and (hopefully) press home the point that CE suffers a kind of dualism that is redolent of Logical Positivism's dualism.

Also, note that my expositions of CE_{EARLY} and CE_{LATE} will be somewhat quick. This is because I am primarily concerned with CE_{DUAL} . CE_{EARLY} and CE_{LATE} are complex views, and my brief treatment will invariably gloss over much nuance. I have, though, attempted to faithfully capture the gist of CE_{EARLY} and CE_{LATE} without straw-manning.

2.1. CE_{EARLY} : *Sola Experientia*

In *The Scientific Image* (1980), van Fraassen develops CE_{EARLY} as a brand of empiricism that putatively circumvents Logical Positivism's self-refutation problem and hidden-metaphysics problem. Van Fraassen does not undertake the delineation and reduction of different kinds of sentences. He is, instead, largely concerned with the epistemic status of (1) scientific observables, (2) scientific truth, and (3) scientific beliefs. Each of these key notions in CE_{EARLY} is framed in roughly dualistic terms. These are (1) van Fraassen's commitment to observable and not unobservable phenomena, (2) his notion of empirical adequacy compared to truth, and (3) pragmatic acceptance instead of belief. Let us briefly look at these three notions in turn.

1. Van Fraassen (1980, ch. 2; 1985) famously and controversially draws his observable/unobservable distinction at the optical microscope. Things viewed with

³ Van Fraassen (2008) proposes mapping the models composing a scientific theory onto observable phenomena via intermediaries he calls "appearances".

the naked human eye or through spectacles are real. Things ‘viewed’ through an optical microscope, an FMRI scanner, or a particle detector could be real but we cannot know for sure.⁴ Van Fraassen is critical of the realist’s desire for explanations ‘behind’ observable phenomena. When we ‘explain’, we are only describing (or sorting) observable phenomena.

2. Van Fraassen’s observable/unobservable distinction, in turn, supports his empirical adequacy/truth distinction. A theory is “empirically adequate if it has some model such that all appearances are isomorphic to empirical substructures of that model” (van Fraassen 1980: 64). For van Fraassen, we should pursue empirically adequate theories rather than true theories (where ‘true’ suggests some correspondence relation between a sentence and a metaphysical reality ‘out there’). There are good (useful) theories and bad (not-so-useful) theories, and a theory need not be true to be good.
3. Van Fraassen’s observable/unobservable distinction also supports a distinction between pragmatic acceptance and belief. To “believe a theory is to believe that one of its models correctly represents the world” (van Fraassen 1980: 47). But, no model can faithfully represent the world (or even part of the world) in all its detail. Pragmatic acceptance of, rather than belief in, a theory is the suitably weaker doxastic commitment. We work with a theory – we use it to perform manipulations and make predictions – without the strong doxastic commitment entailed in the notion of belief.

Criticisms of CE_{EARLY} have mostly centred around the above three distinctions. According to Elliot Sober (1985), CE_{EARLY} gets tangled in semantic and epistemic distinctions having no practical or philosophical relevance to science. Alan Musgrave (1985) and Gideon Rosen (1994) think that CE ’s observable/unobservable distinction is just Logical Positivism’s theory/observation distinction in new guise.

Paul Dicken argues that van Fraassen can only claim that some things are observable while others are unobservable if he has some prior knowledge of the unobservable – a knowledge

⁴ Van Fraassen sometimes allows that the observable/unobservable distinction be drawn somewhere other than at the optical microscope. What matters, he says, is that empiricists draw some line between what is epistemically accessible versus what is not.

van Fraassen denies. In other words, one cannot delineate two things without having some epistemic grasp of both. As Dicken puts it, “in order to draw a line, one must first step beyond it” (2010: 88; see also Musgrave 1985; Nagel 2000; Bueno 2017). If so, then what CE_{EARLY} assumes (knowledge of the unobservable) is at odds with what it claims (we cannot have knowledge of the unobservable). This is reminiscent of Logical Positivism’s self-refutation problem.

James Ladyman (2004) argues persuasively that the modal suffix in van Fraassen’s notion of the *observable* reveals a tacit metaphysical commitment. Rosen (1994) points out that van Fraassen’s semantic account of theories commits him to the existence of at least three unobservable kinds of objects: models of phenomena, models comprising a theory, and functions linking the two. Van Fraassen’s “rejection of ‘metaphysics’ in fact presupposes a fair dose of the metaphysics it purports to do without” (Rosen 1994: 143). This is reminiscent of Logical Positivism’s hidden metaphysics problem.

Partly due to these problems, van Fraassen attempts to modify CE in *The Empirical Stance* (2002). There, he develops Stance Empiricism (or CE_{LATE}), where the role of contextual choice and, therefore, *the will* takes centre stage.

2.2. CE_{LATE}: A Plurality of Stances

Although maintaining some of its features, CE_{LATE} replaces CE_{EARLY}’s prescriptive empiricism with relativised stances informed by voluntaristic attitudes. Although van Fraassen prefers the *empirical stance*, there are other rational (i.e. internally consistent) stances one can adopt toward science. These include the metaphysical stance, the pragmatist stance, and the materialist stance.

As before, I will briefly explicate CE_{LATE} in terms of van Fraassen’s three primary distinctions: (1) the observable/unobservable distinction, (2) the empirical adequacy/truth distinction, and (3) the pragmatic acceptance/belief distinction.⁵

1. In CE_{LATE}, the observable/unobservable distinction is only epistemically binding for those who opt to join the empirical stance. Those who freely choose the metaphysical stance, for example, will naturally forego such a distinction.

⁵ See Zovko and van Fraassen (2022) for a recent (albeit brief) discussion about the role these distinctions play in CE_{LATE}.

2. Regarding truth, CE_{LATE} takes inspiration from James' (1896/1956) pragmatist conception. We must find a balance between truth believed and error avoided. We must find a middle ground between believing only what is absolutely certain (e.g. tautologies) and believing absolutely everything. For van Fraassen, finding such a balance involves a context-relative value judgement, one that is ungrounded in and underdetermined by both rationality and evidence. This introduces *epistemic voluntarism*.
3. Regarding belief, van Fraassen recognises that his ungrounded voluntarism might be susceptible to charges of unbridled relativism. He insists, nonetheless, that ungroundedness signifies the inescapable human condition. Like truth, belief is not compelled by rationality or evidence. Rather, it is the product of context-relative value judgements.

Despite these modifications, it is not clear that CE_{LATE} overcomes Logical Positivism's and CE_{EARLY}'s problems.

The self-refutation problem still lingers. Van Fraassen does not arrive at stance pluralism and epistemic voluntarism via experience alone. Instead, these notions are argued for *a priori*. As Dicken (2010, ch. 2) argues, Van Fraassen's preference for the empirical stance over other supposedly viable stances remains unsatisfyingly mysterious (see also Ladyman 2004). Stating that it is a matter of free choice only pushed the mystery one step back.⁶ At heart, CE_{LATE} is an axiological thesis, but this axiology is inexplicable.

Regarding hidden-metaphysics, non-empirical commitments are still noticeable in CE_{LATE}. As Peter Baumann (2011) argues, CE_{LATE}'s epistemic voluntarism does not appear to be a testable theory derived from observation.⁷ Also, van Fraassen's stances might themselves be metaphysical in nature. According to Anjan Chakravartty (2007), van Fraassen introduces

⁶ Chakravartty (2017 chs. 7–8) embraces this regress. He suggests adopting an *ataraxic* attitude regarding reasons for stance choice. The ways of the will are beyond philosophical analysis. I am not sure if this move is particularly helpful (see van der Merwe forthcoming-b).

⁷ An anonymous reviewer pointed out that van Fraassen is not a verificationist and, therefore, questioned why I am objecting that his voluntarism is not testable. Indeed, CE is not, strictly speaking, a form of verificationism. Like any version of empiricism, CE is, however, intimately tied to – even centred around – the notion of (empirical) testing.

stances to *explain* our epistemic practices. A stance is a state of mind – an attitude or cluster of beliefs – yet such a state is not an empirical phenomenon of the kind CE’s epistemic commitments are supposed to be restricted to (see also Ladyman 2004).

3. CE_{DUAL}: A Theory of Distinctions

I now discuss van Fraassen’s capitalisation of certain key terms in his writings. I argue that this idiosyncrasy reveals a problematic kind of semantic dualism, one that underlies CE’s outward superficial linguistic structure.

3.1. *Distinctions in CE*

As mentioned in the introduction, van Fraassen sometimes distinguishes between small letter ‘i’ induction and capital letter ‘I’ Induction. Here are some examples:

Van Fraassen advises against the use of “Induction and Abduction [which] are born and nurtured in the philosopher’s armchair” (2000: 271).

He states that we should make the following “verbal distinction: let ‘induction’ refer to the practice of forming opinions that go beyond our evidence, and let ‘Induction’ stand for the putative recipe or rules that... delimits the precise conclusions one must believe...” (van Fraassen 2004: 182; see also 2007: 343).

He states that there are “continuing and by now boringly repetitive failures of the idea of Induction and similar rule-governed concepts of rational opinion and its management” (2004: 182).

Unless employed as heuristics to ‘save the phenomena’, CEists are instructed not to indulge in *Induction* and *Abduction*. *Induction* and *Abduction* can lead into an “insidiously enchanted forest” of metaphysical speculation (van Fraassen 2008: 259). Van Fraassen does, however, encourage everyday or pragmatic kinds of *induction* and *abduction*. *induction* and *abduction* are suitably weaker variants; they are useful for day-to-day navigations of the world around us and for generating testable scientific hypotheses (see Blackburn 2002 for an informative discussion).

An anonymous reviewer objected that van Fraassen uses ‘*Induction*’ and ‘*Abduction*’ to indicate a rule – an exceptionless rule that forms part of a general theory of rationality leading to binding conclusions. There is, said the reviewer, no such rule for *induction* and *abduction*. The reviewer and I seem to have a similar understanding of the relevant distinctions. The

second of the above three quotes seems to support the reviewer's claim. However, I do not think that it is quite right to say that 'Induction' and 'Abduction' *indicate* a rule. Rather, 'Induction' and 'Abduction' seem to indicate the *use* of a rule. The third of the above three quotes seems to support this claim. There, van Fraassen refers to *Induction* as "rule-governed" rather than as a rule (*qua* rule). I am not sure if one can say that 'Induction' and 'Abduction' are synonymous with 'a rule'. Induction and abduction are usually understood as actions or processes. They are the action or process of inducting or abducting – of applying inductive or abductive reasoning. On my reading, van Fraassen is distinguishing between (a) inductive and abductive inference that is rule-governed (*Induction* and *Abduction*) and (b) inductive and abductive inference that is not rule-governed (*induction* and *abduction*). He is talking about two different ways of reasoning during inquiry.

Regarding *induction* and *Induction*, we can think of the distinction between practical versus ideal weather forecasting. Van Fraassen recognises that meteorologists use *induction* during forecasting (2000: 257–258, 264–266). As I understand things, he would permit the use of *induction* during *actual* weather forecasting. But, anyone who claims to be capable of employing *Induction* to generate *precision* forecasts is surely mistaken.

Regarding *abduction* and *Abduction*, van Fraassen would presumably allow that *abduction* be used in a court of law to establish the guilt of a defendant beyond a reasonable doubt. He is, however, dismissive of physicists' or philosophers' use of *Abduction* to posit the existence of quarks, strings, or other unobservables. There is, then, a distinction between a weak kind of ampliative inference (*induction* and *abduction*) and a strong kind of ampliative inference (*Induction* and *Abduction*). Van Fraassen recognises both – he has linguistic terms for both – but the former is permitted while the latter is taboo.

On my reading, the same kind of distinction applies to four other core terms in CE. These are 'metaphysics', 'belief', 'truth' and 'explanation'. As with 'induction' and 'abduction', the meaning and proper use of these terms are central to the debate between scientific realists and anti-realists. My contention is that van Fraassen tacitly, yet identifiably, conceives of them in dualistic terms (hence, CE_{DUAL}). I now discuss metaphysics, belief, truth, and explanation in turn.

Metaphysics

Although van Fraassen does not capitalise the word ‘metaphysics’, he does distinguish between a permissible and an impermissible kind of metaphysics, but only “if we can see this project as the good way to engage in metaphysics” (2007: 381; see also 1991). The bad kind is the metaphysics scientific realists employ – the kind that involves supposedly truth-conducive inferences to an unobservable reality. The good kind is metaphysics employed as a heuristic or utilitarian device while ‘saving the phenomena’. Van Fraassen states: “I do from time to time join the metaphysicians in their enterprise” (2004: 180); “metaphysical speculation... has great heuristic and inspirational value, let’s encourage scientists to so far forget themselves as to constantly engage in it” (2004: 181; see also 2002: xviii). As with *induction* and *abduction*, the metaphysics van Fraassen is talking about here is the kind that can be used to generate testable hypotheses (or when adopting realist discourse for the sake of argument). Thus, while rejecting a strong (robust or full-blown) kind of metaphysics, van Fraassen encourages a weak (heuristic or pragmatic) kind of metaphysics. As with induction and abduction, there are two kinds of metaphysics in play here. For consistency, we can then refer to the strong kind as ‘Metaphysics’ and the weak kind as ‘*metaphysics*’.

Belief

The same sort of distinction seems to apply to belief and truth. As before, empirical adequacy might just be a weak kind of truth, and pragmatic acceptance might just be a weak kind of belief. Arthur Fine and Simon Blackburn have argued persuasively that there is no practical difference between believing a theory to be true and accepting a theory as empirically adequate. According to Fine, CE

can follow the usual lattice of inferences and reasons that issues in scientific beliefs until it reaches the border of the observable, at which point the shift is made from belief to acceptance. But the inferential network that winds back and forth across this border is in no way different from that on the observable side alone (1986: 169).

In other words, the rules and methods of reasoning and inference that apply to ‘belief in’ versus ‘pragmatic acceptance of’ a theory appear largely indistinguishable. Both cases amount to “trusting [a theory] in all our practical and intellectual endeavors” (Fine 2001: 11). For Fine, whether we want to label this trust ‘belief’ or ‘acceptance’ is neither here nor there (see also Blackburn 2002: 119–127). Plausibly, it comes down to the *degree* of doxastic commitment we assign to a theory. Belief involves a high degree of doxastic commitment, while pragmatic acceptance involves a low degree of doxastic commitment (see also van der Merwe

forthcoming-b). If so, then the belief/acceptance distinction will be a quantitative rather than a qualitative one. There is no clear moment where belief transforms into acceptance. As before, the former seems to simply be a strong kind of belief and the latter a weak kind of belief.

When we investigate the practicalities involved in believing a theory to be true versus accepting a theory as empirically adequate, we find no working difference.⁸ Once scientists are immersed in their best theories, van Fraassen's distinctions play no recognisable or meaningful role. They do not affect scientists' abilities to make predictions about and manipulations of the world.

Truth

The same seems to apply to CE's truth/empirical adequacy distinction. Only if one equates 'truth' with 'certainty' (i.e. with 'complete and final truth'), does empirical adequacy appear to be a distinct and viable alternative. Van Fraassen rightly points out that scientific theories are never final – they never constitute a complete representation – but then concludes that scientists cannot attain truth. As Musgrave (2018) points out, this involves conflating truth with certainty. A suitably fallibilistic notion of truth exhibits the same 'tentativeness' – the same pragmatic and provisional character – as empirical adequacy (see also Blackburn 2002). When it comes to practical matters, truth and empirical adequacy appear largely indistinguishable. If one accepts that truth comes in degrees,⁹ then this seems to simply be a case of a strong versus a weak kind of truth rather than a case of two qualitatively distinct alethic concepts.

An anonymous reviewer was unconvinced that empirical adequacy is a weak version of truth. The reviewer considered empirical adequacy to be truth about the observable and not approximate truth or the like. If so, then the difference between empirical adequacy and truth might not be analogous to the difference between *induction* and *Induction*. In response, I think that the reviewer is making my point, especially if the observable/unobservable distinction is fuzzy rather than sharp (as already intimated). If empirical adequacy is truth about the observable, while *Truth* is truth about both the observable and unobservable, then we can consider the former to be a weak version of the latter. It is weaker in that it only covers some of the cases that the stronger version does.

⁸ Paul Horwich (1991) argues that genuine belief and pragmatic acceptance are functionally equivalent mental states (see also Leeds 1994).

⁹ Paul Égré (2021) and Jared Henderson (2021) have recently defended a plausible notion of graded truth (see, however, Mankowitz 2023 for an argument against the notion).

As mentioned in the introduction, my goal here is not to detail the back-and-forth debate between van Fraassen and his critics. That said, the above arguments do suggest that van Fraassen's distinctions between belief and pragmatic acceptance and between truth and empirical adequacy are not qualitatively robust. Plausibly, CE's notion of pragmatic acceptance is nothing over and above a minimal kind of belief, and empirical adequacy is nothing over and above a minimal kind of truth. If so, then we can once again think of *truth* versus *Truth* and *belief* versus *Belief*.

Explanation

The same kind of distinction might apply to the notion of explanation. Van Fraassen states, for example, that “the quest for explanation is of great value to the development of science but gives no solace to the realist who needs explanation to be more than a pragmatic virtue” (2019: 18). When we explain, he says, we are merely describing or organising the knowledge we have of observable phenomena (*viz.* ‘saving the phenomena’). There may or may not be “an explanation in terms of unobservable facts ‘behind the phenomenon’ – it really doesn't matter to the goodness of the theory, nor to our understanding of the world” (van Fraassen 1980: 24). Indeed. But, as before, this suggests two kinds of explanation: a weak pragmatic kind and a strong metaphysical kind. The former has practical or heuristic value, while the latter introduces speculative metaphysics (with associated ontological claims about unobservables).

Ex hypothesi, van Fraassen appears to be distinguishing between *explanation* and *Explanation*. In CE, the former exemplifies permitted *metaphysics*, while the latter exemplifies prohibited *Metaphysics*. The former is identifiable with *belief* and *truth*, while the latter is identifiable with *Belief* and *Truth*.

I now argue that the above distinctions are suggestive of a general semantic dualism.

3.2. CE_{DUAL}'s Semantic Dualism

Van Fraassen lays the groundwork for the kind of dualism we have been discussing in “From Vicious Circle to Infinite Regress, and Back Again” (1992). There, he emphasises a distinction between capital ‘L’ Language and small ‘l’ language. We must, he says, “distinguish Language, in the sense of the resources we have for constructing and playing language games, from the real language games that are actually played” (van Fraassen 1992: 12). On my understanding, the former is supposed to be the a priori *Language* of theory, while the latter is supposed to be the a posteriori *language* of pragmatics.

Van Fraassen does not intend that his *language/Language* distinction signal two linguistic domains. What he seems to mean is that one cannot read from linguistic practices whether or not terms like ‘induction’, ‘abduction’, and the like are metaphysically committing. Linguistic usage often underdetermines such commitments. Van Fraassen is abstaining from any metaphysical commitments when he speaks of ‘induction’, ‘abduction’, and the like, but there is metaphysical baggage when those with realist inclinations speak of ‘induction’, ‘abduction’, and the like. This is why he feels the need to differentiate *induction* from *Induction*, *abduction* from *Abduction*, and so on. In any event, even if this is not necessarily a linguistic distinction, it is still a semantic one. Van Fraassen is distinguishing between two semantic systems. The one is expressed in *language* and incorporates *induction*, *abduction*, etc. The other is expressed in *Language* and incorporates *Induction*, *Abduction*, etc.

Given the arguments from Section 3.1, we can think of *Language* as a general semantic category populated with all CE’s undesirable terms (including *Induction*, *Abduction*, *Metaphysics*, *Truth*, *Belief*, and *Explanation*). *language* will then be populated with all CE’s preferred terms (including *induction*, *abduction*, *metaphysics*, *truth*, *belief*, and *explanation*).¹⁰ The members of the former category each refer to some epistemic practice that involves a priori or rule-bound speculation. The members of the latter category each refer to some epistemic practice that is limited to heuristic and pragmatic inferences. If so, then we have two distinct semantic systems in play. Each system presumably has the same syntax, but a different semantics. *Language* entails the realist’s illicit strong *Semantics*, while *language* entails CE’s licit weak *semantics*.¹¹

Note that, even if CEists hold that theories are sets of models (the semantic interpretation from Section 1), they must still philosophise about science (including its theories and subject matters) in some *language* (van Fraassen 2008: 189, 223–225). Philosophy is, by its very nature, *language-oriented*, and semantics is at the heart of this linguistic enterprise.

4. Problems with CE_{DUAL}

¹⁰ *Mutatis mutandis*, the same kind of distinction may apply to related concepts like ‘inquiry’, ‘judgement’, and ‘reason’ (*Inquiry* versus *inquiry*, *Judgement* versus *judgement*, and *Reason* versus *reason*).

¹¹ Obviously, not every linguistic term we use will have a dual meaning. But, there does appear to be a dualism involved when it comes to CE’s *key* terms (‘induction’, ‘abduction’, ‘metaphysics’, ‘truth’, ‘belief’, and ‘explanation’).

The above suggests that an innately, albeit tacitly, dualistic view underlies CE. I am calling this view CE_{DUAL}. Although the self-refutation and hidden-metaphysics problems from before are not easily identifiable in CE_{DUAL}, new kinds of problems suggest a return to Logical Positivism's style of dualism. I identify two such problems. They can be formulated into the following questions:

- (1) What is the *scope* of each of CE_{DUAL}'s two semantic domains?
- (2) Where is the *demarcation* between CE_{DUAL}'s two semantic domains?

I will refer to (1) as the *scope problem* and (2) as the *demarcation problem*. I now discuss each in turn.

4.1. The Scope Problem

Regarding Problem 1, CEists will need to specify the range of *induction* versus *Induction*, *abduction* versus *Abduction*, *metaphysics* versus *Metaphysics*, *truth* versus *Truth*, *belief* versus *Belief*, and *explanation* versus *Explanation*. In other words, what do each of these terms denote? I will focus on 'induction' to highlight the general problem.

Van Fraassen sometimes distinguishes between acceptable "ampliative practice" and unacceptable "ampliative method" (2000: 271 fn. 16; see also 275 fn. 18). The former involves an everyday practical kind of inference (as in *induction* and *abduction*); the latter involves a theoretical rule-governed kind of inference (as in *Induction* and *Abduction*).¹² Dicken, in turn, links this distinction to beliefs:

Scientific realists have one set of epistemic preferences, insofar as they pursue a wide range of beliefs formed on the basis of various rationally compelling ampliative inferences... [CEists] have another set of epistemic preferences, insofar as they pursue a more limited range of beliefs formed on the basis of various rationally permissible ampliative inferences (2010: 31; see also Psillos 1996).

Ampliation is involved in both cases. The difference is between a "wide" (or strong) kind of ampliative inference and a "limited" (or weak) kind.

¹² As before, we might think of the former as 'ampliation' or 'inference' and the latter as 'Ampliation' or 'Inference'.

CEists cannot reject induction *tout court* because we clearly use it when we successfully navigate and manipulate the world day-to-day (where ‘success’ can be cashed out in terms of goal attainment). If this were not the case, then we should, like Buridan’s ass, be frozen in perpetual indecision. It should be impossible to perform even the simplest everyday tasks like opening a door or making a cup of coffee. To perform such tasks successfully (which we clearly do) we must infer that the world will, *ceteris paribus*, behave the way it has in the past. So, van Fraassen must permit some minimal use of induction; but, he does not want to permit too much of it. Note, however, that both induction and *Induction* venture beyond the strictly observable; both go beyond the actual evidence (van Fraassen 1980: 72, 2004: 182; Zovko and van Fraassen 2022).

Now, the problem is that CEists need to, but do not, tell us exactly which inferences fall under the scope of *induction* and which fall under the scope of *Induction*.

Note that van Fraassen’s distinction is not between induction and not-induction. He permits some minimal inductive inference. There is, though, still a kind of dualism present. This is a kind of epistemic dualism, but it is also a semantic dualism because it distinguishes two distinct domains of meaning. As with Logical Positivism, there is a warranted semantic domain (‘*induction*’, ‘*abduction*’, ‘*ampliation*’, ‘*inference*’) and an unwarranted semantic domain (‘*Induction*’, ‘*Abduction*’, ‘*Ampliation*’, ‘*Inference*’). The terms in the former exhibit different semantic qualities (and, presumably, different norms of use) from the latter, if not a different syntax.

Regarding abduction, Thomas Crisp notes that hunter-gatherers successfully utilise inference to the best explanation when tracking wounded animals. Hunter-gatherers make successful inferences about

animals’ injuries and locations from appearances on the trail. Such attempts to get behind the appearances and understand the nature and structure of the reality underlying them are... a form of metaphysics (Crisp 2016: 62).¹³

So, are hunter-gatherers legitimately using *abduction* or illegitimately using *Abduction*? The answer is not at all clear if both do indeed involve “a form of metaphysics” (perhaps different

¹³ According to Richard Schlagel, if we have no epistemic contact with the unobservable – if unobservables cannot be discovered experimentally – then “there is really nothing to influence and guide the construction of theories” (1988: 807; see also Rosen 1994).

degrees of metaphysical speculation). Subscribers to CE need to know how to deal with such cases so that they can employ induction correctly.

The same problem seems to apply to van Fraassen's *metaphysics/Metaphysics* distinction. As mentioned, he does not reject metaphysics *tout court*. He encourages some small amount of metaphysics – a heuristic or pragmatic kind – that can sometimes be *useful* in science. Speculative inferences can suggest how the world *might* be, thereby stimulating productive scientific research (van Fraassen 1991). As with induction, it seems undeniable that we indulge in a bit of metaphysics as we manipulate and navigate the world around us (as in the hunter-gatherer example) (see also Chakravartty 2017, pt. 1). And, this form of metaphysics is often utilised successfully (i.e. it engenders goal-attainment). Van Fraassen recognises as much. But, as before, CEists need to clearly delineate this permitted kind (*metaphysics*) from the taboo kind (*Metaphysics*). What exactly falls into the former versus the latter category? How much metaphysics is an aspiring CEist allowed to indulge in? Once again, it is not clear what the answer should be.

According to Darrell Rowbottom, van Fraassen “owes us an explanation of what sort of metaphysics can be meaningful, and useful, according to one who has the ‘Empirical Stance’” (i.e. one who subscribes to CE_{LATE}) (Rowbottom 2005: 204). In other words, we need to know which entities, claims, and practices fall within the scope of *metaphysics* and which fall within the scope of *Metaphysics*. We need to know which kind of metaphysical language can be warrantably employed and when to do so.

I will not labour the point, but the same criticisms apply *mutatis mutandis* to CE's distinctions between *truth* versus *Truth*, *belief* versus *Belief*, and *explanation* versus *Explanation*. What it takes to hold a *belief* versus a *Belief* and what falls within the scope of *truth* versus *Truth* require explication. It cannot be a matter of degree, otherwise CE is not a form of empiricism. Empiricism is, almost by definition, an inherently dualistic view (I press this point in the next section). Explicating which kinds of truth, belief, and explanation are acceptable versus unacceptable appears impossible if the relevant distinctions are vague. We seem to require two distinct semantic systems that should be, but are not, clearly defined. This is reminiscent of Logical Positivism's difficulty regarding cogently categorising statements into those that fall within the scope of a purely theoretical language versus those that fall within the scope of an observation language (Section 1).

CEists might respond that they are agnostic about *Induction*, *Abduction*, *Metaphysics*, *Truth*, *Belief*, and *Explanation*. They might simply reject my demand for clear delineation. However, recall that van Fraassen talks about *Induction*, *Abduction*, *Metaphysics*, *Truth*, *Belief*, and *Explanation*. He expresses views about them. The CEist's conceptual range must, then, somehow encompass both the small letter and the capital letter versions, even if epistemic warrant is only assigned to the former (see also Musgrave 1985). Van Fraassen treats the terms 'Induction', 'Abduction' etc. as meaningful, even if he is not sure whether they denote anything. Whether CEists reject or are agnostic about *Induction*, *Abduction* etc., they still seem committed to the existence of two separate *semantic* domains. This exemplifies what I am calling CE_{DUAL} – a view whose resemblance to Logical Positivism should be increasingly evident.

4.2. The Demarcation Problem

Problem 2 is closely related to Problem 1. One wonders where exactly the boundary between CE's two semantic domains lies. Where exactly does the one end and the other begin? CEists owe an account of where the demarcation lies that purportedly separates *induction* from *Induction*, *abduction* from *Abduction*, *metaphysics* from *Metaphysics* etc. Likewise, at what point does *belief* give way to *Belief*, *truth* to *Truth*, and *explanation* to *Explanation*? It is not clear how the demarcation can be drawn in a non-arbitrary way. As with the observable/unobservable distinction, tricky cases at the boundary between CE's two domains will surely resist being categorised into one or the other.

Recall the induction involved in weather forecasting (Section 3.1). Van Fraassen accepts that meteorologists employ *induction* during weather forecasting, but denies any rule of *Induction* that might be used in generating precision forecasts (he does not recognise any role for inductive rule/s). As such, there must putatively be a strict demarcation between *induction* and *Induction*. The former is allowed, while the latter is not. Yet, it is not at all clear whether weather forecasting involves *induction* or *Induction*. As far as I can tell, it seems to involve a bit of both. There is something like a rule or set of rules operant in weather forecasting; there is a theory, a formula, or a protocol of sorts; there is some sort of method to meteorology; forecasting is not arbitrary (it is not anarchistic). There may not be a single determinate rule, but weather forecasting is somehow rule-like or rule-bound. It is rule-bound in the sense that

there is a correct and an incorrect way to do it, but it is not *strictly* rule-bound (there is no single unerring method).¹⁴

The obvious alternative is that weather forecasting is rule-bound to different *degrees*. Today's weather forecast is quite precise, but precision drops off as we forecast further into the future. We can place a high degree of trust in today's weather forecast, but then let our trust drop off day by day into the future (see also van der Merwe 2023). There is always some rule or set of rules involved, but they have more traction in the near future than they do in the distant future. The problem is that this option does not appear to be open to CEists. CEists must strictly demarcate between *induction* and *Induction*. As noted in the previous section, empiricists' distinctions must be sharp rather than vague or a matter of degree. Almost by definition, empiricism involves drawing a line that delineates what is epistemically committing from what is not (van Fraassen 1980: 158–159; 2002: 31–46; see also Dicken 2010, ch. 1 and Markie and Folescu 2021). As with Logical Positivism, the demarcation must be qualitative rather than quantitative. A view that advocates for a notion of degrees of epistemic commitment would not be an empiricist view. CEists must somehow draw an epistemic line between *induction* and *Induction* – a line that we must not cross.

The qualitative difference between *induction* and *Induction* in CE is apparent when van Fraassen states, for example, that we should use small letter

‘induction’ to refer to what we all do, which is to form opinions that goes beyond our evidence’, while ‘capital letter, ‘Induction’... is a certain practice of induction subject to rules, norms, or principles of right reason, which can be formulated with some degree or other of precision (van Fraassen in Ladyman 2005: 345; see also van Fraassen 2004: 182).

Simply put, ‘induction’ relates to everyday kinds of “opinions”, while ‘Induction’ relates to formal “rules, norms, or principles”. We can see here that van Fraassen does not consider induction to be the same thing that obtains to different degrees. Rather, *induction* and *Induction* are two separate things that obtain in distinctly different ways. Indeed, despite encouraging *induction*, van Fraassen does “not think that there is such a thing as *Induction*, *in any form*”

¹⁴ See Parker (2014) for more on the philosophy of weather forecasting.

(2007: 343 emphasis added). The problem is that inductive activities like weather forecasting do not seem to fit neatly into either category.

Some have entertained the idea that CE's observable/unobservable distinction may be vague. Bradley Monton and Chad Mohler state that

[i]f, as it is natural to think, 'is observable' is a vague predicate, we should not expect there to be a precise demarcation between what's observable and what's unobservable. Observability can still serve as a useful concept in the philosophy of science, as long as there are clear cases of observability and clear cases of unobservability (2021: np; see also van Fraassen 1980: 15–17, 2008: 110–111).

However, the clear cases are largely philosophically uninteresting. The action is with the tricky cases – with the unclear cases.

Someone, like van Fraassen, who draws a distinction and then uses it to support a general philosophical thesis carries the burden of defending that distinction against sceptical attacks. Critiquing CE's observable/unobservable distinction, Otávio Bueno claims that van Fraassen "hasn't provided an account of what is epistemically special about observation. The closest we get is a discussion of what can be called the *empiricist dogma*" (Bueno 2017: 102 original emphasis). Bueno's point is that CEists have not shown why observability has a special status over unobservability. CEists might also be considered dogmatic when they hold to some distinction but decline to cogently defend it. Appealing to the easy cases seems to be simply sidestepping the issue.

Moreover, CE is a theory replete with distinctions (Section 2) – distinctions that appear foundational to the view (Fine 2001; Cartwright 2007). Despite their appeal to vagueness in the above quote, Monton and Mohler go on to note that CE's account of empirical adequacy rests heavily on the observable/unobservable distinction (see also Bueno 2017). The question is whether CE, *qua* empiricist thesis, can rest on a distinction that is merely a "useful concept". Can CE's weight rest on a distinction that is not joint-carving in any way? Musgrave has similar concerns. He asks as follows: Can the observable/unobservable distinction, which is "admitted to be rough-and-ready, species-specific, and of no ontological significance really bear such an epistemological burden?" (Musgrave 1985: 205; see also Hendry 2001). Paul Churchland thinks that the answer is "No". The observable/unobservable distinction "is only very feebly

principled and is wholly inadequate to bear the great weight that van Fraassen puts on it” (Churchland 1985: 40).

The same objections seem to apply to van Fraassen’s other distinctions. If these distinctions only have pragmatic import, then it is not clear whether they can support CE. Surely, aspiring CEists need to know what kinds of inductions and what kinds of metaphysical practices to trust. And, they need to know what counts as truth and what they are supposed to believe. Saying that is it useful or practical, but not required, to think of things one way rather than another rings somewhat hollow.

An anonymous reviewer objected that I am overstating my case. Drawing distinctions between philosophical approaches using pairs of terms is nothing like dividing the entirety of language into two domains. If so, then the former does not count as any kind of dualism. The reviewer questioned whether expressing conceptual distinctions makes one a dualist. The reviewer has a point. I am, though, not claiming that anyone who makes distinctions is *ipso facto* a dualist. As the reviewer pointed out, this would make us all dualists. Nonetheless, like many of the critics cited in this paper, I think that CE’s case is exceptional in this regard. Van Fraassen does not merely draw several innocuous distinctions while making some or other sundry point. Instead, as argued, the distinctions relate to the key terms in his thesis – terms that reside at the heart of and form the interconnected supporting semantic structure for CE. If these terms are expressed dualistically, then it seems that CE (*qua* general thesis) is rendered semantically dualistic. It is in this sense that CE’s distinctions have broader consequences than the kind of standard distinctions we often make during both everyday and philosophical discourse.

In sum, if some or other distinctions are called on as central support for a general philosophical thesis, then those distinctions should be robustly defended and clearly articulated. Like the Logical Positivists, CEists carry a special burden of making their distinctions non-arbitrary and perspicuous. In both cases, this burden does not appear to have been met. Ideally, each key term in CE’s general language about science (‘induction’, ‘abduction’ etc.) needs two unambiguous ways to be conceptualised and expressed. Reminiscent of Logical Positivism, this would involve either (a) the semantic project of listing the dual meanings of each term or (b) the formal project of somehow linking one semantic system to the other (perhaps by reducing the capital letter version to the small letter version).

Van Fraassen might simply reject these requirements as being too demanding of any philosophical account. Perhaps so, but it is instructive to think about what implications follow

from CE's evident semantic dualism. Articulating just one self-consistent semantics about science is tricky enough. Coherently formulating two that are, not only self-consistent, but also demarcated and conceptually accessible, seems a daunting – perhaps insuperable – task.

Conclusion

I have explicated three versions of CE: CE_{EARLY}, CE_{LATE}, and CE_{DUAL}. The last version is tacit, but identifiable, in van Fraassen's writings. I then argued that, although partly formulated to overcome it, CE has ended up resembling Logical Positivism anyway. CE appears to contain two distinct semantic domains (expressed in *language* and *Language*). Like Logical Positivism's two semantic domains (expressed in a theoretical language and an observation language), these require clear delineation and explication. CEists must account for (1) the scope of CE's two semantic domains and (2) the demarcation between CE's two semantic domains. CEists have not done this, and it is questionable whether it is actually possible.

That said, Logical Positivism and CE are not identical. CE contains a dualism between a pragmatic *language* and a theoretical *Language*, while Logical Positivism contains a dualism between an observation language and a theoretical language. Logical Positivism draws a distinction between meaningful and meaningless languages, while CE draws a distinction between two meaningful yet semantically distinct languages. Nonetheless, it should be apparent that CE (or CE_{DUAL}) and Logical Positivism share salient commonalities.

Quine (1951) famously argued that observation is theory-laden.¹⁵ Most accept that this renders Logical Positivism's kind of dualism untenable. Interestingly, van Fraassen salutes “pragmatists” and “non-reductionists” (like Quine), and considers himself in the same school of holistic thought (1994: 130; 2019: 15–16). He claims that no distinction can be drawn “between the theoretical and the non-theoretical” (van Fraassen 1994: 130). However, if my argument is on point, then CE conceals a kind of dualism that is discordant with pragmatistic holism. CE's dualism is between theory and pragmatics, rather than between theory and observation, but it is still a distinction between the “theoretical and the non-theoretical”. CE appears to have come full circle to the very doctrine van Fraassen laboured to leave behind.

As a way forward, I suggest that CEists should either:

¹⁵ As Putnam puts it, the very “inputs upon which our knowledge is based are conceptually contaminated” (1981: 54; see also van der Merwe 2023, forthcoming-a).

- a. Forego CE's various distinctions. The result is, however, unlikely to resemble empiricism anymore. Plausibly, one cannot formulate a 'real' version of empiricism without falling back on dualism in some way.
- b. Demonstrate that CE's semantic dualism is robust and tenable. It is, however, not clear how this could be done given the above arguments.

Either way, it appears that CE requires revision. I leave it to proponents of the view to work out how to do so.

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