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INTENTIONALITY VERSUS CONSTRUCTIVE EMPIRICISM

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SUMMARY

By focussing on the intentional character of observation in science, we argue that Constructive Empiricism – B.C. van Fraassen's much debated and explored view of science – is inconsistent. We then argue there are at least two ways out of our Inconsistency Argument, one of which is more easily to square with Constructive Empiricism than the other.

1. The Inconsistency Argument

We shall argue that there is a tension if not an inconsistency between B.C. van Fraassen's well-known view of science, *Constructive Empiricism* (CE)[1], and his less well-known view on *intentionality*. In this opening Section, we collect a number of premises (mostly from CE) and expound an argument in favour of the inconsistency of CE that will set the stage of this paper; then we provide an outline of this paper.

The distinction between *observable* and *unobservable* concrete objects (events, processes, facts) is one of the conceptual pillars of CE. For one thing, the *doxastic policy* of CE to believe only those accepted propositions of science that are about observables only, and to remain neutral with regard to all other accepted propositions, relies on the mentioned distinction. For another thing, the analysis of *empirical adequacy*, which is the epistemic aim of science according to CE,

crucially involves the distinction. So here is the first premise of our argument, which is a definition:

> (Obs) *Characterisation of Observability.* A concrete object *X* (event, process) being *observable* to us, human beings of sound mind and eye-sight, means that there are circumstances such that if we were in those circumstances, we would *observe X.*[2]

Characterisation (Obs) makes observability an anthropocentric, dispositional, extrinsic, somewhat vague and yet a perfectly objective concept, just like portability and edibility are perfectly objective concepts which are also anthropocentric, dispositional, extrinsic and somewhat vague. (Obs) also governs the use of the word 'observable' in common English and is therefore constitutive for the meaning of the word 'observable', as what one expects from a definition of a word in use.

The second premise of our argument we call

> (Nat) *The Naturalisation Thesis of Observability.* The observability of a concrete object *X* is an extrinsic property of *X*, which relates the observed to the observer. The observability of *X* is wholly determined by: (i) the physiological and physical properties of our sense organs (our *capacity* to observe things, like our capacity to move our limbs, to digest food, to breathe air, to hear sounds, and what have you); (ii) the relevant physical properties of *X* (size and reflectance of electro-magnetic radiation), and (iii) by the physical interaction between *X* and our sense organs. The extension of observability is a matter of scientific inquiry, not of philosophical analysis, to be conducted in the laboratory and outdoors rather than behind the desk or in the comfy chair. Succinctly, observability is a concept that can be *naturalised*, it can be characterised in terms of *physical* concepts only.[3]

Typically the concepts of the natural sciences (physics, chemistry, astronomy, geology, physiology, etc.) are or can be *naturalised* (i.e., they can be reduced to physical concepts), whereas most of the concepts of psychology and history, say,

turn out to resist naturalisation and arguably cannot be naturalised at all. Psychological (or mental) concepts usually are straightforwardly *intentional* (thinking, believing, dreaming, etc.) or figure in descriptions of *intentional behaviour* (kissing, writing, hating, loving, singing, attending, etc.). Concepts that are or can be naturalised are also called *physicalist* concepts.

Van Fraassen has advanced precisely such anti-reductionist claims about human agency and the intentional idiom generally when defending CE. This gives us the third premise.

> (AR) *Anti-Reductionism.* Descriptions of human behaviour as intentional actions, as manifestations of human agency, cannot be reduced to, or faithfully translated in, physicalist vocabulary. "CE would be saddled with a type of behaviourism which I am not able to take at all seriously", says Van Fraassen; and elsewhere: "the body and its physical interactions are the subject of physics and physiology, not so my actions".[4] In brief, intentional concepts are not physicalist; they cannot be naturalised.

Next we consider the fourth premise; it is not a thesis typical for CE but a conceptual truth; it provides a sufficient condition for calling a concept 'intentional':

> (Int) If a predicate *F* describes a manifestation of human agency, of goal-oriented behaviour, then *F* expresses an intentional concept.

In general, descriptions of intentional behaviour, of the form 'person *p* is intentionally *F*-ing', or '*p* is *F*-ing with the intention to *G*', make the concept expressed by predicate *F* intentional. Agency and intentionality are two sides of the same coin: an event involving a person qualifies as an *action*, as a manifestation of human agency, iff it has at least one intentional description.[5] Giovanni Cassini was observing a 'red permanent spot' on the face of the planet Jupiter; Jan Swammerdan was observing 'bloodless little animals' under the microscope; Christiaan Huygens was observing the rings of the planet Saturn; Charles Darwin was observing finches on the Galapagos Islands; Pieter Zeeman was observing the splitting of spectral lines in a spectrometer; *et cetera ad libitum.* Scientific

observers pay consciously visual attention to the objects they observe. These examples testify to the following, fifth premise:

> (AgO) *Agency Thesis of Observation*. The concept of observation expresses a manifestation of human Agency, of goal-oriented human behaviour.

We now have an explosive mixture of five statements, as the following argument shows.

1. Object *X* being *observable* to us means that there are circumstances such that if we were in those circumstances, we would *observe X* (Obs).
2. Observability is a physicalist concept (Obs, Nat).
3. If *F* is an intentional concept, then *F* is not physicalist (AR).
4. If observability is an intentional concept, then it is not physicalist (from 3 by instantiation).
5. Observabililty is not an intentional concept (from 2 and 4).
6. If a concept *F* expresses a manifestation of human agency, of goal-oriented behaviour, then *F* is an intentional concept (Int).
7. If the concept of observation expresses a manifestation of human agency, of goal-oriented behaviour, then observation is an intentional concept (from 6 by instantiation).
8. The concept of observation expresses a manifestation of human agency, of goal-oriented human behaviour (AgO).
9. Observation is an intentional concept (from 7 and 8).
10. If observation is intentional, then also observability (from 1).
11. Observability is an intentional concept (from 9 and 10).
12. Contradiction (from 5 and 11).

Call this the *The Inconsistency Argument.* Statements (Obs), (Nat), (AR), (Int) and (AgO) are jointly inconsistent. So granted the innocuous premises (Obs), (Int) and (AgO), *if* (Nat) and (AR) are indeed part of CE, *then* CE is inconsistent by the Inconsistency Argument, and faces the dilemma to renounce (Nat) or (AR). This much is certain.

Is CE committed to the premises of the Inconsistency Argument? Since premises (Obs), (Nat) and (AR) contain literal quotations of Van Fraassen (and are not quoted out of context by us, we claim), they are part and parcel of CE. Premise (Int) is a conceptual truth, providing a sufficient condition for when to call a concept 'intentional'; and similarly for (AgO). The fact that certain parts of the world ('mental events', such as having thoughts and feelings, 'mental processes', such as dreaming and thinking, and, most importantly for us, manifestations of human agency, of intentional behaviour) cannot be understood but in a framework of viewing agents as persons, as being "embedded in the space of reasons"[6], leads us directly to the conclusion that observation is an intentional concept (step 9 in the Inconsistency Argument). Hence CE is in trouble.

In the next two Sections, we shall mount a general argument to the effect that any philosophical view of science, CE notably included, must adhere to *the intentionality of observation* in order to make sense of science – which is the aim of CE. Our argument will consist mainly in a brief analysis of the process of observation in science (Sections 2, 3). This will strengthen our conclusion that CE is in trouble, because it strengthens premise (AgO) of the Inconsistency Argument. We then explore two exit strategies for CE (Section 4).

2. The Process of Observation

We discern the following Events in the visual process of observation (we do this also to regiment our language to a certain but necessary extent; cf. Dretske, 1969). An observation will be one of these events [E3] and will come in two kinds.

[E1] *Registration* (visually registering object *X*): the event of forming of an image of object *X*, on the retina of the eyes when human beings register *X*, on celluloid when a now old-fashioned camera registers *X*, on a display when a digital camera registers *X*, etc.[7]

[E2] *Object-seeing* (seeing object *X*): the event of becoming aware of object *X* by whatever it is that registers the image of *X* [E1]. Cameras cannot object-see, only

living beings can object-see, such as human beings and animal beings; 'having a mind' or 'the capacity to become aware of' is necessary for object-seeing. Subject *S* object-seeing *X* results in (or is) having a mental state that is intentional and (almost by definition) perceptual.

Becoming aware of something arguably is a matter of degree. When driving your car and conversing intensely with your passenger, you are less aware of the scenery than when you are driving alone and are paying attention to the road, or when the passenger and you are silently admiring the scenery. A person may not even be aware at all of something he sees — but later, when questioned, or when under hypnosis, it may turn out he did see something 'unconsciously' because now he reports it. In contrast, cameras never are aware of what they are recording: it doesn't even make sense to say this; they can only register [E1].

[E3] *Observation* (observing *X*, looking at *X*): the event of looking at *X*, paying visual attention to *X* with some particular purpose in mind. We speak of *action-observation* (short for: observation with the intention to act) when the purpose is to perform a particular *action* that involves *X* [E3.a]. We speak of *doxastic-oriented observation* when the purpose is to acquire beliefs about *X* [E3.b]. Animals cannot observe doxastically [E3.b], only beings that have mastered a language have this capacity, notably human beings, when we take this capacity to be necessary for being in a mental state of *belief*; but animals arguably can action-observe [E3.a], such as predators observing prey with the purpose to catch, kill and eat it. Observation also results in a mental state that is intentional (with intentional object *X*) and is perceptual.

[E4] *Doxastic seeing* (seeing *that* φ, for example seeing *that X* is a *G*): the event of observing object *X* and acquiring the ability to report a judgement about *X*, like 'That was a *G*', in particular the ability to answer the question '*What* did you see?' Again, animals cannot see doxastically, only beings that have mastered a language have this capacity.[8] Subject *S* doxastic seeing that φ results in *S* having a mental state that is intentional (with φ as intentional object) and is propositional (because its intentional object, φ, is a proposition).

Logically speaking, both observation [E3] and doxastic seeing [E4] presuppse object-seeing [E2], which in turn presupposes visual registration [E1], but the converse presupposition relations fail. Observing *X* doxastically [E3.b] typically results in the acquisition of beliefs about *X*, which one then can report; in other words, *succesfully* observing *X* doxastically [E3.b] typically leads to doxastic seeing-that [E4]. But not the other way around: many of our doxastic beliefs about observables we have acquired without having been actively engaged in observation [E3.b]. When Johnny says to his colleague Brad that he happened to see his wife Angelina yesterday, Johnny has *seen* her doxastically [E4]; it does not imply that Johnny has been *observing* Angelina [E3], with some purpose in mind — if Johnny had said to Brad "I have been observing your wife", Brad presumably would have responded suspiciously. We point out that the theory-*ladenness* of observation only makes sense when by 'observation' here is meant [E3] or [E4].

In the light of our disctinctions, there is a danger of committing the fallacy of equivocation with respect to 'observation' in (AgO). For do we mean that object-observation [E3] or that doxastic seeing [E4] is a manifestation of human agency? We mean both. So let us be explicit about this and refine (AgO):

(AgO∗) *Refined Agency Thesis of Obsrvation.* The concepts of action-observation [E3.a], doxastic-oriented observation [E3.b] and doxastic seeing-that [E4] are manifestations of human agency, of goal-oriented behaviour.

The Inconsistency Argument remains the same when (AgO∗) replaces (AgO) in steps 7 and 8.

In the next Section, we elaborate on observation [E3] and doxastic seeing [E4] by arguing that both are indispensable for science – registration [E1] and object-seeing [E2] are relevant for science only in that they are necessary conditions for [E3] and [E4].

3. Observation in Science

The purpose of observation in science is quite obvious: to acquire beliefs relevant to the observer's scientific purposes and interests, such as the hypothesis he is investigating, the instrument he is testing, the theory he is developing or the model he is constructing. One can, of course, unexpectedly come to observe something and thereby come to believe something (like Johnny accidentally seeing Brad's wife Angelina in the previous Section), something which also happens in science, like Alexander Fleming seeing unexpected bacterial growth on a culture dish that had been invaded by a mold whose spore must have drifted in through an open window of the laboratory; like Hans Christian Orsted happened to see a compas needle turn in the vincinity of a cupper wire through which an electric current runs; like Luigi Galvani, who was investigating the nerves in frog legs, and had threaded some legs on copper wire hanging from a balcony in such a way that a puff of wind caused the legs to touch the iron railing, spotted that the legs jerked violently when a spark snapped (and, for a moment, a closed circuit arose); like Wilhelm Röntgen, who got his hand between a discharge tube and a screen coated with a barium compound, and saw the bones of his own hand through the shadow of his skin; like Robert Wilson and Arno Penzias stumbling upon an inexplicable signal that turned out to be the after-glow of the Big Bang. This shows that doxastic seeing-that [E4], like stepping on someone's toe to mention a more mundane example, is not always an intentional action. Not *every* doxastic seeing-that [E4] is an intended doxastic observation [E3.b]. Both such acts are however indispensible for science. Any philosophical view of science, e.g. CE, should take heed of them.

This is not to say that objective facts, which can be described using physicalist terminology, do not matter for observation. On the contrary. For example, it would be irrational for Scarlett to try to observe *X* if she believes the circumstances do not allow her attempt to succeed, or if there are no such things as *X*'s. Trying to observe the Morning Star on a cloudy morning doesn't make sense, and trying to observe flying buildings in the sky doesn't make sense either. Van Fraassen's characterisation of what is observable clearly hints at this feature: "*there are circumstances* such that if we were in those circumstances, then we would observe

X"[9]. In science we constantly rearrange our environment in order to create favourable circumstances for the observation of whatever we intend or hope to observe. All these circumstances can be described without using intentional idiom but using only physicalist concepts.

In full generality, the general action-theoretic principle that for any action-type *F*, the conditions on an action token's being an *F*-ing extend beyond its being performed out of an intention to *F*, straightforwardly applies to the activities of observation. The intention to *F* could not be successfully executed if the enabling circumstances were unfavourable. This structural feature of *every* intentional action – their successful execution being dependent on further, non-intentional facts – is inherited by all acts of observing.

Both [E1] registration and [E2] object-seeing can be reconstructed as *anthropocentric* concepts in the sense that both involve visual-registration-by-the-two-light-detectors-above-our-noses, that is, *human eyes*. Nevertheless, unlike observing *X* with the intention of acquiring beliefs about *X* [E3], and unlike observing *X* and acquiring beliefs about *X* [E4], they are not *intentional activities*. Visual registration and [E1] object-seeing [E2] are necessary for the possibility of science because they are necessary conditions for observation [E3], but they are far from sufficient: nothing of scientific interest can be achieved with only these two types of events [E1, E2]. Observation in science has a purpose.

This explains why the inference from 'Hypatia observes this parchment' and 'this parchment is a bunch of molecules' to 'Hypatia observes a bunch of molecules' is valid under a physicalist reading, but invalid when we add to the first description that it was, under that description, intentional – *the parchment* was the intended object of attention of Hypatia, not a bunch of molecules for the concept of a molecule was alien to Hypatia.[10] The alleged physicalist character of 'Hypatia observes this parchment' can therefore not be exploited as an argument *for* the observability of unobservables, e.g. molecules (this is precisely Van Fraassen's own point in 1980: 214, objection 2). The argument is blocked because 'Hypatia observes this page' is intentional: she payed attention to *the parchment* (*A*) when observing it, not to a

particular bunch of molecules (*B*) — in spite of the fact that *A* = *B*. Similarly, when private eye Mike is observing John (*C*), he is not intentionally observing Angelina's father (*D*) , in spite of the fact that *C* = *D*, because Mike may not know that his target is Angelina's father.

In general, if *p* has the intention to observe *X*, then *p* does not necessarily have the intention to observe *Y*, even if *X* = *Y*. In short, observation, unlike registration [E1], characterises an intentional activity with the purpose to acquire beliefs about *X* [E3]. The acts of observation [E3] and doxastic seeing [E4] are instances of goal-oriented human behaviour and this makes these concepts intentional (AgO*).

Our distinction between doxastic observation [E3.b] and doxastic seeing-that [E4] preserves the independence of observation from the more complex capacity to produce *observation reports* about the things observed. Scarlett, a member of our epistemic community, doxastically observes *X* and doxastically sees *that F*(*X*) – that is, she visually attends to *X*, reports to another member, Penelope, what she has observed, who in turn sees Scarlett's doxastic observations as relevant to the theory that she (Penelope) happens to hold. Doxastically seeing *that F*(*X*) by Scarlett was a result of her doxastically observing *X* and therefore intentional, but it did not require her to accept or reject a scientific theory according to which *F*(*X*). So Scarlett's act of doxastically observing *X* [E3] and doxastically seeing *that F*(*X*) [E4] --- communicated to Penelope in terms that did not involve acceptance of the theory that Scarlett herself happens to hold --- had an impact on the theory that Penelope holds. Communication between Scarlett and Penelope creates a situation in which *it was doxastically seen that F*(*X*) *by Penelope* [E4], although Penelope herself did not *doxastically observe X* [E3.b]. Such 'agent-less' doxastic seeing is more the rule than the exception in science. Furthermore, it need not be the same person that is registering *X*, object-seeing *X* and doxastic seeing *that F*(*X*). Science is a collective activity.

To summarise, our sketch above of the role of the mentioned observation activities in scientific inquiry makes the case for the indispensability of doxastic observation [E3.b] and doxastic observation [E4] as part of scientific activity in general, so that

they are indispensable too for making sense of science. The intentional character of the doxastic observation [E3] and doxastic seeing [E4] makes these concepts intentional. This secures premise (AgO, AgO*) of the Inconsistency Argument (see Section 1). We therefore re-inforce our conclusion at the end of Section 1: CE is in trouble.

4. Exit Strategies

Is there a way out of the Inconsistency Argument for CE? We can think of two exit strategies.

(**A**) The most obvious way is to weaken the controversial Naturalisation Thesis of Observability (Nat) to claiming that only our capacity *to register* objects can be naturalised, resulting in the hardly controversial — and rather insipid — *Naturalisation Thesis of Registrability*. The relevance of this thesis for (philosophy of) science resides in the fact that visual registration [E1] is necessary for both doxastic observation [E3] and doxastic seeing-that [E4]. Then CE can agree with, if not underline everything we have, in the previous Sections, brought to bear on observation in science. In CE, the role of the observable/unobservable-*to-us* distinction would, then, be partly played by the registrable/unregistrable-*to-us* distinction, which is equally anthropocentric, dispositional, somewhat vague and yet perfectly objective.

Perhaps registrability *is* what Van Fraassen has meant all along![11] He merely expressed this concept by the word 'observability'. The Characterisation of Observability (Obs) then is not an *intensional definition* of observability, with *definiens* and *definiendum* by definition having the same meaning, but an *extensional criterion* of 'observability', or, even better, an intensional definition of *registrability*: concrete object *X* is registrable by us iff there are circumstances such that we would register *X* if we were in those circumstances. Then step 10 in the Inconsistency Argument (Section 1) fails: observation is intentional whilst registrability is not; and even when 'registrable by us' and 'observable by us' are co-extensive, step 10 remains illicit and the Inconsistency Argument still falls apart.

In fact, the entire Inconsistency Argument against CE collapses because it commits the fallacy of equivocation with regard to 'observation'. *Unfortunate if not misleading choice of words, that* is what our criticism of CE in this, for us, worst case scenario would boil down to. Yet even if this scenario were to transpire, we would have provided a clarification of the issue of observability in CE which helps one, for instance, to understand the opposition that Van Fraassen's view on observability has provoked over the past decades: critics thought of observation as of doxastic observation [E3] or doxastic-seeing [E4], or both, for the simple reason that these intentional concepts are indispensable in order to make sense of science (the aim of CE), and they thought Van Fraassen meant *that*, whilst camera-like visual registration [E1] was all that he meant in the first place when talking about observabililty – to repeat, *if* this is what he meant all along.[12] Perhaps the Van Fraassen of *The Scientific Image* was not clear, and perhaps even somewhat confused about the finer distinctions in the process of observation that we have drawn [E1—E4], in which case our criticism is stronger than merely a charge of unfortunate choice of words; for then we charge Van Fraassen with being conceptually confused.

Specifically, *observability* is not *observation*: the presence of observable (registrable) objects is necessary for observation but not sufficient: what must be added is the observer's specific intentional action of paying visual attention for the purpose of acquiring beliefs about the observable object of visual attention [E3.b] and his capacity to expresses those beliefs in language when successful [E4]. So when Van Fraassen compares humans with pieces of measurement apparatus when it comes to observation[13], this comparison ignores the intentional character of obervation in science [E3, E4]. When comparing humans to pieces of measurement apparatus, we are speaking about registrability and only about registrability, not about observation.

(**B**) The second way out is to reconsider the non-reducibility of intentional concepts to physicalist ones and renounce Anti-Reductionism (AR), and then perhaps seeking refuge among the ranks of the Neuromaniacs (Churchland *cs*). Such a re-consideration is not ours to indulge in; it is up to the creator of CE.

At this point there is nothing else to do for us than to wait eagerly for Van Fraassen's decision which exit strategy he chooses, (**A**) or (**B**), or perhaps some unconceived alternative.

Whatever way out will be the chosen one, (**A**) or (**B**), or perhaps yet another one, we claim to have provided a clarification, if not disentangled a conceptual confusion of issues central to CE, namely the issues of observation, observability and registrability. The nature of our clarification will depend on which exit strategy will be the chosen one, and we predict that (**A**) will be the way to go for CE. Finally, we also claim that we have exposed a lacuna in CE that has been overlooked: an account of full-blooded intentional observation in science [E2, E3, E4] – of which we have sketched only the barest of outlines in the previous two Sections. A lacuna with regard to *observation* and *observability* is rather surprising for today's most prominent *empiricist*. Yet this is what we must conclude.

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End Notes

[1] See Fraassen (1980), (1989), (2002); books devoted to CE: Hooker & Churchland (1985), Monton (2007).

[2] Fraassen (1980: 17–19), Monton & Fraassen (2003: 409), Muller (2005: 61–83); Muller & Fraassen (2008).

[3] See Fraassen (1980: 17), (1992: 14); Monton & Fraassen (2003: 409).

[4] Fraassen (1994: 183), (2004: 469).

[5] See Anscombe (1957, 37–38).

[6] Fraassen (2004: 468).

[7] Cf. Dretske's 'non-epistemic seeing' (1969: 18–20).

[8] See Dretske (1969: 78–79).

[9] Monton & Van Fraassen (2003: 409), our italics; see further Muller (2005: 61–83) for a specification of general circumstances of observability.

[10] Cf. Miller (1987: 360).

[11] Dretske also uses 'observability' to mean 'registrability' (1969: 203).

[12] We point out that Muller's (2005) physicalist characterisation of observability is, then, better seen as characterising and even defining *registerability-by-us*.

[13] Fraassen (1980: 17–19).