

Bas Van Fraassen

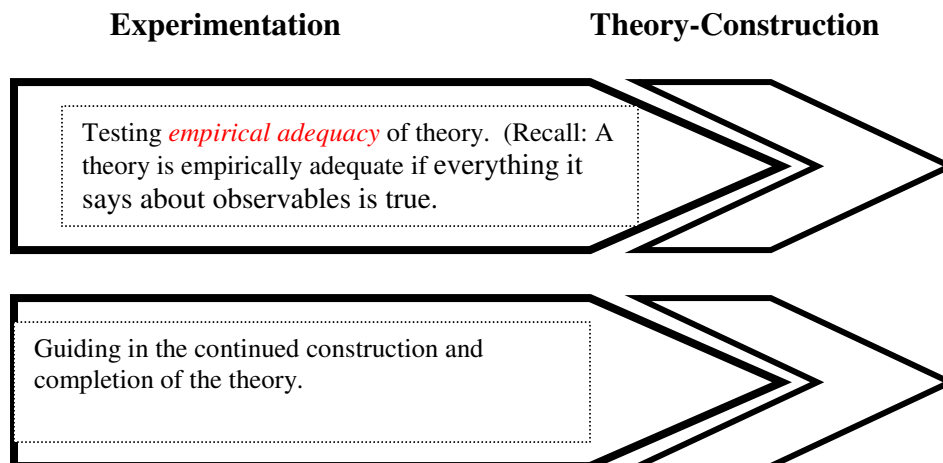
“The **real importance of theory**, to the working scientist, is that **it is a factor in experimental design**. This is quite the reverse of the picture drawn by traditional philosophy of science. In that picture, **everything is subordinate to the aim of knowing the structure of the world**. The central activity is therefore the construction of theories that describe this structure...Whatever the core of truth in that picture (and surely it has some truth to it) it contrasts sharply with the activity Kuhn has termed ‘normal science’¹, and even with much of what is revolutionary. **Scientists aim to discover facts about the world—about the regularities in the observable parts of the world. To discover these, one needs experimentation as opposed to reason and reflection. But those regularities are exceedingly subtle and complex, so experimental design is exceedingly difficult. Hence the need for the construction of theories, and for appeal to previously constructed theories to guide the experimental inquiry...**”

*Bas Van Fraassen*² (1980), 73-74.

...Van Fraassen cites Oscar Wilde³:

“It is only shallow people who do not judge by appearances. The true mystery of the world is the visible, not the invisible.”

The Essentials of Constructive Empiricism



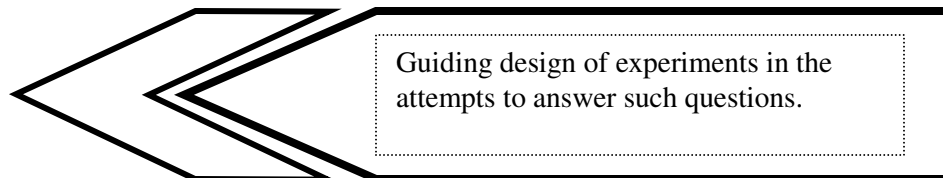
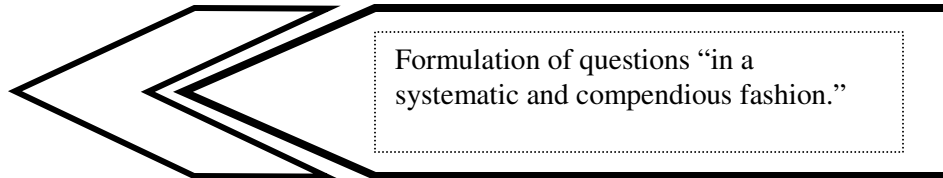
¹ Recall Kuhn’s instrumentalist leanings, namely that the aim of scientific paradigms serve as a framework to guide and foster puzzle-solving activity, of which theories are but ‘instruments’ thereon.

² *The Scientific Image*. Oxford: Clarendon Press.

³ From “The Picture of Dorian Grey,” (cited on p. 204, in *The Scientific Image*.)

Experimentation

Theory-Construction



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- Bas Van Fraassen’s “Constructive Empiricism”

*“Science aims to give us theories that are empirically adequate; and acceptance of a theory involves as belief only that it is **empirically adequate**.⁴”*

-Bas Van Fraassen, CC1998 (1069)

“[A] theory is empirically adequate **exactly** if what it says about observable things and events in the world, **is true**...such a theory has at least **one model** that all actual phenomena fit inside...**all the phenomena; these are not exhausted by those actually observed**, nor even by those observed at some time, whether past, present, or future.” (ibid.)

⁴ Recall how the term was used before in Kuhn, Longino, etc. I defined the term during **Lecture IX**, loosely in terms of “saving the phenomena.” That is to say, a theory tells a ‘story’ in such a way that above all else it must be satisfied by empirical constraints (whether in the form of simple, passive, ‘field’ observations or complex experimental data, achieved through somewhat artificial means. By and large, this is the notion that Kuhn and others you have read think of this notion. **Van Fraassen, on the other hand, has a somewhat contrived and perhaps contentious definition thereon, for reasons we’ll discuss shortly.**

- **Note 1:** As footnote 4 here alludes to, this is a highly contrived and somewhat artificial notion of “empirical adequacy.” (The problem-terms are highlighted in red boldface.) For starters, one sees this notion of “exactly” (read “literally”). (recall Plato’s paradox of representation, as discussed in the opening remarks in **Lecture IX**. Another term “is true.” Yet BVF advertises himself as an anti-realist! His realists like Musgrave pick up on his notion and argue that “van Fraassen [is] firmly in the realist camp as far as the *interpretation*. His antirealism proceeds entirely on the *epistemological or methodological* level.” (Musgrave, **CC1998**, 1089)
- **Note 2:** By ‘model’ BVF means something rather artificial, stemming from logic (recall **Lecture II**.) Logicians refer to models as structures/sets of sentences/‘possible world(s)’ (or situations) in which a set of axioms or assumptions hold true. (For example, a triangle sitting on an infinitely flat 2D plane serves as a *model* for Euclidean geometry—Euclid’s axioms are satisfied in this instance. Whereas a triangle sitting on a curved, let’s say spherical, surface is *not* a model for Euclidean planar geometry. For instance, the sum of its internal angles $> 180^\circ$.) Hence his somewhat construed notion of a ‘model’ through which *all* phenomena ‘fit inside’ (hold *true*) leads him to claim that the statements: “‘there is a mouse in the wainscoting’ and ‘All observable phenomena are as if there is a mouse in the wainscoting’ are totally equivalent; each implies each other.” (**CC1998**, 1077) (Another issue realists like Musgrave take issue with) Recall the thought experiment involving the class of empirically equivalent Newtonian theories, in which the center of mass of the Universe has a distribution of velocities⁵: “Here it might seem that one of the empirically equivalent Newtonian theories had been confirmed and the rest refuted.” (1092)

BVF holds on to the notion of ‘literal’ due to general issues stemming from realism⁶ viz. philosophy of language, meaning (recall his definition of realism obtained from Hilary Putnam & Michael Dummett⁷:

“Realism I characterize as the belief that statements of...[a] class possess an objective truth-value, independently of our means of knowing it...true or false in virtue of a reality existing independently of us. The anti-realist opposes to this the view that statements of the...class are to be understood only by reference to the sort of thing which we count as evidence for a statement of that class.” (Dummett, **CC1998**, 1082)

⁵ For you physicists with concerns about General Relativistic covariance, keep in mind that Musgrave is referring to *Newtonian* theories

⁶ Recall **Lecture IX**, the issues of truth, meaning, and representation as evinced in the issue of the realism versus anti-realism question certainly transcends this question as it appears in the philosophy of science.

⁷ “A realist (with respect to a given theory or discourse) holds that (1) the sentences of that theory are true or false; and (2) ...what makes them true or false is something external—that is to say, it is not (in general) our sense data, actual or potential, or the structure of our minds, or our language, etc.” (1066) **Recall the metaphysical notion of “[T]ruth” (Lecture IX) this connotes.**

- **In short, (contra anti-realists like Kuhn, Longino, etc., as well as realists like Kitcher) BVF assents to a “correspondence theory of truth.”⁸**

“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. This is the correct statement of scientific realism.” (1066)

- **BVF hedges his epistemics by arguing that the aim of science of empirical adequacy, (regardless of individual aims of practicing scientists). Epistemically, this presupposes the scientist accept such theor(ies) (distinguished from mere belief):**

[Acceptance] “relates not at all to our epistemic attitudes toward theories...but only to the correct understanding of **what a theory says.**” (1069)

“Acceptance of theories (whether full, tentative, to a degree, etc.) is a phenomenon of scientific activity which clearly **involves more than belief...if a scientist accepts a theory, [s/]he thereby involves [her/]himself in a certain sort of research programme.**” (1069)

“[T]o accept [therefore] a theory is (for us) to believe that that it is empirically adequate—what the theory says *about what is observable* (by us) is true.” (1074)

- **BVF accuses Grover Maxwell of an equivocation (Recall Maxwell’s somewhat metaphysically and semantically naïve argument that theoretical/observational distinction of terms are theory dependent.)**

“[E]xpressions as ‘theoretical entity’ and ‘observational-theoretical dichotomy’ are...examples of **category mistakes**. Terms or concepts are theoretical (introduced or adapted for the purposes of theory construction); **entities** are observable or unobservable.” (1071)

“The term ‘observable’ classifies putative entities (entities which may or may not exist). A flying horse is observable—that is why we are so sure that there aren’t any—the number seventeen is not.” (1071-1072)

⁸ Recall **Lecture I**: according to correspondence theorists, a statement *p* is **true** if and only if it *corresponds* to an objective state of affairs that the statement refers to. (Correspondence theorists view statements/propositions as ‘hooking up’ to the world viz. this special case of reference, i.e. the relation of correspondence. For example, “th[at] cat is on the mat” if and only if the statement corresponds to a state of a affairs dealing with concepts of a particular cat and a particular mat, and its spatial relations.” (The term **concept** is important here: Recall, for example, BVF’s distinction between **observing verusu observing that**. (1072)

Hence Maxwell's puzzle reduces to the unproblematic notion that "observable" is a *vague predicate*.

"[P]redicates in a natural language are almost all vague, and there is [certainly] no problem in their use; only in formulating the logic that governs them." (1073)

- **Contra realists (like Sellers) who adopt a notion of 'explanatory power'**

Nominalist/realists (brute regularities, confusion of metaphysical contingency with an epistemic one) "[I]t seems to me...illegitimate to equate..a lucky accident [a metaphysical notion] ...with having no explanation [an epistemic/methodological notion]" (1079)

"Sellers recognized very well that a demand for hidden variables would run counter to the main opinions current in...physics." (1081)

Musgrave

- **Main objection: Fraassen's equivocation of truth/ empirical adequacy**
- **Risks/penalties for realism**