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Chapter 4

Constructive Empiricism

1. Introduction

In his 1980 *The Scientific Image*, Bas van Fraassen proposed a version of empiricism called "constructive empiricism." It appeared at first to be a sober response and correction to the excesses of earlier empiricist accounts. It dispensed with the logical positivists' emphasis on formal logic and with their focus on meaning. Core statements of a scientific theory were to be understood literally, even if they were not to be believed. The monograph entered the literature just as the doctrine of scientific realism was gaining widespread acceptance. Van Fraassen's account became an irresistible target for the new generation of scientific realists; and the interest in constructive empiricism persisted for decades. One index of its prominence is that there were several volumes of critical essays written by leading philosophers of science on constructive empiricism. Van Fraassen himself included his lengthy replies in two of these volumes, in his van Fraassen (1985, 2007).[1]

The monograph, *The Scientific Image*, appeared to be the sober corrective just sketched. There were, however, curious elements in the view. It urged us to accept only the empirical adequacy of scientific theories. But it gave no guide as to which theories merited this acceptance and which did not. It was if the choice was just voluntary. The view was disconcertingly anthropocentric. It singled out for acceptance just what we humans could observe, unaided by any instrumentation. Critics pressed van Fraassen to concede that acceptance could be extended even if only slightly by our most secure of instrumental aids. Van Fraassen proved dogged in his resistance to even modest extensions. These were oblique indications of an extremism underlying the view.

[1] The volume of writing on van Fraassen's constructive empiricism is so great that I have abandoned hope of surveying it and have limited the exposition here to a recounting of van Fraassen's own narratives.

A study of the original monograph and van Fraassen's later elaborations shows that a reappraisal is needed. What lies behind the view is an absolute skepticism about inductive inference. This skepticism was initially tacit and barely visible. Recognizing it is essential to understanding the larger project. Once it is seen, the project of constructive empiricism becomes clear. It is to give some account of science while *denying* that we can learn inductively from experience. Here the view is more extreme than the logical positivism of Carnap or the logical empiricism of Reichenbach. Both gave learning from experience inductively a central role. It is more extreme than Popper's anti-inductivism, since Popper offered his method of conjectures and refutations as a surrogate for inductive inference. Since empirical science is routinely conceived as our premier project for learning about the world from experience, it is hard to see how such a skeptical project can succeed.

That this inductive skepticism lies behind the original project was not initially apparent to van Fraassen himself. He reported that he only later came to realize the depth of his skepticism. In correcting what he later labeled as "My Mistake," he wrote (2007, p. 367):

> … a slogan as 'Experience is our only source of information'—or anything of that ilk—makes no literal sense, and cannot be the core of an empiricist position.

He could then turn to the curious boast of his (2002) characterization of empiricism: "experience is not mentioned at all."

If the author of the monograph of 1980 did not then appreciate its foundation in skepticism, then it is no wonder that readers like me have found the view opaque. It seems to be curiously dogmatic over what should otherwise be unimportant points, or, better said, points that would matter only to extreme skeptics. We have already seen that Sextus Empiricus was, contrary to his name, no empiricist in the philosophical sense by any definition of the term used over the millennia. He was a skeptic. We now see that van Fraassen's "constructive empiricism" is no empiricism at all, as the empiricist doctrine came to be understood in the twentieth century. A view that denies that we can learn from experience is not empiricist in this more recent sense, but deeply skeptical.

The sections that follow recount the thesis of the original monograph, its basic elements and the gradual emergence of the skepticism beneath them.

2 Constructive Empiricism of *The Scientific Image*

Constructive empiricism depends upon a division between what is observable and what is unobservable according to a theory of interest. A later example conveys the distinction well. It is, to quote the first section heading in van Fraassen (2001), "Light is not observable." The case of the rainbow indicates what van Fraassen had in mind. What we all communally observe is a spectrum of colors arrayed in an arch. That is the observable. We do not believe, however, that there is a real material thing that lies behind what we observe. There is, literally understood, no colored arch in the sky. We should, he urged, treat in the same way observations with optical instruments such as microscopes and telescopes; and indeed all observations engendered by instrumentation. We should not be lured into reifying as things something behind the observations. He wrote (2001, p. 157, his emphasis):

> The success of that family of instruments (microscope, electron microscope, radio telescope) derives in part from the possibility of representing their products as images of real things existing independently of any relations to those instruments. *But their products are images*; they are optically produced, publicly inspectable images. It is these images that are like the rainbow (they cannot themselves be represented as independent things). The difference, that we cannot think of the rainbow as [an] image of a real arch, while we can think of the microscope image as of a similarly structured object, is important but irrelevant for my point.

The generalization of this example comprises the canonical statement of constructive empiricism found in *The Scientific Image* (1980, p.12-13, his emphasis):

> *Science aims to give us theories which are empirically adequate; and acceptance of a theory involves as belief only that it is empirically adequate.* This is the statement of the anti-realist position I advocate; I shall call it *constructive empiricism*.

The empirical adequacy of a theory resides just in its successful accommodation of observations. Theories of the rainbow are empirically adequate in just this sense. We see an arc of circular section at 40 to 42 degrees around the direction of sunlight, containing colors spread from red to violet; and that is just what we expect to see according to the optical theories of rainbows as light reflected from raindrops.

What attitude are we to take to the unobservable parts of a theory: the light as opposed to the observations it produces? Here the view is recovered from its denial of another view, scientific realism. The canonical statement of that view is given as (1980, p. 8, his emphasis)

> *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.

Responding to the literal construal of theories of the realist, van Fraassen identified his version of antirealism. It reverses the commitments of an antirealism that seeks truth but not literal construal (1980, p. 10)

> … the language of science should be literally construed, but its theories need not be true to be good. The antirealism I shall advocate belongs to the second sort.

Literal construal does not require belief. Indeed, belief is accorded sparingly according to the formulation given a few pages earlier in the text (1980, p.4):

> On the view I shall develop, the belief involved in accepting a scientific theory is only that it "saves the phenomena," that is, correctly describes what is observable. But acceptance is not merely belief.

Providing this alternative to realism was, we are assured in the very first sentence of the volume, motivating (1980. P. vii) "The aim of this book is to develop a constructive alternative to scientific realism,…" The "constructive" in constructive empiricism reflects this agnosticism about the unobservable parts of a scientific theory (1980, p. 5)

> I use the adjective "constructive" to indicate my view that scientific activity is one of construction rather than discovery: construction of models that must be adequate to the phenomena, and not discovery of truth concerning the unobservable.

Talk of a colored arc of circular section in theories of the rainbow mean just what they say. There is an arc with the requisite colors. However, the talk is not to be believed. There is no real arc in the sky. It is our construction and serves to return our observations of rainbows.

3. Antirealism and Anti-metaphysics

In its antirealism, constructive empiricism had chosen a new opponent. The target of the logical positivists was the metaphysics of the nineteenth and early twentieth century German idealists. Their claims were deprecated as meaningless gibberish. The target for constructive

empiricism was not abstruse philosophical pronouncements. It was the core claims of routine science; or, more precisely, that they should be believed as true. Van Fraassen maintained the polemic against metaphysics of the earlier positivists and logical positivist. He explained in his 1980 monograph that its suppression was an achievement of constructive empiricism (1980, p. 73):

> However, there is also a positive argument for constructive empiricism—it makes better sense of science, and of scientific activity, than realism does and does so without inflationary metaphysics.

However here the notion of metaphysics was transformed into something that might seem benign. He later clarified the term (2002, p. 37):[2]

> What exactly are the targets of the empiricist critique? As I see it, the targets are forms of metaphysics that (a) give absolute primacy to demands for explanation and (b) are satisfied with explanations by-postulate, that is, explanations that postulate the reality of certain entities or aspects of the world not already evident in experience.

A more complete portrait of this target is given in *The Scientific Image*. It is a particular argument for scientific realism, now commonly known as the "no miracles argument." The success of science, the argument goes, would be miraculous if the science were incorrect. Its truth is the best explanation of its success. The version van Fraassen gives at the outset of Chapter 5 "The Pragmatics of Explanation" is (1980, p. 98):

> … science aims to find explanations, but nothing is an explanation unless it is true (explanation requires true premisses); so science aims to find true theories about what the world is like. Hence scientific realism is correct.

The chapter undoes the argument by identifying a pragmatic element in explanations. They succeed in satisfying a pragmatic interest that will vary from questioner to questioner. The link between successful explanation and truth is thereby broken.[3] The 2002 characterization of the

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[2] An almost identical formulation is found in the earlier van Fraassen (1994, p. 311).

[3] Related to this rebuttal is a celebrated riposte earlier in the text (1980, p. 40): "I claim that the success of current scientific theories is no miracle. … For any scientific theory is born into a life

metaphysics targeted continues with a characterization of empiricism as requiring precisely the denial of this metaphysics (2002, p. 37)

> The empiricist critiques I see as correspondingly involving
>
> (a) a rejection of demands for explanation at certain crucial points and
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> (b) a strong dissatisfaction with explanations (even if called for) that proceed by postulation.
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> I will refer to these as the first and second characteristics of empiricism. Others may be added as we go along.

Where Carnap dismissed as gibberish the metaphysics of Heidegger's "*Das Nichts selbst nichtet,*" van Fraassen assailed metaphysics by adopting agnosticism[4] over whether we truly see a bacterium through a microscope.

4. Set Theory, not Formal Logic

What has been left open above is precisely how van Fraassen's constructive empiricism characterized theories. In the older logical positivist and logical empiricist tradition, theories were collections of sentences, organized axiomatically. Their structure was captured most precisely by representing the theories in a formal logic, most commonly first order predicate logic. The theorists of this earlier tradition were greatly impressed by the major strides then being made in symbolic logic that ultimately issued in Kurt Gödel's extraordinary undecidability and incompleteness proofs. The hope was that this fertility could be transferred into philosophy of sciences. It was not to be. Impressive as these results were, they obscured foundational problems in science behind a screen of problems that were artefacts of the formal logic and not of the science itself.

A correction was overdue and, by the time of *The Scientific Image*, it was well underway through the work of such philosophers as Patrick Suppes. He advocated the use of far simpler set

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of fierce competition, a jungle red in tooth and claw. Only the successful theories survive—the ones which in fact latched on to actual regularities in nature."

[4] The term is van Fraassen's (1980, p. 72) "I wish merely to be agnostic about the existence of the unobservable aspects of the world described by science—but sense-data, I am sure, do not exist."

theory in place of the formal logic and metalogic of the logical positivists. Van Fraassen reported this correction with approval (1980, p. 65-66, his emphasis):

> When Patrick Suppes first advocated this sort of picture of theories in his studies of mechanics (with the slogan that *philosophy of science should use mathematics, and not meta-mathematics*), he proposed a canonical form for the formulation of theories. This used set theory.

Van Fraassen identified, correctly in my view, how the focus on formal logic had led philosophers of science astray (1980, p. 56):

> The syntactically defined relationships are simply the wrong ones. Perhaps the worst consequence of the syntactic approach was the way it focused attention on philosophically irrelevant technical questions. It is hard not to conclude that those discussions of axiomatizability in restricted vocabularies, "theoretical terms," Craig's theorem, "reduction sentences," "empirical languages," Ramsey and Carnap sentences, were one and all off the mark—solutions to purely self-generated problems, and philosophically irrelevant. The main lesson of twentieth-century philosophy of science may well be this: no concept which is essentially language-dependent has any philosophical importance at all.

In place of the propositions and well-formed formulae of predicate logic, van Fraassen offered simple structures in set theory. A simple example—my example—gives enough of a sense of it.[5] Assume we wish to present a theory of a real-number-valued magnitude, such as the masses of bodies. We could write a set of axioms that specify the properties of the real numbers and make them the axioms of mass. The result would be complicated and needlessly so. For all that matters can be recovered simply by positing that mass can take on all positive real number values. That is, we specify a mathematical structure—the set of positive real numbers—as the model for mass.

This model has continuum many possible values. They are far more than ever could be identified empirically. Any actual measurement of mass using some scale or balance will tell us

[5] Van Fraassen's (1980, Ch. 3) examples are more elaborate and involve geometry and formulations of Newtonian and quantum mechanics.

that the mass of interest is such and such a multiple of some chosen unit mass. Crucially, the multiple cannot be recovered with infinite precision. While there may be a mass of magnitude π, even our most accurate measurements will only return some truncated approximation for it. It might be 3.14 = 314/100, or 3.14159 = 314,159/100,000 or something longer. All such measurement results will be rational numbers. They are the observationally or empirically accessible portions of the theory.

More precisely, the set of positive rational numbers comprises the empirical substructure of the theory. This is the observable part of the theory to which constructive empiricism directs acceptance. We are to understand that the theory says that masses can have any real value. But we are not to believe it, since observation will only ever return rational values.

Here is how van Fraassen (1980, p. 64) described the general case:

> To present a theory is to specify a family of structures, its models; and secondly, to specify certain parts of those models (the empirical substructures) as candidates for the direct representation of observable phenomena. The structures which can be described in experimental and measurement reports we can call appearances: the theory is empirically adequate if it has some model such that all appearances are isomorphic to empirical substructures of that model.

This semantic replacement of the earlier syntactic view of theories proved especially welcome in the philosophy of physics of the 1980s. For a newly energized philosophy of physics was drawing heavily on the representations given to physical theories by mathematically-minded physicists. Their approach was to specify a theory through its models, where a model would most commonly be a tuple of mathematical structures, just like those described by van Fraassen. While this semantic approach was appealing to philosophers of physics, it was less so to philosophers of other sciences whose foundational conceptions were poorly suited to simple, set theoretic capture.

5. Observation

A distinctive feature of constructive empiricism is its strict division of the unobservable from the observable. The division is unapologetically anthropocentric. What is observable is whatever we unaided humans can observe. The obvious worry is the contingency of our human powers of observation. If they were somehow to change, would the range of the observable

correspondingly change? Van Fraassen has, from the first writings, given a resounding *yes* to this question. He wrote (1980, p. 18):

> At present, we count the human race as the epistemic community to which we belong; but this race may mutate, or that community may be increased by adding other animals (terrestrial or extra-terrestrial) through relevant ideological or moral decisions ("to count them as persons"). Hence the anti-realist would, on my proposal, have to accept conditions of the form
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> > If the epistemic community changes in fashion Y, then my beliefs about the world will change in manner Z.

This view is baffling to those who expect an empiricist philosophy of science to give some account of how we can learn something more about the world from experience, even if the compass of what we learn is narrow. For the constructive empiricist, anything outside our immediate observations is beyond our reach. The excess of the view is so palpable that it seemed to critics that only a slight nudge would be needed to move van Fraassen to a more expansive view.

These nudges came in many forms, many of them already familiar to van Fraassen. They were in Grover Maxwell (1962), a work that *The Scientific Image* had already lauded as (1980, p. 14) "the locus classicus for the new realists' contention that the theory/observation distinction cannot be drawn." One approach conjures up a slippery slope along which any placement of the observable/theory distinction seems arbitrary. Maxwell (1962, p. 7) wrote of:

> … a continuous series beginning with looking through a vacuum and containing these as members: looking through a windowpane, looking through glasses, looking through binoculars, looking through a low-power microscope, looking through a high-power microscope, etc., in the order given. The important consequence is that, so far, we are left without criteria which would enable us to draw a nonarbitrary line between "observation" and "theory."

Or we may imagine some minor or not so minor augmentation of our human powers of observation. Maxwell (1962, p. 11) imagined:

> … a human mutant is born who is able to "observe" ultraviolet radiation, or even X rays, in the same way we "observe" visible light.

These and many variations arise so easily that van Fraassen must surely have wearied of their familiar repetition. In responding to critics in a volume of essays on his empiricism, he remarked (1985, pp. 255-56) on "…the many independent challenges to where I 'draw the line' on observability…." He listed challenges by Paul Churchland in the volume as (p. 256):

> First, there is the case of the man all of whose sensory modalities have been destroyed and who now receives surrogate sensory input electronically. … Next, he asks us to envisage an epistemic community consisting entirely of beings in this predicament. Thirdly, Churchland imagines that we encounter a race of humanoids whose left eyes have the same structure as a human eye plus an electron microscope. Science tells us that virus particles and individual DNA strands are observable to them.

Van Fraassen remained unmoved in the face of these challenges. We need not rehearse his replies since they are predictable: what is observable is just what is observable to the community of human observers, properly conceived. Any extension is simply to be denied.

Van Fraassen's recalcitrance is baffling only as long we harbor the thought that his empiricism seeks to understand just how much we, as empiricists, can learn of the world from experience. If, however, van Fraassen's view is not empirical in this sense but deeply skeptical, then we should expect a dogged retraction to the absolute minimum that must be conceded from human observations. For insisting on the minimum is what skeptics do.

6. Anthropocentrism

Van Fraassen's account of observation and belief is curiously anthropocentric. Our beliefs are held hostage by the specific observational powers of our community. Migratory birds have the ability to sense the earth's magnetic field directly. Were we to gain that faculty, we would then be authorized by constructive empiricism to form beliefs about the existence of this field. Absent this faculty, we may believe that we have detected and mapped out the configuration of the earth's magnetic field factually in detail using compass needles and other methods. Constructive empiricism denies us this belief. Someone unrestrained by constructive empiricism may well find that our probing of the earth's magnetic field actually does better at identifying this field than the sensory faculty of migratory birds.

That van Fraassen must deny this indicates a very different conception of how we engage with the world through our experiences. A striking passage in van Fraassen (1994, p. 312) may provide a clue to the anthropocentrism of van Fraassen's conception and is worth quoting in its entirety:

> Suppose that, in a philosophical way, I do not understand ethics or science or religion. It might be one thing to take me by the hand and lead me into relevant experience. That might allow me to acquire a deeper sense of insight into those aspects of human existence. It would be quite another thing—and to the empiricists of little or no value—to postulate that there are certain entities or realms of being about which ethics (or science, or religion) tells us a true story. Yet that is what philosophers have often tended to do: to "explain" ethics by the contention that ethical principles are just the (putative) truths about Values, scientific theories the putative true summary of the Laws of Nature, and religious doctrines the putative true description of a divine, extramundane reality. Such philosophical accounts tend to be backed up with the assertion that unless we can think of the relevant text as purporting to be a true story, there is no explaining or understanding the subject at all.[6] The empiricist response is to deny firstly the value of any such 'explanation', and secondly the reasons anyone might have for thinking it to be true, and then furthermore to reject the legitimacy and appropriateness of that demand for explanation itself.

Van Fraassen here recounts a view of ethics and religion, in which ethical and religious experiences provides deeper insights in those realms. Those insight do not amount to learning truths about an ethical or a divine reality. The experiences in these two areas are highly personal and thus automatically anthropocentric.

One reaction to this non-factive view of ethics and religion is that reform is needed. Ethics and religion should make factual claims about the world and these factual claims should be supported by evidence in the same way as are the factual claims of a science. That is, we

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6 Van Fraassen's footnote (his emphasis): "A fourth example is the assertion: if mathematics is not the true description of a platonic realm of abstract entities, and also does not just consist of logical tautologies, then you can't explain *why* it is useful for science."

might ask ethics and religion to adopt the attitudes and methods of empirical science, as realists understand them.

Constructive empiricism proceeds in the reverse direction. It asks science to adopt the attitudes that van Fraassen reports as being within ethics and religion. In them, personal experience is central and inferences to facts beyond them are disavowed. The anthropocentrism of constructive empiricism thereby arises automatically. At the same time, ethics and religion are protected from complaints that they are unscientific. Ethics, religion and science would equally eschew the search for facts beyond human experience.

7. Acceptance

The central notion of constructive empiricism is that of "acceptance." It figures in the canonical statement of the view "*…and acceptance of a theory involves as belief only that it is empirically adequate.*" At first and in earlier of van Frassen's writings, the notion of acceptance seems straightforward. The canonical statement explains the term "empirically adequate" hesitantly (1980, p. 12):

> For now, I shall leave that with the preliminary explication that a theory is empirically adequate exactly if what it says about the observable things and events in this world, is true—exactly if it 'saves the phenomena.' A little more precisely: such a theory has at least one model that all the actual phenomena fit inside. I must emphasize that this refers to *all* the phenomena; these are not exhausted by those actually observed, nor even by those observed at some time, whether past, present, or future.

Similar sentiments appear a few pages later (1980, p. 69):

> … empirical adequacy goes far beyond what we can know at any given time. (All the results of measurement are not in; they will never all be in; and in any case, we won't measure everything that can be measured.)

Were this any other author, the import of these words would be easily understood. While we can only ever affirm a tiny part of the observational consequences of a theory, success there can be strong enough inductively to assure us of the continued success of the theory observationally.

The difficulty is that *this* author has disputed energetically that the observational success of a science supports its truth, as scientific realists have urged it does. Can a constructive

empiricist then allow the same inference over the observational portion of a theory? Van Fraassen's explicit recognition of the problem was triggered by a remark that is otherwise routine in constructive empiricism (1980, p. 71):

> … when the theory has implications about what is not observable, the evidence does not warrant the conclusion that it is true.

He then immediately sensed the peril:

> The danger is clearly that, by parity of reasoning, my arguments would, if successful at all, establish that the evidence never warrants a conclusion that goes beyond it. This is already quite unacceptable, for we do in our daily life infer, or at least arrive at, conclusions that go beyond the evidence we have, and will resist as sophistical any philosophical theory which calls us irrational for that reason alone.

The following two pages of text purport to give a preliminary answer and escape. I have not been able understand them.

The tension continues. We see it appearing in his 1985 responses to criticism, where he sought to separate acceptance from belief (1985, p.295):

> What was valuable in the literature on induction were its more or less careful accounts of reasons for acceptance of theories. Of these, reasons to believe are a proper subclass, and the great tragedy of this subject, which turned the idea of induction into an impossible ideal, was to confuse reasons for acceptance *überhaupt* with reasons for belief. In my view, as long as we try to maintain that conflation, we cannot make sense of either scientific practice or methodology.

If—and I am unsure that this is so—"acceptance" here includes a constructive empiricist's acceptance of the empirical adequacy of a theory, then its acceptance can be something other than belief. Then a belief in the theory's continuing success with observables would be lost. What might be left? Here we might recall that the accounts of acceptance of empirical adequacy routinely add extra elements. For example (1980, 12):

> … acceptance involves a commitment to confront any future phenomena by means of the conceptual resources of this theory. It determines the terms in which we shall seek explanations.

And (1985, p. 281):

> What is there in acceptance besides belief, …? … In addition, the acceptance involves a commitment to maintain the theory as part of the body of science. That means that new phenomena are confronted within the conceptual frame of the theory, and new models of phenomena are expected to be constructed so as to be embeddable in some models of that theory.

It is attitudes and behaviors specified here, not beliefs. Eventually, with the development of the notion of a "stance" sketched below, they are all that will remain. The simple notion of belief will be lost.

8. Anti-inductivism

That there is something missing from the accounts of both scientific realism and constructive empiricism only becomes noticeable when it is pointed out. And then its omission is hard to ignore. In both canonical formulations of Section 2 above, acceptance figures centrally. In each we either accept a theory as literally true or as merely empirically adequate. However we surely do neither without further conditions. We need some assurance that these acceptances are appropriate. They are surely not merited by every theory. In statements of scientific realism elsewhere, that assurance comes, in some form, typically through the weight of evidence. In motivating his characterization of scientific realism, van Fraassen first gave a formulation due to Richard Boyd, quoted from the writings of Hilary Putnam. It begins (1980, p. 8, my emphasis):

> That terms in *mature* scientific theories typically refer…, that the theories accepted in a *mature* science are typically approximately true,…

Reference and truth are accorded only to *mature* scientific theories. In the source from which van Fraassen quotes, Putnam (1975, p. 73) does not elaborate on what distinguishes a scientific theory as mature. My default presumption is that maturity comes when a theory has been secured so massively by the weight of evidence that serious competition is not expected or even entertained. Whatever construal may be intended, very few of all possible theories can be so designated. Something similar is needed here. We would not judge a theory empirically adequate if it has merely had one, minor predictive success.

We might imagine that this extra condition does not belong in a treatise on constructive realism. Might these inductive considerations belong elsewhere and simply be assumed here? Possibly. But even so, there should be some indication, some tip of the hat as given by Putnam,

to the idea that evidential or inductive considerations must enter in some manner in the decision to accept. But there is none in van Fraassen's narratives. Without them, acceptance is treated as a decision willfully made, voluntarily. We shall see shortly that this later becomes van Fraassen's explicit view, the empirical stance.

It may be tempting to discount the omission of inductive considerations as something whose explicit discussion lies outside the scope of the discussion of constructive empiricism. Perhaps it is present tacitly, as in Putnam's mention of *mature* theories. We can see that matter are otherwise. Elements of anti-inductivism are already present in the rejection of scientific realism in *The Scientific Image* (Ch.2, §3, pp. 19-23, emphasis in original). There it notes that "[t]he main rule of inference invoked in arguments of this sort is the *rule of inference to the best explanation*." The goal of the ensuing discussion is to defeat this abductive pathway to scientific realism by weakening the scope of the rule. A later summary of Chapter 2 on realism directly denies that evidence can ever establish the truth of unobservables (1980, p. 71): "when the theory has implications about what is not observable, the evidence does not warrant the conclusion that it is true."

A later analysis uses the metaphor of "a man in a glass booth" as a vehicle for urging that the notorious problem of the priors defeats Bayesian accounts of learning theory from observational evidence (1985, p. 250, emphasis in original):

> The basic picture of the deliverances of experience the *revelation model of evidence* is of a man in a glass booth with a ticker tape that prints out statements which he treats as divine revelation. Each time a new such statement appears, he becomes fully certain that it is true, and the only, other thing he does is to adjust his prior opinions to accommodate it (i.e., he conditionalizes on this evidence). It is clear that, if the ticker tape has been delivering only nontheoretical statements, then his theoretical opinions derive mainly from the prior opinions he brought with him to this situation. No proofs about how the evidence can, in the long run, swamp any given prior opinion can take the edge of this damning point: that he can today have no significant theoretical opinions unless his prior opinions also had significant theoretical content.

These denials fall short of a complete repudiation of entire project of inductive logic. Such repudiations soon follow. They come in the form of a startling announcement (1985, p. 295):

> Inductive logic is a make-believe theory; no one has ever written its principles. Attempts to do so have always landed in incoherence or fallen afoul of hilarious counterexamples.[7] But, reluctant to admit that they were only talking about a gleam in their eyes, philosophers always pretended, at least in terminology, that there is such a discipline as inductive logic.

A comparably startling assessment was given over 20 years later in response to remarks by Nancy Cartwright (2007 pp. 343-44, his emphasis):

> I do not think that there is such a thing as Induction, in any form, and I would also express this in more or less her [Cartwright's] words: *there is no purely epistemic warrant for going beyond our evidence.* If there is to be a rationale—let alone justification—for selecting the observable as the range for the proper epistemic aspect of acceptance, that will have to be *something that is not, or not purely, epistemic warrant.*

9. The Empirical Stance

If the entire project of induction and inductive logic is abandoned, we lose the instrument essential to the project of learning about the world from observation. Whatever his empiricism might be, it cannot support this last project. Van Fraassen later gave autobiographical recollections of this realization. He wrote (2007, pp. 366-67)

> 3.1 My Mistake
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> My own thinking about empiricism involved to begin a great mistake. Throughout the 1980s I remained in thrall to one of the great deceptions in textbook philosophy. Both in my reply to critics (1985: 286) and in Laws and Symmetry (p. 8) I wrote of empiricism as the position that experience is our one and only source of information about the world.

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[7] [van Fraassen's footnote, his emphasis] "Some readers have apparently thought that, in chapter 2, section 3 of the *The Scientific Image*, I assert inference to the empirical adequacy of the best explanation to be a correct inductive principle. Not so; I *exhibited* this putative rival principle as part of a demonstration that we can have no good evidence for the psychological hypothesis that people do in fact follow the rule of inference to the best explanation."

> … The latter day conception of experience signalled in that ‘source of knowledge’ slogan is a curious philosophical miscreant: something like ‘a psychic event involving a single individual, with a ‘‘content’’ logically independent of what is happening to that individual.’ It is a mystery how anyone could mention this with a straight face as the basis on which scientific knowledge is built—or attribute that view to anyone else. But I was steeped in the textbook history of philosophy which depicts the rationalism–empiricism prelude to Kant in just that way, and taken in by it.
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> …When I started thinking for myself about this, I became aghast at the implications of what this could mean, and at the disconnect in my own thoughts between this ‘official’ view of empiricism and what I really knew about it….

Since the content of these moments of self-realization is startling, I have quoted them at some length. Once they had taken hold of him, van Fraassen saw the need to provide a new understanding of the claims of his empiricism. This new understanding, van Fraassen continued, came in the form of “stances,” as elaborated in works in a paper (1994) and his 2002 monograph, *The Empirical Stance*.

The first step in these developments of the notion of a stance is negative. It is to impugn the sorts of factual principles that might otherwise be taken to underpin empiricism. One target is the principle (1994, p. 312):

> (*) Experience is our one and only source of information.

An extensive analysis in the paper (1994) and the later monograph (2002) leads to the rejection of all principles of this type. The reasons are various but rely in parts on an accusation of self-refuting circularity. One conclusion is important in its decoupling of attitudes and beliefs (1994, p. 326):

> The only way out is to deny the initial bias: rationality does not require our attitudes to be justified by beliefs.

Both texts then offer the notion of a "stance" as the right way to understand empiricism. In one version, it is described as (2002, pp. 47-48):[8]

> A philosophical position can consist in a stance (attitude, commitment, approach, a cluster of such-possibly including some propositional attitudes such as beliefs as well). Such a stance can of course be expressed, and may involve or presuppose some beliefs as well, but cannot be simply equated with having beliefs or making assertions about what there is.

This understanding of empiricism leads, in van Fraassen's view, to what would otherwise be regarded as a complete abandoning of empiricism. His autobiographical reflections note (2007, p. 368):

> In my own proposal for a characterization of empiricism (beginning with *The Empirical Stance*, pp. 36–8, 46–8, 62–3) experience is not mentioned at all. If I had succeeded in all I set out to do, the 'sole source of information' slogan about what experience is would not be discussed any more in connection with the formulation of empiricism.

The characterization given in the places cited is almost entirely negative. Its core ideas were quoted in Section 3 above. They are based around a denial that explanatory success authorizes any inferences. This is not empiricism in the twentieth century sense, but a form of inductive skepticism targeted specifically at these forms of inductive inference. They happen to be just those often used in support of scientific realism. An earlier statement of this characterization is more explicit in its dispensing with beliefs. Van Fraassen wrote (1994, p. 317-318, emphasis in original):

> For [the characterization of] empiricists I listed *rejection* of explanation demands, *dissatisfaction* and *disvaluing* of explanation by postulate. Moreover I listed the empiricists' calling us back to experience, their rebellion against theory, their *ideals* of epistemic rationality, what they regard as having significance, their *admiration*

[8] The same formula appears in van Fraassen (1994, p. 318) "… a stance (attitude, commitment, approach). Such a stance can of course be expressed, and may involve or presuppose some beliefs as well, but cannot be simply equated with having beliefs."

> for science and the virtue they see in an idea of rationality that does not bar disagreement. Notice that not a single one of these factors is a belief.

A conception of empiricism that does not require beliefs or assertions about what there is would seem to leave little room for a conception of scientific rationality. Yet van Fraassen averred otherwise (2002, p. 63):

> Empiricism may also be approached through reflection on its positive attitude toward science. But this admiring attitude is not directed so much to the content of the sciences as to their forms and practices of inquiry. Science is a paradigm of rational inquiry. To take it as such is precisely to take up one of the most central attitudes in the empiricist stance. But one may take it so while showing little deference to the content of any science per se.

Here empiricism is reduced to an admiration for the practices of science, while discounting what these practices purport to have achieved. It is a most curious attitude. If we cannot admire the practices of science for their successes, then what in them is to be admired?

Finally, we can note, tangentially, that this overall approach conforms with van Fraassen's earlier voluntarist approach to rationality. According to it, our beliefs are not compelled up on us by external factors. Rather he formulated his view as follows (1984, p. 256, his emphasis):

> I call it "voluntarist," because it makes judgment in general, and subjective probability in particular, a matter of cognitive commitment, intention, *engagement*. Belief is a matter of the will.

10. Stances Assessed

What are we to make of the conception of empiricism as a stance? We can, if we are so inclined, take it as a voluntary choice to conceive of things in certain ways. When we are free to make such choices, many are available. We might choose among these:

> The world is benevolent.
>
> The world is malevolent.
>
> The world is beautiful.
>
> The worlds is ugly.

We can include in the choices Einstein's famous remark:

The Lord is subtle, but he is not malicious.

The present question is what they have to do with the empirical project of learning about the world from experience. In so far as they are *only* freely chosen attitudes, they can only be of personal significance to us. We may find solace in the idea of the beauty in or the benevolence of the world. But we have no assurance that these attitudes will be epistemically fertile in the project of learning about the world.

There is another possibility. These sorts of slogans can aid in the project if they coincide with factual properties of the world. This can happen in many ways. If the world is beautiful in the sense of mathematical Platonism, then knowing this fact offers us a significant epistemic advantage. Einstein's remark reflected his belief in a factual aspect of the world: physical laws may be hard to find, but they are such that finding them is not beyond our human capacities. In his later life he had come to believe that these laws could best be found by the Platonic route, that is, by investigating the mathematically simplest laws.[9] When the epistemic power derives from such factual conditions, its success is unconnected with the free choice of attitudes and stances. All that matters is that the attitude chosen happens to coincide, perhaps even by design, with the factual character of the world.

In sum, if we understand empiricists to be engaged in learning about the world from experience, then epistemic stances can be assured to have a role in their project only in so far as they are not freely chosen stances as characterized by van Fraassen.

11. Conclusion

This chapter has taken a more critical approach to constructive empiricism than it has to other views surveyed. It is needed. Constructive empiricism has become the definitive formulation of empiricism over the last half century. Yet it represents a retrograde development in empiricist thought. As I have discussed elsewhere in this volume, there are two elements in empiricist thinking. The first is a privileging of experience in our efforts to learn about the world. The second is a skeptical restriction on what we can learn from experience. Developments earlier in the twentieth century strengthened this first element. Most notably Reichenbach's logical empiricism developed realist themes that came to a fuller expression in the subsequent

[9] For an account of how Einstein came to this view, see Norton (2000).

emergence of scientific realism. The second skeptical element was suppressed; and that suppression was, at least to me, most welcome.

Constructive empiricism represents a degeneration of this positive trend. It is an atavism that returns to what made the empiricism of earlier centuries an unpopular doctrine, widely judged as unacceptable. That is, it has revived the most skeptical strands of empiricism, the second element. It has excised completely what is to me the most essential element of empiricism, the privileging of experience in our efforts to learn about the world.

It is an aberration of later twentieth century philosophy that the term "constructive empiricism" was accepted as its label. It should have been called "constructive skepticism." For it is the *skeptical* view that we learn nothing new from observation. All our efforts to extend knowledge by even the smallest steps beyond what we observe are merely *constructions*, chosen voluntarily by us.

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