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Van Fraassen meets Popper: Logical relations and cognitive abilities

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ABSTRACT

Van Fraassen, like Popper before him, assumes that confirmation and disconfirmation relations are logical relations and thus hold only among abstract items. This raises a problem about how experience, for Popper, and observables, for van Fraassen, enter into epistemic evaluations. Each philosopher offers a drastic proposal: Popper holds that basic statements are accepted by convention; van Fraassen introduces his "pragmatic tautology." Another alternative is to reject the claim that all evaluative relations are logical relations. Ayer proposed this option in responding to Popper, as did Sosa in a different context. I argue that this option should be pursued and propose a line of research that the option suggests.

> Let A = <{$P_1, \ldots P_n$},C> be a valid argument, a sequence in which C is a logical consequence of preceding steps. *Philosophy's Most Difficult Problem* is that of adjudicating in a principled way the conflict between supposing that A is a sound demonstration of a counterintuitive truth, as opposed to seeing it as a counterexample of its premises. (Woods, 2003, p. 14)

One of the fundamental questions van Fraassen addresses in *Scientific Representation* (henceforth SR) is how we compare theories with empirical results. Following a now-familiar approach, van Fraassen argues that we do not compare theories with actual bits of data, but with data models or with what he calls 'surface models'. Data models, in van Fraassen's terminology, are summaries of relative frequencies found by particular measurements; surface models are mathematical idealizations that smooth out data models—for example, by replacing summaries with continuous functions (SR, pp. 166–167). While this may well be an accurate account of what scientists do, it takes on a special significance in van Fraassen's philosophical context where it solves one problem, but generates another, more difficult, problem. The solved problem is how we compare a theory—which is an abstract structure—with concrete aspects of nature. For van Fraassen this problem is dissolved because data models and surface models are themselves abstract structures, so the only comparison is between abstract entities. But this raises the problem of how theories are ever confronted with either the items in nature that constitute their subject matter, or with the sensory experience that mediates our access to nature. Popper addressed a similar problem in *The Logic of Scientific Discovery* (henceforth LSD). Popper's reasons for introducing the problem are similar to van Fraassen's and we can gain some insight into the issue and the range of possible solutions by reexamining Popper's version.

The problem, for Popper, is how we can evaluate statements against experience. This is problematic because Popper holds that all epistemic evaluation is mediated by logic, and logical relations hold only among statements.[1] Experiences are psychological events, and there are no logical relations between psychological events and statements. As a result, experience cannot play a role in epistemic evaluations. To think that experience can play such a role is just one instance of psychologism—which, for Popper, encompasses any appeal to psychological events as a means of evaluating the truth or falsity of a statement. A perceptual experience may motivate acceptance of a statement but this has nothing to do with a proper epistemic evaluation of that statement; it is no better than table

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[1] This is Popper's customary terminology in LSD where he uses 'statement' and 'proposition' as synonyms. He states this explicitly in the case of 'basic statement' (LSD, p. 43). I will not pursue the familiar issues in the present discussion.

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thumping (LSD, p. 105). More generally, Popper denies that there are any *justification* relations—such as we might find in an inductive logic—because he views logic as encompassed in tautological transformations (LSD, Section 1). Thus the fact that induction is ampliative is sufficient to undermine any proposed logic of support.

Yet Popper holds that there are empirical refutations of statements and he must provide a non-psychologistic account of such refutations. In order to do so Popper first specifies a class of statements that he calls 'basic statements'. These are singular statements, the least general statements in our corpus. Examples include 'The table top in front of me is brown', 'This ammeter reads 5', and others of their ilk. According to Popper, we ought to reject a theory when one of its consequences contradicts a basic statement that we have accepted. Our problem then shifts to determining the grounds for accepting a basic statement. Even if there were a logic that could mediate acceptance, experiences could not serve as premises of this logic. Given the options that Popper is prepared to admit, he concludes that acceptance of a basic statement is a matter of convention: 'Basic statements are accepted as a result of a decision or agreement; and to that extent they are conventions' (LSD, p. 106).[2] Scientists accept a basic statement because they decide to do so, with no *reason* for doing so in the only sense of 'reason' that Popper will allow. Thus: 'I differ from the positivist in holding that basic statements are not justifiable by our immediate experiences, but are, from the logical point of view, accepted by an act, by a free decision' (LSD, p. 109).

On the other hand, since basic statements are part of the scientific corpus, they are refutable. Given the constraints within which Popper is working, he holds that we reject a basic statement when we accept another, incompatible, basic statement. Confronted with two incompatible basic statements we must decide which one to accept, and there cannot be any logically compelling reason for making one decision or another; the outcome of this decision is a convention that can, of course, be revised. One of the major virtues of LSD is its exceptional consistency, a consistency that leads Popper to bite a lot of hard bullets.

Unfortunately, Popper muddies the issue by suggesting that we could verify basic statements if there were genuinely indubitable observation reports. Popper considers 'the epistemologies of sensationalism and positivism' (LSD, p. 94) which hold that all factual knowledge is based on sense perception: 'Whether this table is red or blue can be found out only by consulting our sense-experience. By the immediate feeling of conviction which it conveys, we can distinguish the true statement, the one whose terms agree with experience, from the false statement, whose terms do not agree with it' (LSD, p. 94). Popper responds that, 'This doctrine founders in my opinion on the problems of induction and of universals'. He notes that every description uses universal names so that descriptions transcend experience, and thus cannot be conclusively verified by experience. This is followed by a discussion of protocol sentences that focuses on Reinenger, Carnap, and Neurath. One part of the remarks about Carnap are particularly salient. Popper distinguishes between Carnap's earlier view 'that protocol sentences are ultimate, and *not in need of confirmation*' (LSD, p. 96) and his later rejection of this view. Summing up the discussion, Popper writes:

> In Carnap's earlier view, the system of protocol sentences was the touchstone by which every assertion of an empirical science had to be judged. This is why they had to be 'irrefutable'. For they could overthrow sentences—sentences other than protocol sentences, of course. But if they are deprived of this function, and if they themselves can be overthrown by theories, what are they for? (LSD, 97)

It is not clear why appeal to indubitable observation statements would avoid Popper's strong version of psychologism, but this question is moot given Popper's denial that such statements exist.

Ayer picks up the question of empirical warrant in his contribution to Schilpp's Popper volume. Ayer focuses on the issue of indubitability and rejects the claim that empirical warrant requires indubitable observation statements. He emphasizes that such statements 'were intended to stop the infinite regress of justifying one statement by another, as being statements which needed no further justification. But the only ground for holding that these statements need no further justification is that they are sufficiently justified by the actual occurrence of the experiences which they describe' (1974, p. 689). Ayer agrees that experience does not conclusively verify these statements, 'but this is not a bar to our holding that they give us an adequate ground for accepting them' (1974, p. 689). Thus, Ayer concludes, 'we have to reject the view that statements can be justified only by one another . . . ' (1974, p. 689). Popper does not address this issue in his response to Ayer.

Van Fraassen has a much richer view of logic than does Popper. In particular, van Fraassen locates both the process of representation and the acceptance and rejection of theories squarely in the realm of pragmatics. Still, van Fraassen wrestles with essentially the same question that Popper does: how can we compare theories—which are abstract entities—with concrete objects in nature. For van Fraassen there is a prior issue: 'the most fundamental question is this: *How can an abstract entity, such as a mathematical structure, represent something that is not abstract*, something in nature'? (SR, p. 240). This is crucial because van Fraassen emphasizes that actual comparisons are always between abstract structures. For example:

> When Newton claimed that his theory of gravitation fit the phenomena, he meant in part that his equations entailed (under certain simplifying assumptions) Kepler's laws of planetary motion . . . What Kepler's laws gave him was in effect what I have called a *surface model*, a structure constructed from data painstakingly amassed by astronomical observations. The matching Newton demonstrated was therefore between mathematical structures . . . (SR, p. 257)

After recalling his earlier discussion of maps and adding another example van Fraassen insists that data models are not dictated by phenomena:

> Nor does the phenomenon, what it is like, taken by itself, determine which structures are data models for it. That depends on our selective attention to the phenomenon, and our decisions in attending to certain aspects, to represent them in certain ways to a certain extent. (SR, p. 258)

It is this central role for decisions that places us in the domain of pragmatics.

But, van Fraassen acknowledges, this raises a problem that he dubs the 'loss of reality objection': 'Hence the theory does not confront the observable phenomena, those things, events, and processes out there, but only certain representations of them. Empirical adequacy is not adequacy to the phenomena pure and simple, but to the phenomena *as described*!' (SR, p. 258). Van Fraassen then attempts to dissolve this problem by what he calls a 'pragmatic tautology':

[2] Popper adds: 'The decisions are reached in accordance with a procedure governed by rules' (LSD, p. 106), but 'Methodological rules are here regarded as *conventions*' (LSD, p. 53).