Ayer on the criterion of verifiability

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[For a more in-depth discussion of issues surrounding the criterion of verifiability from which much of the following is drawn, see Soames, *Philosophical Analysis in the 20th Century*, v. 1, ch. 13.]

1   The critique of metaphysics

Ayer's stated aim in *Language, Truth & Logic* is one which many philosophers have pursued: "to establish beyond question what should be the purpose and method of a philosophical inquiry" (33).

Central to this aim, as Ayer conceived of it, was the demolition of traditional metaphysics, where this was thought of as the attempt to say something about "a reality transcending the world of science and common sense." Ayer thought that this metaphysical project was an impossible one. The reason why he thought this was a kind of empiricism: the view that all of our knowledge must be based in sense experience. In Ayer's view, scientific knowledge was the paradigm of knowledge that conformed to this empiricist restriction.

Ayer, however, took this empiricism one step further. He thought not only that claims not based on sense experience must be unjustified, but also that claims that were not based on experience were nonsense:

> "...the fact that a conclusion does not follow from its putative premise is not sufficient to show that it is false. Consequently one cannot overthrow a system of transcendent metaphysics merely by criticizing the way in which it comes into being. What is required is rather a criticism of the nature of the actual statements which comprise it. And this is the line of argument which we shall, in fact, pursue. For we shall maintain that no statement which refers to a "reality" transcending the limits of all possible sense-experience can possibly have any literal significance; from which it must follow that the labours of those who have striven to describe such a reality have all been devoted to the production of nonsense." (34)

Similarity to Wittgenstein in this claim; the status of elementary propositions and a difference between the sense/nonsense distinction for the two. Ayer's attempt to go one step beyond Wittgenstein in providing a test for the meaningfulness of statements.

2 Observation statements

The criterion of verifiability says that a sentence is meaningful if and only if it has some relation to observation. Historically, the form that formulations of this criterion took was to settle on a class of observation sentences, and then to claim that all and only sentences which bear a certain specified relation to these sentences will count as meaningful. There were then two tasks to be accomplished: (i) saying what an observation sentence is, and (ii) spelling out the required relationship between meaningful sentences and observation sentences.

One main issue regarding the first task is whether the observation sentences are thought of as claims about sense data, or as claims about material objects. Intuitively, it is hard to see how material object statements could count as observation sentences if one buys a sense datum theory of perception (as Ayer and many of the other logical positivists did); but if one takes sense datum statements as the observation statements, then one runs the danger of making the material object statements of, e.g., science come out meaningless. This is not a result that Ayer and the other logical positivists were prepared to accept; in their view, scientific and commonsense claims made on the basis of sensory experience were the paradigm cases of meaningful utterances, and the question was whether other claims of philosophy should also be categorized as meaningful.

In what follows we'll abstract away from the nature of observation sentences; we can take them loosely to include both sense datum statements and the material object statements corresponding to them, and focus instead on the relationship between a sentences which are *not* observation statements and observation required for the former to be meaningful.

3 'In principle' verifiability

Before going into the details of attempts to do this, it is worth distinguishing between claims which have been verified – i.e., which have been investigated via their correlated observation sentences – and claims which can, in principle, be verified. As Ayer says, plausibly,

> "Plainly we all understand, in many cases believe, propositions which we have not in fact taken steps to verify. Many of these are propositions which we could verify if we took enough trouble. ... A simple and familiar example of such a proposition is the proposition that there are mountains on the farther side of the moon. No rocket has yet been invented which would enable me to go and look at the farther side of the moon, so that I am unable to decide the matter by actual observation. But I do know what observations would decide it for me, if, as is theoretically conceivable, I were once in a position to make them. And therefore I say that the proposition is verifiable in principle, if not in practice, and is accordingly significant. On the other hand, such a metaphysical pseudo-proposition as "the Absolute enters into, but is itself incapable of, evolution and progress", is not even in principle verifiable. For one cannot conceive of an observation which would enable one to determine whether the Absolute did, or did not, enter into evolution and progress." (36)

The moral of this is that if we are trying to establish the meaningfulness of some sentence by relating it to some set of observation sentences, we need not require that we have actually made the observations corresponding to those observation sentences; all that is required is that we could, in principle, make those observations.

4 Strong verification

Ayer discusses (beginning p. 37) attempts to define meaningfulness in terms of what he calls strong verifiability. We can take, by slightly expanding the sense Ayer attached to the term, attempts to define meaningfulness in terms of strong verification to include attempts to define meaningfulness in terms of either *conclusive verification* or *conclusive falsification*. These notions are defined as follows:

> S is *conclusively verifiable* $\equiv_{df}$ some finite set O of observation statements entails S
>
> S is *conclusively falsifiable* $\equiv_{df}$ some finite set O of observation statements entails $\neg S$

4.1 Conclusive verifiability

The first attempt at defining meaningfulness in terms of strong verification is to say that a sentence is meaningful if and only if it is conclusively verifiable.

As Ayer notes, there is a problem with this view:

> "...if we accept conclusive verifiability as our criterion of significance, as some positivists have proposed, our argument will prove too much. Consider, for example, the case of general propositions of law – such propositions, namely, as "arsenic is poisonous"; "all men are mortal"; "a body tends to expand when it is heated." It is of the very nature of these propositions that their truth cannot be established with certainty by any finite series of observations." (37)

Ayer's point here is a general one, and shows that universally quantified claims are not conclusively verifiable. Because these claims are nonetheless meaningful, the suggested criterion of meaning is not a good one.

4.2   Conclusive falsifiability

A second attempt is to say that a sentence is meaningful iff it is conclusively falsifiable or, as Ayer puts it, "definitively confutable."

Ayer responds to this suggestion by claiming that no generalization can either be conclusively verified or falsified by experience, since an observation statement can only contradict a generalization with the help of other supporting propositions. But this is not obvious; and anyway there is a simpler argument against the equation of meaningfulness with conclusive falsifiability.

Just as universal generalizations are not conclusively verifiable, existential generalizations are not conclusively falsifiable. E.g., 'There is at least one red swan." It seems that no finite set of observation sentences can entail that this is false, for just the same reason that no finite set of observation sentences can entail that the universal generalization "All swans are non-red" is true.

4.3   Conclusive verifiability or falsifiability

This result suggests an obvious way of extending our first two attempts to define meaningfulness in terms of strong verification: we can claim that a sentence is meaningful if and only if it is *either* conclusively verifiable *or* conclusively falsifiable. This seems to deal with simple universal generalizations, since they are conclusively falsifiable, and with simple existential generalizations, since they are conclusively verifiable.

Ayer does not explicitly consider this possibility. But it seems to run into the following three problems (from Soames, pp. 280-282).

4.3.1   Mixed quantification

There is still a problem in dealing with sentences which contain both universal and existential quantification, like

For every question, there is an answer.

which may be formalized as

$$\forall x \ (x \text{ is a question} \rightarrow \exists y \ (y \text{ is an answer to } x))$$

We know that this claim is not conclusively verifiable, for the same reason as 'All swans are white' is not conclusively verifiable: no finite set of observation statements entails the truth of a claim about *all* the questions.

So if it is to be meaningful, it had better be conclusively falsifiable. But it isn't. To conclusively falsify a claim is to be able to derive its negation from a finite set of observation statements. In this case, we'd have to be able to derive

$$\neg \forall x \ (x \text{ is a question} \rightarrow \exists y \ (y \text{ is an answer to } x))$$

which is equivalent to

$$\exists x \ \neg \ (x \text{ is a question} \rightarrow \exists y \ (y \text{ is an answer to } x))$$

i.e.,

$$\exists x \ (x \text{ is a question} \ \& \ \neg \ \exists y \ (y \text{ is an answer to } x))$$

which is equivalent to

$$\exists x \ (x \text{ is a question} \ \& \ \forall y \ \neg(y \text{ is an answer to } x))$$

So for our original sentence to be conclusively falsifiable, we have to be able to derive the above from some set of observation sentences. But we can't: to derive this from a set of observation sentences, we'd have to be able to derive from such a set the universal claim that there is some question such that *every answer* fails to be an answer to that question. But we can no more derive this from a set of observation sentences than we can derive "All swans are white." from such a claim.

(The problem here stems from the fact that conclusive falsifiability of a sentence is just conclusive verifiability of its negation, and if a sentence contains both existential and universal quantification in the above way, then both it and its negation will be universal claims.)

So the claim that a sentence is meaningful iff it is either conclusively falsifiable or conclusively verifiable entails that all sentences of mixed quantification like the above are meaningless. But again, the positivists were not willing to accept this result. (And they were right in thinking that this result was absurd.)

4.3.2 'Most' and other quantifiers

Another problem stems from certain quantifiers other than the universal and existential quantifiers, like 'most.' Consider, e.g.,

> 'Most ravens are black.'

How would you go about trying to either conclusively verify or falsify this sentence on the basis of observation sentences?

One plausible idea: we could conclusively verify this sentence, it seems, if we could add to the list of observation sentences a general claim like 'These are all the ravens.' This general claim is conclusively falsifiable, and hence meaningful. So one wants to formulate a more general criterion, which gives a step-by-step analysis of meaningfulness, along the following lines: S is meaningful iff either it or its negation are entailed by a set of sentences containing only observation sentences, sentences which are conclusively verifiable or falsifiable, and other sentences already qualified as meaningful by this test. This resembles the test that Ayer eventually suggests; we'll return to it later. But this kind of stepwise definition in terms of strong verification is also challenged by a third problem facing our proposed analysis.

4.3.3 Statements about unobservables

Consider, for example, claims about *electrons.* Electrons are not directly observable; rather, they are postulated to explain phenomena which are observable. But just because the postulation of electrons explains observable phenomena, it does not follow that claims about electrons may be derived from observation sentences. But the positivists were, for good reason, reluctant to consign claims about electrons to the same category as metaphysical claims like "The Absolute is lazy."

5   Weak verification

This problem suggests that an entirely new approach is in order, and this is in fact what Ayer suggests. He says:

> "Accordingly, we fall back on the weaker sense of verification. We say that the question that must be asked about any putative statement of fact is not, Would any observations make its truth or falsehood logically certain? but simply, Would any observations be relevant to the determination of its truth or falsehood? And it is only if a negative answer is given to this second question that we conclude that the statement under consideration is nonsensical." (38)

This move from focusing on what can be derived from observation claims to focusing on what observation claims might be relevant to marks an important shift between two different ways of thinking about the criterion of verifiability.

But, as Ayer notes, we need to be a bit more specific than this in formulating a weak criterion of verifiability. He gives two precise ways of formulating the basic intuition here, one in Chapter 1, and the second in the Preface to the 2nd edition of *Language, Truth, & Logic.*

5.1 Ayer's first definition

In the first edition to the book (1935), Ayer gave the following account of verifiability:

> "Let us call a proposition which records an actual or possible observation an experiential proposition. Then we may say that it is the mark of a genuine factual proposition, not that it should be equivalent to an experiential proposition, or any finite number of experiential propositions, but simply that some experiential propositions can be deduced from it in conjunction with certain other premises without being deducible from those other premises alone." (38-39)

We can formulate this as follows:

> S is meaningful if there is some set of sentences $P_1 \ldots P_n$ and some observation sentence O such that (i) O follows from S together with $P_1 \ldots P_n$ but (ii) O does not follow from $P_1 \ldots P_n$ alone.

While this formula is fairly abstract, there is a simple and plausible thought behind it. Ayer's idea was that, given the failure of strong verification analyses of meaningfulness, verifiability cannot amount to equivalence or entailment relations between a sentence and some set of observation sentences; rather, what we want is a clear way of stating the thought that a sentence, even if not equivalent to a set of observation sentences, *makes some difference to what is observable.* This is what Ayer's definition tries to capture. It says, plausibly, that a sentence has empirical consequences, and hence is meaningful, if adding it to some stock of propositions *changes which observation sentences follow from that stock of propositions.*

This definition seems to do well with the cases which proved problematic above. Let's examine them:

> *Sentences of mixed quantification, like 'Every liquid has a boiling point.'*

Consider the sentence 'x is a liquid.' By itself, it does not follow from this sentence that 'x has a boiling point' is true. But it *does* follow this sentence, along with our example sentence, than 'x has a boiling point' is true. So we get the good result that sentences like this one can be meaningful.

> *Other quantified sentences, like 'Most apples are red.'*

Consider the sentence 'These five items are all the apples.' From this, it does not follow that 'Three of these items are red.'; but it does follow if we add the premise 'Most apples are red.' Hence the latter claim qualifies as meaningful.

Statements about unobservables.

To see how this might work, note that we can have conditionals connecting claims about unobservables with observation statements. For example, consider 'If a substance is composed primarily of H_2O molecules, it will boil at 100°C.' From this, it does not follow that, for some specified x, 'x will boil at 100°C.' But it does follow if we add a statement about unobservables: 'x is composed primarily of H_2O molecules'; hence we can count this statement, correctly, as meaningful by Ayer's new criterion.

There is, however, a problem implicit in the way that we just handled the case of statements about unobservables which is devastating to Ayer's definition. This was pointed out by Isaiah Berlin. The problem is, intuitively, that when we go to decide whether a given sentence S is meaningful, we try to find some proposition or set of propositions $S*$ such that, when we add S to $S*$, we can derive some observation sentence not derivable from $S*$ alone; but *there are no restrictions at all put on what $S*$ can be.*

The result is that we can derive from Ayer's first definition the unwanted result that *every sentence* is verifiable, and hence meaningful. Consider the sentence

The absolute is lazy.

Is there any sentence which, combined with this sentence, entails an observation sentence it does not entail by itself? Of course; the conditional sentence

If the absolute is lazy, then this is red.

is such a sentence.

In general, for any sentence S, we can prove that S is meaningful by deriving from it together with the conditional $S \rightarrow O$ the observation sentence O.

5.2 Ayer's second definition

Accordingly, in the second edition of the book (1946) Ayer gave a new account of the principle of verifiability. His aim was to stick with the spirit of his 1935 definition, while placing restrictions on the class of 'supplementary propositions' which could be used to derive an observation statement from a given sentence.

To this end, he distinguished (p. 13) between direct and indirect verifiability, where these notions are defined as follows:

S is *directly verifiable* $\equiv_{df}$ (i) S is an observation statement or (ii) S entails in conjunction with a set of observation statements some observation statement not entailed by that set alone.

S is *indirectly verifiable* $\equiv_{df}$ (i) S entails in conjunction with a set $S*$ of statements some observation statement not entailed by that set alone and (ii) there is no statement in $S*$ which is not either (a) directly verifiable, (b) analytic, or (c) capable of being independently shown to be indirectly verifiable.

The central claim of the theory is then:

A sentence is meaningful if and only if it is either directly or indirectly verifiable.

5.3 Hempel's objection

Hempel's objection is stated in his "The Empiricist Criterion of Meaning." His argument assumes the following two plausible claims:

(i) A sentence is meaningful if and only if it is true or false.

(ii) For any sentence S, S is true iff $\neg S$ is false.

Now take any true meaningful sentence (it can be an observation sentence, or not) like 'This is red.' Consider the conjunction

This is red and the Absolute is lazy.

This sentence must be meaningful, since it entails the observation sentence 'This is red.' So, by assumption (i), it must be either true or false.

Suppose first that the sentence is true. Then it follows that 'The Absolute is lazy.' must be true as well, since the truth of a conjunction entails the truth of its conjuncts. But then, by principle (i), it must be meaningful.

Suppose then that the sentence is false. Then by principle (ii) its negation must be true; and, if both 'Not(This is red and the Absolute is lazy)' and 'This is red' are true, we know that 'Not(The Absolute is lazy)' must be true. But then we know by (ii) again that its negation, 'The Absolute is lazy' must be false. But then it follows from principle (i) that 'The Absolute is lazy.' is meaningful.

So again a formulation of the principle of verifiability leads to the result that all sentences are meaningful.

What are the prospects for denying one or both of the premises on which Hempel's argument rests?

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5.4   Church's objection

In his review of the second edition of *Language, Truth, & Logic*, Alonzo Church provided an argument for the same conclusion which made do with less substantial assumptions than (i) and (ii). (The following exposition of the argument follows that in Soames, pp. 289-90).

Assume the following:

> There are at least three observation sentences p, q, r, none of which entail either of the others.

Now we can take any sentence s – even a nonsense sentence like 'The Absolute is lazy' – and form the following complex sentence:

> **(1)** $(\neg p \ \& \ q) \vee (r \ \& \ \neg s)$

Now note that sentence (1) counts as directly verifiable. Proof: p is an observation sentence; the conjunction of sentence (1) with p entails r; and r is an observation sentence which (by hypothesis) is not entailed by p alone.

q is either entailed by sentence (1), or it is not. Either way, s will end up counting as meaningful.

Suppose first that q is *not* entailed by (1). Then, since q is entailed by the combination of (1) and s, and (1) is directly verifiable, s counts as indirectly verifiable.

Suppose now that q is entailed by (1) alone. Then q must be entailed by both of its disjuncts; in particular, it must be entailed by its right-hand disjunct, which we can label as sentence (2):

> **(2)** $r \ \& \ \neg s$

If (2) entails q, then the negation of s must be directly verifiable. Proof: if (2) entails q, then the conjunction of $\neg s$ with r entails q; but r is not (by hypothesis) entailed by r alone.

But since the negation of a directly verifiable statement is always indirectly verifiable, and hence meaningful, it follows that if q is entailed by (1), then s must be indirectly verifiable, and hence meaningful.

So whether or not q is entailed by (1), s is counted as meaningful – no matter what it is.