THE SEMANTIC STANCE OF SCIENTIFIC ENTITY REALISM

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I. Introduction

In this paper I will examine the role played by the notion of truth within theversion of scientific realism known as scientific entity realism. Scientific entityrealism is the thesis that the unobservable entities postulated by scientific theories are real. As such, it is an ontological thesis about the existence of certain entities. By contrast, scientific realism is often characterized as a thesis primarily involving the truth of theories. Sometimes scientific realism is expressed as the thesis that theoretical statements are intended as true descriptions of reality. Another favoured theme is that theoretical statements are objectively true or false in virtue of the way the world is independently of us. To such formulations it is usually added that the sense of 'true' required by scientific realism is the correspondence sense. To mark the contrast with scientific entity realism, I shall say that a formulation of scientific realism in terms of truth is a semantic version of scientific realism.

The question I will address here is whether scientific entity realism may fairly be regarded as a non-semantic thesis strictly distinct from semantic versions of scientific realism. More specifically, does scientific entity realism express or, without further assumption, entail a version of the thesis of scientific realism which involves the notion of truth?

II. Scientific Entity Realism

When a doctrine is labelled 'realist', this is in general because the doctrine lays claim to the reality of some entity or kind of entity. In

the case of scientific entity realism, what is claimed to be real are the unobservable entities (e.g. electrons, atoms) which are postulated by scientific theories. As such, scientific entity realism is opposed to doctrines such as phenomenalism and instrumentalism, which reduce theoretical entities to experience or regard them as fictions.

To say that theoretical entities are real is not just to claim that they exist. For a phenomenalist who holds that theoretical entities are to be construed as logical constructs out of experience may claim that, so construed, such entities exist. To exclude such construals, the mode of existence of theoretical entities must be specified. According to scientific entity realism, theoretical entities exist in their own right, without in any way depending on human thought or experience. They enjoy a mind-independent mode of existence which, contrary to phenomenalism, is not reducible to being the object or content of experience.

Scientific entity realism is therefore the doctrine that the unobservable entities postulated by scientific theories are real in the sense that they exist mind-independently. This may be expressed more simply as follows:

(ER) The entities postulated by science are real.

ER captures the idea that theoretical entities are neither phenomenal constructs nor mere predictive devices.

There are, however, a number of objections which may be raised against this formulation of entity realism. First, not all entities hypothesized by scientists are real, since some entities asserted to exist by scientists turn out not to exist. Second, not all theoretical descriptions of entities betoken genuine ontological commitments, since theories sometimes employ idealized or simplified descriptions. Third, scientific entity realists do not assert the existence of all entities postulated by theories, but only those entities for which there is good evidence. Given these objections, ER would need to be reformulated to accurately reflect scientific entity realism.

Nevertheless, for present purposes, there is no need to modify ER. This is because the question to be pursued here is whether realistic treatment of the theoretical entities of science engenders a thesis concerned with truth. Such a question is strictly concerned with the semantic implications of treating such entities as real. It may very

well be the case that realistic treatment is not warranted in the case of all theoretical entities. Yet the question of whether there are limitations on the extent to which realistic treatment of entities is justified is a separate issue from the question of the semantic implications of treating such entities as real. Thus, the latter question may be considered independently of the limitations entity realists may wish to impose on ontological commitments to theoretical entities.

It might further be objected that since ER concerns the postulation of entities by science, it is therefore a semantic thesis. For if the entities postulated by science are real, as ER suggests, then the existence claims made by theories in postulating such entities are true. Thus, a semantic thesis about the truth of the existence claims of theories does follow from ER. However, as I will argue in Section V, what follows is a very weak semantic thesis, which is not committed to any particular conception of truth.

III. Is Scientific Entity Realism a Thesis About Truth?

In this section I will discuss the relation between scientific entity realism and truth. My point of departure will be Michael Devitt's suggestion in his [1984] that realism is not a semantic doctrine. Devitt defines realism as follows:

> Tokens of most current commonsense, and scientific, physical types objectively exist independently of the mental. [1984, p. 34]

He then considers whether realism expresses a semantic thesis about truth:

> What has truth to do with Realism? On the face of it, nothing at all. Realism says nothing about truth nor even about the bearers of truth, sentences and beliefs ... Realism says nothing semantic at all. [1984, p. 34]

On the face of it, Devitt is right to claim that realism says nothing semantic. For realism, as defined by Devitt, is an assertion of the

mode of existence of certain entities. It is therefore an ontological thesis about the existence of things rather than a semantic thesis.

I will now attempt to develop Devitt's suggestion in the context of our formulation of scientific entity realism ER. Consider, first, whether ER says anything semantic. On the face of it, as Devitt might say, it does not: ER says only that some non-linguistic things are real. It is neither formulated in a metalanguage as a thesis about expressions of an object-language, nor does it apply a semantic predicate such as 'true' to any item capable of bearing semantic properties. In the absence of semantic and metalinguistic devices, ER would appear not to express a semantic thesis.

This alone may seem enough to establish that ER is a non-semantic thesis distinct from any semantic version of scientific realism. However, it might be objected that it is a trivial task to produce an alternative formulation of ER that is a semantic thesis. For the device of semantic ascent guarantees that any object-linguistic assertion has an equivalent metalinguistic formulation cast in terms of truth. In particular, semantic ascent on ER yields the following statement:

(ER*) The statement 'The entities postulated by science are real' is true.

ER* is itself true if and only if the entities postulated by science are real; i.e., if and only if ER is true. It is couched in a metalanguage and it contains the semantic term 'true'. Thus ER is equivalent to ER*, and ER* is a semantic thesis: it would seem to follow that ER is semantic.

This objection depends on the precise sense in which an object-linguistic assertion and the associated metalinguistic assertion of its truth are equivalent. Since such assertions agree in truth-value, they are at least materially equivalent. But mere material equivalence of ER and ER* hardly shows ER to be semantic. For statements the same in truth-value may differ radically with respect to content. Thus ER and ER* might be materially equivalent even though one is a semantic thesis and the other is not. Therefore, in order to establish that ER is semantic, the objection requires a stronger form of equivalence.

In fact, the truth-value of an assertion is necessarily the same as that of an assertion of its truth. Thus, the relation between such assertions is indeed stronger than material equivalence. Since it is

impossible for such assertions to diverge in truth-value, their relation is therefore one of logical (or "strict") equivalence. However, even the fact that ER and ER* are related by this stronger form of equivalence does not establish that ER expresses a thesis of the same kind as ER*. For, as I will now argue, despite the logical equivalence of ER and the semantic thesis ER*, ER is not semantic.

In the first place, it is a mistake to infer from the logical equivalence of ER and ER*, and the occurrence of 'true' in ER*, that ER is a semantic thesis. For this would imply that any statement whatsoever is semantic, since for any statement whatsoever there is a logically equivalent formulation of it which is an assertion of its truth. But to say that any statement whatsoever is semantic trivializes the idea of being semantic, and completely removes the point of describing something as a semantic thesis.

Against this, it might be countered that a pragmatic implication of the act of asserting a statement is that the statement asserted is put forward as true. All assertions are therefore tacitly semantic, since they assert the truth of a statement. But the question here is not whether the act of asserting a statement implies that it is put forward as true. Rather, the question is whether the content of the statement is itself a semantic thesis which involves in some way a semantic notion such as truth.

The main problem with the above argument that ER is semantic is that it rests on the assumption that logically equivalent assertions have the same meaning. Specifically, it assumes that because ER and ER* are logically equivalent they express the same thesis. The trouble is that logically equivalent assertions are not necessarily semantically equivalent. Assertions may be such that there is no possible condition in which one is true and the other false, yet they may differ in meaning.

In particular, it does not follow from the fact that ER and ER* necessarily converge in truth-value that they mean the same thing. ER is a statement about the unobservable entities of science, whereas ER* says that that statement is true. But to say that a statement is true is to assert something about the statement which is not expressed by the statement itself. It is to say of the statement that it has a particular semantic property, namely truth. But to say of a statement that it is

true is to say something different in meaning from saying of some entities that they exist. Given this lack of synonymy between ER and ER*, the entity realist's ontological thesis appears to be distinct from the semantic thesis derived from it by semantic ascent: ER is not a semantic thesis.

There is a further problem with use of semantic ascent to show that ER is semantic. If the logical equivalence of ER and ER* does not entail that ER is semantic, the only way semantic ascent can show ER is semantic is if it transforms its meaning into something semantic. The problem with this is that sentences are meaning invariant with respect to assertion of truth. That is, assertion of the truth of a sentence does not result in transformation of the meaning of the sentence of which truth is asserted. Thus, while semantic ascent on the entity realist's thesis yields an assertion of its truth, it does not alter its meaning. In particular, it adds nothing semantic to the statement of the thesis itself. So, despite semantic ascent, the meaning of ER once truth is attributed to it by ER* remains precisely the same, namely, a statement of the reality of certain entities.

IV. Truth and Existence Claims

In the previous section I argued that ER is neither rendered semantic by virtue of logical equivalence to ER*, nor transformed into a semantic thesis by semantic ascent. I conclude from this that semantic ascent on ER does not show it to express a semantic thesis such as ER*. However, while ER may not express a semantic thesis, it might seem to entail one. I now turn to the question whether ER entails a semantic thesis without further assumption.

Consider the thesis expressed by ER that the entities postulated by science are real. What follows if a particular entity postulated by a given theory is indeed real? Presumably, if a theory postulates the existence of an entity which in fact exists, what the theory says when it postulates that very entity is true. For while the theory may otherwise say some false things about the entity, the theory's existence claim regarding the entity is true, provided only that the entity exists.

In this way, it appears that the scientific entity realist's ontological thesis concerning the existence of theoretical entities

leads to a semantic thesis concerning the truth of the existence claims of theories. In particular, it seems to follow from the thesis that the entities postulated by science are real that the existence claims made by theories when they postulate such entities are true. In other words, ER entails

(ER_t) The existence claims of scientific theories are true. On the face of it, ER_t states a semantic thesis, since it refers to linguistic items and predicates truth of those items.

Since ER_t is an apparent consequence of ER, ER seems to entail a semantic thesis after all. But let us look more closely at the inference from ER to ER_t. The inference proceeds from the existence of theoretical entities, which ER asserts, to the truth of the existence claims made by theories in postulating such entities, which ER_t asserts. Such an inference requires an assumption about the relation between existence and the truth of existence claims. In particular, it assumes that if an entity exists, then the sentence which asserts its existence is true. But this is not a special assumption about the relation between existence and the truth of existence claims. Rather, it is a simple instance of semantic ascent from an object- linguistic sentence to an assertion of the truth of the sentence in a metalanguage.

Thus, while the thesis that the existence claims of theories are true is indeed a semantic thesis, it is not a thesis which follows from scientific entity realism without further assumption. Rather, ER_t is a consequence of ER which follows from ER only by means of semantic ascent. Strictly speaking, therefore, the scientific entity realist's thesis of the reality of theoretical entities does not immediately entail a semantic thesis about the truth of theories.

V. Semantic Ascent and the Theory of Truth

Given semantic ascent, ER entails a semantic thesis which involves the notion of truth. From this it may seem a short step to a more standard version of scientific realism which incorporates a substantive conception of truth, such as a correspondence theory. However, semantic ascent is not tied to any particular theory of truth. Thus, as I will now argue, any semantic implication arising from entity realism via semantic ascent is similarly uncommitted with regard to the nature of truth.

Let us first consider the basis of semantic ascent. The device of semantic ascent is derived from the standard disquotational truth schema, or "T-scheme":
'P' is true if and only if P.

To ascend semantically from the assertion of a sentence to the assertion of the truth of the sentence is to proceed in accordance with the conditional "If P, then 'P' is true". Since this conditional follows from the T-scheme, semantic ascent is licensed by the T-scheme.

The trouble is that views diverge widely on the relation between the T-scheme and the concept of truth. While there are those who regard the T-scheme as a definition of truth, others regard it as a minimal constraint which any complete concept of truth must satisfy. Thus, to endorse the T-scheme is not to endorse any particular theory of truth.

Semantic ascent suffers from a similar ambiguity. It takes over from the T-scheme the same imprecision about the nature of truth. As a result, the semantic thesis derived from entity realism via semantic ascent does not specifically commit such realism to any particular theory of truth. So, while it is indeed a thesis about the truth of certain theoretical claims, there is no indication what truth is.

To see this, it is sufficient to note that the T-scheme is common ground to all the standard theories of truth. The disquotational, pragmatic, coherence, verificationist and correspondence theories of truth all agree that truth, whatever it is, must conform to the T-scheme. The disquotationalist claims that there is no more to truth than disquotation, so that the T-scheme exhausts the meaning of the word 'true'. The remaining truth-theories differ on what is to be added to the T-scheme in order to fully specify what 'true' means. The pragmatist says to be true is to be useful, the coherence theorist that it is coherence with a system of beliefs, the verificationist that it is to be verified, and the correspondence theorist says that it is a relation between sentences and extralinguistic items.

Since semantic ascent follows from the T-scheme, and the T-scheme is common ground to the major truth-theories, it follows that semantic ascent is also common ground to the major truth-theories. Given this, the semantic thesis derived from scientific entity realism constitutes an uninformative thesis about truth. Since it is arrived at

by means of the device of semantic ascent, which is common to all the best-known theories of truth, it is committed to no particular theory of truth.

VI. Three Objections

In light of the apparent neutrality of the T-scheme, the semantic stance of scientific entity realism seems minimal indeed. For, beyond complying with the T-scheme, the semantic thesis to which it gives rise via semantic ascent is perfectly neutral with regard to the nature of truth. However, the idea that entity realism combined with semantic ascent yields no specific interpretation of truth is bound to be controversial. In this section I will consider three objections that are likely to arise.

Objection one: Scientific entity realism is not consistent with all theories of truth. For example, it is inconsistent with the coherence theory, which makes existence contingent on relations between beliefs, in violation of the mind-independence aspect of realism. As a result, it is impossible to combine all truth-theories with entity realism, which is not therefore neutral with respect to theory of truth.

Reply: The point of my argument in the last section was not that the entity realist can embrace any theory of truth at all. The point, rather, was that to embrace both entity realism and semantic ascent is not yet to embrace any particular theory of truth. Absent further argument, a gap remains between semantic implications of entity realism derived via semantic ascent and versions of scientific realism which incorporate a substantive conception of truth.

Objection two: If entity realism is inconsistent with certain truth-theories, it cannot be denied that entity realism is a semantic thesis which involves a definite view of truth. For, unless entity realism says something specific about truth, it cannot disagree about the nature of truth with any theory of truth.

Reply: The inconsistency between entity realism and some theories of truth is not due to disagreement about the nature of truth. It is due, rather, to conflict between a consequence of certain truth-theories with respect to the existence of entities and the mind-independence aspect of entity realism. That is, the conflict is due, not

to what entity realism says about truth, but to what a truth-theory says about existence. Thus it does not follow from the inconsistency of entity realism with a truth-theory that entity realism is committed to any specific conception of truth.

Objection three: Scientific entity realism requires a correspondence theory of truth. This is because of the commitment of entity realism to the mind-independent existence of theoretical entities. Given the contrast between mind-independent entities and theoretical existence claims couched in language, the truth of such claims must consist in a correspondence relation between linguistic and extra-linguistic items.

Reply: It is certainly the case that, if entity realism is to be combined with a theory of truth, a theory of truth is required that is consistent with the mind-independent existence of theoretical entities. But while this requirement may reduce the range of truth-theories consistent with entity realism, it need not reduce the range of suitable candidates to the correspondence theory alone. Theories of truth which tie truth closely to epistemic evaluation fall foul of the independence aspect of entity realism. However, there exist theories of truth apart from the correspondence theory, which do not identify truth with an epistemic property, and which are therefore consistent with mind-independence.

Moreover, even if entity realism did require a correspondence theory, it would not follow that 'true' occurs in its semantic consequence in a correspondence sense. The semantic consequence is generated from entity realism by semantic ascent. Semantic ascent is subject only to the constraint of the T-scheme, which is neutral with regard to theory of truth. Therefore, the term 'true' occurs in it as a term that is neutral between the various truth-theories.

VII. Conclusion

In this paper I have considered the question whether scientific entity realism is a thesis about the truth of theories. I rejected the attempt to render it semantic by embedding it within an assertion of its own truth. I argued that semantic ascent on the existence claims of theories yields a thesis concerning the truth of such claims. I then noted that this semantic thesis does not follow from the statement of

entity realism without further assumption. I observed that the resulting semantic thesis is noncommittal about the nature of truth. Finally, I defended this observation against three objections which suggest that entity realism has specific truth-theoretic commitments.

I conclude that scientific entity realism is not to be identified with a semantic thesis. It does not itself assert, nor does it immediately entail, a thesis about the truth of theories. Moreover, while a thesis involving truth does follow from entity realism by means of semantic ascent, the entity realist is not thereby committed to any specific account of truth. Certainly, the minimal semantic thesis derived via semantic ascent does not itself provide support for a realist seeking to incorporate some specific truth-theory within scientific realism. Such a realist must find grounds independent of scientific entity realism for embracing any particular theory of truth.

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