

THEORY AND OBSERVATION : NOLA VERSUS POPPER

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Empiricist philosophers used to distinguish observational predicates from theoretical predicates and observation statements from theoretical statements. The main point of the distinction was epistemological : the observation statements were those whose truth or falsity could be ascertained directly by using our senses; they provided the basis against which we could evaluate other statements. Observation statements were therefore particular statements whose predicates were all observational predicates. If 'red', 'book' and 'table' are all observational predicates, then the statement "There is a red book on the table now" is an observation statement. Once we ascertain from experience that this statement is true, then we can use it to show the falsity of statements like "Nothing is on the table now" or "All books are blue".

Modern philosophers say that this is all wrong. Now our slogan is that *observation is theory-laden*. Without wishing to dispute contemporary wisdom, I want to find out exactly what the slogan means and to evaluate some of the arguments in favour of it.

Our problem is a very old one and it is well to remind ourselves, however briefly and dogmatically, of its ancient lineage. The ancient sceptics disputed the epistemological claim that by using our senses we can come to be absolutely sure of the truth-values of observation statements. They produced arguments based on the possibility of sensory illusion, or hallucination, or dreaming. The standard response to such arguments was to try to guarantee the infallibility of experiential reports by turning them into reports about how things appear or seem to observers. Hence the view that what we *immediately* experience are ideas or appearances or sense-

data occurring in our own minds, and that statements about things in the outside world are inferences from the immediate data of experience. We might call this standard response *idea-ism*, in deference to its Lockean ancestry. The price paid for the (alleged) infallibility of our knowledge of our own ideas was to widen the gap between the experiential foundation for knowledge and the knowledge that was supposed to be erected upon it. Indeed, it became difficult to prevent *idea-ism* from turning into *idealism*, into the view that only ideas in the minds of observers (and 'logical constructions' therefrom) really exist. And by invalid arguments whose subtleties need not now concern us, philosophers did turn *idea-ism* into *idealism* of various forms.

The collapse of a naive realist theory of perception under sceptical attack does not force us into *idea-ism*. Instead, we can retain the realism of naive realism, but renounce as naive the infallibility of the process. The options are something like this:

Naive realism : We perceive external objects as they really are.

Idea-ism : We perceive ideas as they really are.

Critical realism : We perceive external objects not necessarily as they really are.

(Notice that on a critical realist view of perception *hallucinations* are not cases of perception at all, but cases where the subject thinks he perceives something but does not really do so. The same applies to *dreams*, in which we do not perceive things either but may, while we dream, merely think that we do. The ancient sceptical arguments retain whatever force they originally had : but what the possibility of hallucination or dreaming now shows is that we cannot ever be absolutely sure on any occasion that we are perceiving at all. Illusions are different : they remain cases of perception, but cases where we do not perceive external objects as they really are.)

Now let us return to the modern slogan : observation is theory-laden. The slogan cannot be *literally* true. If anything is 'theory-laden' it cannot be observation but rather statements made on the basis of observation. Observation is simply an act that humans and other creatures perform, a special kind of event or process occurring in the nervous systems of humans and other creatures. How can an act or event or process be 'theory-laden'? Observations can occur in (things can be observed by) creatures whose theories about what they observe differ widely or by creatures who have no theory at

all about what they observe. If our theories differ, we will *report* what we observe differently; and if we have no theory at all we will not be able to *report* anything at all about what it is that we have observed. We can put the point using the familiar distinction between *seeing* and *seeing that* (more generally, between *perceiving* and *perceiving that*, or between *observing* and *observing that*). It is not seeing (or perceiving or observing) which might be theory-laden, but rather seeing (or perceiving or observing) that something is the case. The cat may see the TV set, as shown by his avoiding it while chasing the mouse. What the cat presumably does not do is see that it is a TV set, because to do that the cat must know what a TV set is or possess the concept of a TV set. Similarly, a person who has had no experience of TV sets and lacks the concept may be able to see the TV set perfectly well — but such a person will not be able to see it *as* a TV set or see *that* it is a TV set.

Now as Martin Frické shows in his paper in this volume, neglect of this point has produced a lot of bad philosophy. It has led philosophers to claim that observers with different concepts or theories *see different things*. The Westerner sees the TV set but the Kalahari bushman does not. And this in turn has led to the idea that what is in the world for us to see depends upon what concepts or theories we possess. Thus metaphorical talk about how the 'world of the Westerner' differs from the 'world of the Kalahari bushman', talk which does no harm when it is merely metaphorical, comes to be taken literally and to do a great deal of harm. It leads to *conceptual idealism*, in which the real world disappears and is supplanted by a series of different worlds whose varying contents are a function of the concepts and theories of those who live in them. This can entertain: as well as familiar worlds with TV sets in them, there are exciting worlds containing spooks and spirits, ghosts and witches, not to mention stationary earths, substances containing phlogiston, and whatever else can be 'observed' by people with false beliefs. But all this, though entertaining, is just philosophical rubbish¹.

Setting this fashionable rubbish aside, let us ask how and in what respect statements reporting what we observe are theory-laden. A most influential argument to this effect was proposed by Sir Karl Popper. It has been a persistent theme of his writings and it has been widely accepted. But it has been criticised most interesting-

ly in Robert Nola's paper in this volume. I shall present Popper's argument, consider Nola's criticism of it, and see whether anything of Popper's position can be rescued from Nola's attack.

Let us begin with some passages from Popper which represent his view and his argument for it² :

... we can utter no scientific statement that does not go far beyond what can be known with certainty 'on the basis of immediate experience'. (This fact may be referred to as the 'transcendence inherent in any description'.) Every description uses *universal* names (or symbols, or ideas); every statement has the character of a theory, of a hypothesis. The statement, 'Here is a glass of water' cannot be verified by any observational experience. The reason is that the *universals* which appear in it cannot be correlated with any specific sense-experience. ... By the word 'glass', for example, we denote physical bodies which exhibit certain *law-like behaviour*, and the same holds for the word 'water'. Universals cannot be reduced to classes of experiences ...

There is no sharp dividing line between an 'empirical language' and a 'theoretical language': *we are theorizing all the time*, even when we make the most trivial singular statement... Admittedly, if we say 'All swans are white', then the whiteness we predicate is an observable property; and to this extent, a singular statement such as 'This swan here is white' may be said to be based on observation. Yet it transcends experience — not because of the word 'white', but because of the word 'swan'. For by calling something a 'swan', we attribute to it properties which go far beyond more observation — almost as far as when we assert that it is composed of 'corpuscles'. Thus not only the more abstract explanatory theories transcend experience, but even the most ordinary singular statements. For even ordinary singular statements are always *interpretations of 'the facts' in the light of theories*. (And the same holds even for 'the facts' of the case. They contain *universals*; and universals always entail a *law-like* behaviour.) ... words like 'glass' or 'water' are used to characterise the *law-like behaviour* of certain things; which may be expressed by calling them 'dispositional words'. Now since every law transcends experience ... every predicate ex-

pressing law-like behaviour transcends experience also; this is why the statement 'this container contains water' is a testable but non-verifiable hypothesis, transcending experience. ... since *all universals are dispositional*, they cannot be reduced to experience. We must introduce them as undefined terms, except those which we may define in terms of other non-experiential universals (such as 'water' if we choose to define it as 'a compound of two atoms of hydrogen and one of oxygen').

That *all* universals are dispositional is often overlooked, owing to the fact that universals can be dispositional in varying degrees. Thus 'soluble' or 'breakable' are clearly dispositional in a higher degree than 'dissolved' or 'broken'. But it is sometimes not realised that even 'dissolved' and 'broken' are dispositional. A chemist would not say that sugar or salt has *dissolved* in water if he did not expect that he could get the sugar or the salt back, by evaporating the water. Thus 'dissolved' denotes a dispositional state. And as to 'broken', we need only consider how we proceed *if we are in doubt* whether or not a thing is broken — something we have dropped, perhaps, or say, a bone in our body : we test the behaviour of the thing in question, trying to find out whether it does not show a certain undue mobility. Thus 'broken', like 'dissolved', describes dispositions to behave in a certain regular or law-like manner. Similarly, we say of a surface that it is red, or white, if it has the disposition to reflect red, or white, light; and consequently the disposition to look in daylight red, or white. In general, the dispositional character of any universal property will become clear if we consider what tests we should undertake if we are in doubt whether or not the property is present in some particular case.

Thus the attempt to distinguish between dispositional and non-dispositional predicates is mistaken, just as is the attempt to distinguish between theoretical terms ... and non-theoretical or empirical or observational ... terms ...

In my opinion *all universals are dispositional*. If 'breakable' is dispositional, so is 'broken', considering for example how a doctor decides whether a bone is broken or not. Nor should we call a glass 'broken' if the pieces would fuse the moment they were put together : the criterion of being broken is

behaviour *under certain conditions*. Similarly, 'red' is dispositional: a thing is red if it is able to reflect a certain kind of light — if it 'looks red' in certain situations. But even 'looking red' is dispositional. It describes the disposition of a thing to make onlookers agree that it looks red. No doubt there are degrees of dispositional character: 'able to conduct electricity' is dispositional in a higher degree than 'conducting electricity now' which is still very highly dispositional. These degrees correspond fairly closely to those of the conjectural or hypothetical character of theories... We may express all this by saying that the customary distinction between '*observational terms*' (or '*non-theoretical terms*') and '*theoretical terms*' is mistaken, since all terms are theoretical to some degree, though some are more theoretical than others: just as we said that all theories are conjectural, though some are more conjectural than others.

The argument in these passages, stripped to its essentials, might be set out as follows:

- (1) Every descriptive statement contains universal terms;
- (2) Every universal term is *dispositional*, that is, every universal term denotes, characterises or entails law-like behaviour;
- (3) In describing any object using a universal term we commit ourselves to the prediction that it will display the law-like behaviour associated with that universal term;
- (4) If such a prediction turns out to be mistaken, then we may, perhaps must, declare false our description of the object as falling under the universal term;
- (5) Hence any observation statement, in which as a result of sense-experience we describe some object using a universal term, transcends experience and has the status of a falsifiable hypothesis.

I have left (4) here ambiguous at a crucial point ("may, perhaps must, declare false"), for reasons which will become apparent. But first, let us illustrate the argument with a simple example.

Suppose the law-like behaviour (or part of it) denoted or characterised or entailed by the term 'x is water' is 'x will quench your thirst if you drink it'. Then if I look around and declare "Here is a glass of water", I commit myself to the prediction that the contents of the glass will quench my thirst if I drink them. If this prediction turns out to be false, as it might, then I may (perhaps must)

reject my observation report and say that the glass did not contain water after all. Hence my so-called 'observation report' is revisable in the light of possible future experience — in short, it is a falsifiable hypothesis.

There is a peculiarity in Popper's formulations which is mentioned by Nola. It is odd to speak, as Popper does, of universal terms *denoting* or *characterising* law-like behaviour, and even odder to speak of universal terms *entailing* law-like statements depicting that law-like behaviour. Nola explicates Popper's claim thus: associated with each universal term T there is a sentence of the form

$$(F) \quad (x) (Tx \supset L_1(x) \& L_2(x) \& \dots \& L_n(x))$$

where the law-schemas $L_i(x)$ are the ones 'entailed' by using the term T of the object x . Thus, reverting to the simple example just given, if Tx is "x is water", then $L_1(x)$ might be "x quenches thirst if drunk".

I now turn to Nola's criticism. He claims that Popper's argument rests upon an unacceptable theory about the *meaning* of universal terms, the so-called *law-cluster theory*. According to this theory, the *meaning* of a universal term is given by the cluster of laws (or law-like statements) associated with it. Thus a statement of the form (F) specifies the *meaning* of the term T — such a statement is a Carnapian 'meaning postulate' and it is analytically true. And it is because the universal term 'x is water' *means* 'x will quench thirst if drunk' that a person who says "Here is a glass of water" commits himself to the prediction that the contents of the glass will quench his thirst if he drinks them. If the prediction turns out to be false, the person must renounce the statement "Here is a glass of water". For he cannot (without changing the meaning of the term 'water') renounce the analytic truth "Water quenches thirst if drunk". To put it another way, since the prediction follows from the observation statement "Here is a glass of water" by itself (given what the term 'water' means), if the prediction is found to be false then by *modus tollens* the single non-analytic premise from which it follows must be false also. (On Nola's interpretation, the Popper's argument can be strengthened by putting 'must' instead of 'may' in (4).)

Nola criticises the law-cluster theory on several counts. First, it commits us :

... to an unacceptably strong *a priori* view of much of science that one would have thought was empirical. There would be no need for us to perform the labour of scientifically investigating bodies, such as water or glass, to arrive at the laws governing their behaviour; all we need to do is draw out the entailments contained in the senses expressed by the terms 'water' or 'glass'. This seems plainly wrong ... (p. 28).

Second, our theories change. If we insist on incorporating these changing theories into the meaning of the term concerned, then meanings will change also and our changing theories will not be competing theories about the same thing. Aristotle thought water was an element comprising the qualities of coldness and moisture, Cavendish and Priestley thought water could be produced by phlogisticating dephlogisticated air, Lavoisier and Dalton thought water was a compound of atoms of hydrogen and oxygen. Did Aristotle, Cavendish and Dalton all mean something different when they said that some glass was full of water? Does a person ignorant of any of their theories mean something different again (assuming he can mean anything at all)? Surely it is more sensible to hold that our beliefs about the nature of water have changed but that the meaning of the term 'water' has not. Finally, some of our changing theories about water have turned out to be false. If the false theories of Aristotle or Cavendish are built into the meaning of the term 'water', then nothing falls under that term. And hence whenever Aristotle or Cavendish asserted that some glass was full of water they asserted a falsehood. Surely it is more sensible to maintain that, despite their false views about the nature of water, Aristotle and Cavendish might sometimes have asserted truths about the contents of glasses?

(This last absurdity can be avoided, but only at the expense of an even greater one. We might maintain that in Aristotle's time the world did, after all, contain glasses of water *in Aristotle's sense* ('Aristotelian water'). Glasses of Aristotelian water ceased to exist when Aristotle's theory was superseded, to be supplanted first by glasses of 'phlogistic water', and finally by glasses of H_2O . In this way the law-cluster theory of meaning, together with the charitable

principle that the humdrum statements of our ancestors were not all false, leads us once again to *conceptual idealism* : the view that what exists in the world depends upon our ideas about the world, and changes as those ideas change.)

I agree with Nola that the law-cluster theory is false. (At least, I reject the extreme form of the theory whereby *any* accepted generalization employing the term *T* figures in a meaning postulate of the form (F) for the term *T*. A less extreme version of the theory will be mentioned later.) I am not sure that Nola is right to attribute the law-cluster theory to Popper, though it must be admitted that this is a possible interpretation of the passages I cited earlier. But Popper declares repeatedly that "words and the problems connected with their meaning are unimportant"³, and it would be odd to find him basing one of his central theses on a theory about the meaning of universal terms. (It would be odd but it would not be impossible. When Popper says that problems connected with the meanings of words are unimportant, he usually is talking about the undesirability of quarrelling about the real or essential meaning of some word. But many of those who interest themselves in the *philosophical* problems connected with the meanings of words would agree with Popper here, despite what he sometimes seems to suppose.) Furthermore, we can find places where Popper argues specifically against what has come to be called the law-cluster theory. Thus he criticises the view (he calls it the conventionalist view) that natural laws are definitions of the theoretical concepts they contain. He says that for him "The melting point of lead is about 335° C" is not a partial definition of the concept 'lead' but rather a synthetic and falsifiable assertion⁴. Finally, as I will show later, the law-cluster theory of universal terms would commit Popper to a form of the verifiability theory of meaning, a theory which he has consistently rejected.

There is a more interesting problem than this exegetical one. The more interesting problem is this : how much of Popper's position can be rescued if we do not rest it upon the law-cluster theory of universal terms ? I think that an alternative interpretation of Popper's argument is possible and that his epistemological thesis, though not his semantical thesis, can be retained. By the 'epistemological thesis' I mean the thesis that all statements are conjectural, though some are more conjectural than others. By the 'semantical thesis' I mean the thesis that all universal terms are dispositional, though some are more dispositional than others.

This second interpretation is pretty obvious given what has been said so far. It consists simply in taking the law-like statements employing the term T to be synthetic rather than analytic statements. It consists, in short, of taking any sentence of the form (F) to be a synthetic assertion, which might be false if something falls under the term T while none of the law-schemas employing T in the consequent happen to be true of it. On this interpretation, an observation statement may still have predictive implications and may still be blamed if these predictions turn out to be false. Suppose (reverting to our simple example) that a person who asserts "Here is a glass of water" also believes (though he may not articulate this belief) that water quenches thirst if drunk. Such a person is committed to the prediction that the contents of the glass will quench his thirst if he drinks them, for this prediction follows (enthymematically) from his observation statement and his (unstated) general hypothesis. And if this prediction turns out to be false, the person must either renounce his general belief or renounce his observation report. Since he *may* choose the latter course, his observation statement is corrigible in the light of future experience, and has the status of a falsifiable hypothesis.

Most of Popper's characteristic theses can be retained on this second interpretation of his position. "Observation is theory-laden" simply means that in describing what we observe we must use terms which also figure in our general theories. "Observation is always interpretation of the facts in the light of theory" simply means that in describing what I observe using a universal term T I interpret it as something which will behave in accordance with whatever general beliefs I hold employing the term T . "All terms are theoretical, but some are more theoretical than others" simply means that every universal term figures in some general hypotheses, and that some figure in more hypotheses (or in more sweeping or more precise hypotheses) than others. Only the dictum "All terms are dispositional, but some are more dispositional than others" is mistaken: to be a theoretical term and to be a dispositional term are not, *pace* Popper, the same thing.

Before arguing this last point, let us note that Popper's position interpreted in this second way might seem more vulnerable than it is on Nola's interpretation. First of all, it rests on the assumption that whenever we describe an entity using a universal term we also

accept some general hypothesis which employs that term. This assumption might be disputed. Norman Malcolm seems to dispute it when he says, concerning the observation statement "There is an ink-bottle here" uttered in appropriate circumstances, that it lies "beyond the reach of doubt" and provides a fixed point of certainty :

There is nothing whatever that could happen in the next moment or the next year that would by me be called *evidence* that there is not an ink-bottle here now. No future experience or investigation could prove to me that I am mistaken⁵.

What if Malcolm reaches for his ink-bottle and his hand passes right through it? He insists that he would still not have been mistaken in saying "There is an ink-bottle here"⁶. So when Malcolm talks about humdrum objects like ink-bottles he does not even believe that they are solid objects which will resist the motion of his hand. But if one's head is as empty of general *beliefs* as this, why bother to talk in general *terms* at all (and how else can one talk)? Most of us, when we employ general terms, do so precisely *because* we believe that entities properly so described behave in a certain regular fashion. After all, this gives the enterprise of categorizing the world its point: it enables us, in virtue of the general beliefs we hold, to anticipate the future behaviour of the entities so categorized.

Perhaps we are being unfair, and Malcolm really wishes to exploit a second apparent weakness in Popper's position as here interpreted. This arises from the fact that Popper can no longer say that we *must* revise our observation statement if some prediction which follows from it and a general belief turns out to be false. We may always revise the general belief (since it is not here construed as an analytic truth) and retain the observation report. This suggests that Popper's conclusions can be rebutted if we say that in circumstances like this we must *always* reject general beliefs rather than particular observation statements. This seems to be John Austin's view (and it may have been Malcolm's view also). Austin says, concerning the observation statement "There is a goldfinch in the garden" :

If we have made sure it's a goldfinch, and a real goldfinch, and then in the future it does something outrageous (explodes,

quotes Mrs. Woolf, or what not), we don't say we were wrong to say it was a goldfinch, *we don't know what to say*... When I have made sure it's a real goldfinch (not stuffed, corroborated by the disinterested, etc.) then I am *not* "predicting" in saying it's a real goldfinch, and in a very good sense I can't be proved wrong whatever happens. It seems a serious mistake to suppose that language (or most language, language about real things) is 'predictive' in such a way that the future can always prove it wrong. What the future *can* always do, is to make us *revise our ideas* about goldfinches or real goldfinches or anything else⁷.

Now all but the last sentence of this suggests that when Austin talks about goldfinches his head is as empty of general beliefs as is Malcolm's when he talks about ink-bottles. But in the last sentence Austin admits that he has some 'ideas' about goldfinches (they don't explode, quote Mrs. Woolf, or what not), and says that if the goldfinch in his garden violates any of these 'ideas' (if it explodes, quotes Mrs. Woolf, or what not) then he will revise them. What he will never do, it seems, is admit that he was wrong to say "There's a goldfinch in the garden". Well, the Austin strategy is logically possible, but I doubt that it is sensible. The senses being fallible (see the old sceptic arguments once again), Austin's strategy threatens to empty our heads of general ideas about anything, and using general terms would have as little point as it would if we had entertained no such ideas in the first place.

A third apparent weakness of Popper's position, as here interpreted, is that it contains no theory at all about the *meaning* of universal terms and that this leaves a gap which must be filled. I have agreed with Robert Nola in rejecting the *extreme* law-cluster theory according to which universal terms are defined (*via* a sentence of the form (F)) by the *entire* body of theory in which the term figures. Nola himself favours another extreme view, the Kripkean view that universal terms have no meaning (in the sense of Fregean sense) but function like proper names as denoting expressions. This second theory has its own difficulties (of which Robert Nola is more aware than most) about how the denotation or reference of universal terms gets fixed in the absence of defining conditions for them. In between these two extremes there is the traditional Mill-Frege theory according to which each universal term has an intension or sense (which fixes its extension or reference) but figures also in synthetic propositions. The chief difficulty with this theory is whether we can

draw a non-arbitrary line between statements which are analytically true in virtue of the sense and synthetic ones which are not. (It will not do to say that the defining conditions will be those found against the term in a dictionary : notoriously, dictionary definitions may be synthetic, falsifiable, indeed, false. Nor will it do to say that the defining conditions will be those specified by expert users of the term : notoriously, experts may christen as 'definitions' principles whose contingent truth they wish to take for granted.) I am not sure that a failure to commit oneself to any of these options really is a weakness in the present context. For what I have shown is that all of Popper's characteristic theses about the theory-laden character of observation statements can be maintained *whatever* theory of meaning we adopt⁸.

What I have just said is not quite true. There remains Popper's dictum that all universals are dispositional, that the distinction between dispositional and non-dispositional terms is illusory. This dictum does, I think, rest upon an unacceptable law-cluster theory of meaning, and must be rejected along with that theory. Popper contrasts an admittedly dispositional term like 'soluble' with an apparently non-dispositional term like 'dissolved' and argues thus :

A chemist would not say that sugar or salt has *dissolved* in water if he did not expect that he could get the sugar or the salt back, by evaporating the water. Thus 'dissolved' denotes a dispositional state⁹.

This argument is invalid as it stands. Its premise might be true (and I shall grant its truth) while its conclusion is false. The extra premise which we need to render the argument valid is that the chemist's expectation derives from the *meaning* he attaches to the word 'dissolved'. In particular, Popper is clearly assuming that the statement "Any dissolved substance can be recovered by evaporation" is an analytic truth. For if this statement is only contingently true, then a chemist who accepts it will have the expectation that Popper attributes to him, yet the term 'dissolved' will *not* denote the dispositional state of being recoverable by evaporation. Facts about the chemist's expectations do not by themselves establish that the term 'dissolved' *means* (in part) 'recoverable upon evaporation'. In short, this argument for the dispositional character of the term 'dissolved' must, if it is to be valid, assume what it sets out to prove.

What holds for this particular example holds quite generally. Popper's general argument runs as follows :

In general, the dispositional character of any universal property will become clear if we consider what tests we should undertake if we are in doubt whether or not the property is present in some particular case¹⁰.

Let U denote some universal property. Then a statement of the form "Under conditions C , an object has U if and only if it does X " describes a *test for the presence of U* . I will assume, with Popper, that a collection of statements of this form are associated with every universal term U . This means that anyone who ascribes U to some object, and who accepts any of these statements, will be logically committed to a battery of predictions of the form "Under conditions C , this object will do X ". And to repeat, any of these predictions might be refuted, compelling such a person *either* to give up his claim that the object has U *or* to reject the test-procedure in question as inadequate. But this is not to say that U means (in part) "under conditions C , will do X ". For this to be the case, each description of a test-procedure for the presence of U must be deemed *necessarily* true, true by virtue of the meaning of the term U . But this is to accept (at least as far as descriptions of test-procedures are concerned) the cluster theory of the meaning of universal terms.

This theory is implausible, considering that test-procedures are constantly being refined and improved, and entirely new ones discovered. X-rays provided doctors with a new procedure for determining whether a bone is broken. The addition of this procedure to medical science certainly meant that the statement "This bone is broken" came to have new predictive implications about what would be revealed if an X-ray were taken of the bone. But did this discovery *change the meaning* of the term 'broken' as applied to bones? I think not. A contemporary doctor who says "This arm is broken" means precisely the same as his nineteenth century predecessor — it is simply that he has a new way of testing the truth of his assertion.

The theory is implausible on another count. Suppose that we have *two* test-procedures for the presence of U : "Under conditions C , an object has U if and only if it does X " and "Under conditions

D, an object has *U* if and only if it does *Y*". Now it cannot be that *both* of these descriptions of test-procedures are true by virtue of the meaning of the term *U*. For taken together they entail the falsifiable assertion that if an object did *X* under conditions *C* then it will do *Y* under conditions *D*. It seems arbitrary to say that one of the test-procedures is analytic and the other not. But the only way to preserve the analyticity of both of them is to maintain that different meanings are specified for the term *U* by the two test-procedures, so that the entailment above mentioned rests on the fallacy of equivocation. In short, if test-procedures are analytically connected with universal terms, then there cannot be two of them for the same term. Surely it is more plausible to maintain that *neither* test-procedure is analytically linked with the universal term.

Popper always opposed the verifiability theory of meaning, the theory that the meaning of a statement is the method of its verification. Yet in establishing his thesis that all universals are dispositional, he appeals to something close to a verifiability theory of their meaning. For how else are we to characterize the view that the meaning of a universal term is given by the collection of test-procedures that we use when applying that term?

I conclude that this thesis of Popper's must be rejected, and that there *is* a distinction between dispositional and non-dispositional terms. Indeed, I am not sure that Popper's view here is even coherent. 'Breakable' presumably means 'under conditions *C*, will become broken'. More generally, 'X-able' presumably means 'under conditions *C*, will become *X*'¹. But if *X* is *also* dispositional, and means 'under conditions *D*, will become *Y*', and *Y* is *also* dispositional, then we seem to be involved in an infinite regress. It seems that if any term is to be dispositional, some other term must be non-dispositional. There is a semantic dependence between the two kinds of term. (I do not think that the *semantic* dependence of dispositionals upon non-dispositionals has any *metaphysical* implications. It could be that whenever a dispositional predicate is true of some entity, then that entity will possess some non-dispositional property in virtue of which it satisfies the dispositional predicate. For example, it could be that an object is breakable if and only if it possesses a molecular constitution of a certain kind. But this would be an interesting physical *discovery*: 'breakable' would not *mean* possessing the molecular constitution in question.)

I have, then, two conclusions. First, Popper's contention that all universals are dispositional does rest upon an unacceptable law-cluster theory of the meaning of universal terms and ought to be rejected. Second, Popper's defence of the theory-laden character of observation statements and their consequent fallibility need not rest upon any such theory of meaning and ought to be accepted. Observation is theory-laden all right, and we do not need an unacceptable theory of meaning to show that it is.

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NOTES

¹ Lest it be lost to posterity, let me here record the Kiwi response to a visiting Californian Professor who was 'into multiple realities'. At our conference he first objected to one speaker's Quinean talk about 'rabbit-slices', apparently because it displayed a want of due regard for dumb animals. Next he objected to another speaker's robust declaration that hobbits did not exist, saying that they were real enough for Tolkein. Finally, he gave a paper of his own in which he asked, *inter alia*, why God should not be a black woman. All this provoked a limerick competition which was won with the following little masterpiece :

There was a young man from Pomona,
Metaphysically he was a loner,
The world he inhabits,
Has hobbits and rabbits,
And a God who's not in,
When you phone her.

² These three passages are to be found in Popper's *The Logic of Scientific Discovery*, pp. 94-5 and 423-5, and in his *Conjectures and Refutations*, pp. 118-9.

³ See, for example, *The Logic of Scientific Discovery*, p. 441.

⁴ *Logic of Scientific Discovery*, p. 79, note 2. As Nola points out, Popper's views are far from clear. While insisting that "The melting point of lead is about 335^o C" is synthetic and falsifiable, he also tells us that it "asserts, among other things, that an element with a given atomic structure (atomic number 82) always has this melting point, whatever name we may give to this element" (*loc. cit.*). Now

of course, the statement in question asserts no such thing *unless* we take the statement "Lead is an element with atomic number 82" to be a definition of the term 'lead'. So Popper does seem here to endorse a traditional theory whereby *some* law-like generalizations about lead specify the meaning of the term and are analytic, while others do not and are synthetic. The difficulty with this view is, of course, to justify treating "Lead is an element whose melting point is 335^o C" in one way and "Lead is an element whose atomic number is 82" in a radically different way. (This is the problem of making good the analytic-synthetic dichotomy once again.) Given his repeated insistence that we should not quarrel about the 'real' or 'essential' meaning of words, Popper seems committed to the view that it does not matter which (or how many ?) of the law-like statements employing *T* we build into a meaning postulate for *T*. But then he cannot object to the conventionalists and he is committed to some form of the law-cluster theory (perhaps even its radical form).

An interpretation more consistent with Popper's other views would see him as rejecting the law-cluster theory of meaning in all its versions. Admittedly, some law-like statements can become better entrenched than others, so that we are loth to revise them when things go wrong. But to say that some generalisation has become practically unrevisable, though not unrevisable in principle, is not to say that it has become analytic, for unrevisability and analyticity are not the same. (Most of the so-called 'definitions' presented by scientists would have to be construed in this way, as propositions which, from a practical though not a theoretical perspective, have become unrevisable.) But if scientific terms lack Fregean senses, then we need some other account of how they acquire reference — Nola favours Kripke's causal theory.

⁵N. Malcolm, *Knowledge and Certainty* (1963), pp. 67–8.

⁶*Op. cit.*, p. 66.

⁷J. Austin, *Philosophical Papers*, pp. 88–9.

⁸Different theories of meaning will, of course, *explicate* theory-ladenness differently. On the traditional theory it arises in two ways. Suppose 'water' means (is defined as) 'a chemical compound of two atoms of hydrogen and one of oxygen' and that "Water quenches thirst" is an accepted contingent proposition about water. Then "Here is a glass of water" entails (by virtue of the meaning of the

term 'water') a prediction about the result of subjecting the contents of the glass to chemical analysis. It also entails (in conjunction with a suppressed premise stating the accepted proposition) a prediction about what will happen if a thirsty person drinks the contents of the glass. If the former prediction fails, then we must reject our observation report and say that the glass did not contain water after all. If the latter prediction fails, then we may say the same or we may stick to our observation report and reject our previously accepted proposition about water. On the extreme law-cluster theory of meaning, all predictions are of the first kind and their failure must be responded to similarly. On the Kripke theory of meaning (or rather, of reference), all predictions are of the second kind and their failure must be responded to similarly.

⁹ *Logic of Scientific Discovery*, p. 424.

¹⁰ *Logic of Scientific Discovery*, p. 425.

¹¹ Notice that if this is so, then ascribing a *dispositional* property to an object entails *by itself* conditional predictions about that object in virtue of the meaning of the dispositional predicate.