

THEORY-LADEN OBSERVATION AND INCOMMENSURABILITY

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ABSTRACT: In this paper, I investigate the logical relation between two claims: (1) observations are theory-laden¹ and (2) there is no empirical common ground upon which to evaluate successive scientific theories that belong to different paradigms. I, first, construct an argument where (1) is the main premise and (2) is the conclusion. I argue that the term „theory-laden” has three distinct senses: semantic, psychological and epistemic. If ‘theory-laden’ is understood in either epistemic or psychological senses, then the conclusion becomes a claim about people. If incommensurability is to be a claim about theories, then ‘theory-laden’ in the main premise should be understood in the semantic sense. I, then, argue that there is a further distinction to be drawn between the absolute and relative senses of theory-laden. The relative sense of theory-laden allows observations that are relatively neutral between the theories under examination. I then conclude that the argument from theory-ladenness only shows that foundational empiricism is not a tenable philosophical position, but it fails to show that no empirical test can decide between successive theories that belong to different paradigms.

¹ First things are first. Let’s remember Dretske’s distinction between „seeing as” and „seeing that” (1969). „Seeing as” is to perceive, under appropriate conditions, whatever observable properties an object has, without passing any judgment on what these properties are. However, „seeing that” involves describing what one sees. For example, most animals that have eyes similar to ours see objects—trees, other animals, etc. However, they don’t see, for example, *that what they are looking at is a tree*. Only „seeing that” kind of observations, whether in the sense of psychological, epistemological or semantic, are theory-laden. See also Bird (2000, 97 – 148) where he makes similar distinctions and based on these distinctions he argues against this premise that both Hanson and Kuhn defended. Bird (2000, 122) argues that theory-dependence of perception is weaker than Hanson and Kuhn thought and that for this reason it does not establish the conclusion that there are no common observations to successive paradigms. In this paper, though, I will grant that the premise is true and then see what follows from it. See also Anna Estancy (2001) on theory-ladenness of observation and the neutrality of observation. She presents an account of theory-laden in the light of new developments in cognitive science and argues that theory-ladenness of observation does not undermine the objectivity of science. However, these arguments don’t focus on the logical relationship between this premise and the conclusion presented in the above argument. See also William F. Brewer and Bruce L. Lambert (2001) for a similar kind of account.

KEYWORDS: Incommensurability, Kuhn, objectivity, observation, rationality, theory-choice, theory-laden, theory-neutral observation.

I

There has been a fair amount of literature accumulated in the last 40 years on the topic of incommensurability mainly due to Thomas Kuhn's *The Structure of Scientific Revolutions* (SSR). I will not be the first one to argue, for example, that the incommensurability of theories belonging to different paradigms does not follow from the premise that all observations are theory-laden. There is also a huge literature on whether observations are theory-laden, though I will not take issue with this claim. What I think will be a new and interesting philosophical exercise is to construct an argument step by step that Kuhn (or perhaps it is better to say some people who took Kuhn to be arguing for relativism) might have had in mind and try to see how and where the argument fails. This philosophical exercise, I believe, teaches us two things:

- (1) while all observations are theory-laden, it can still be possible to find observations that may be neutral between the theories under tests;
- (2) that Kuhn's argument so constructed shows that foundational empiricism is not a tenable philosophical position.

Since the argument from the theory-ladenness of observation to the incommensurability of theories belonging to different paradigms has mainly been attributed to Kuhn, I will cite and comment on some passages from Kuhn's *SSR* that might have motivated philosophical discussions surrounding incommensurability thesis. It is not an exaggeration to say that Thomas S. Kuhn's *SSR* has been one of the most influential books in 20th century philosophy and history of science. In philosophical circles, his claim that successive scientific paradigms are incommensurable was the one that attracted philosophers most. Kuhn's thesis of incommensurability has been taken to undermine the rationality of science. Though, Kuhn in his later works doesn't accept this charge, his response is that philosophers who are critical of his work are looking at issues from the perspective of their own conception of rationality and objectivity and then claim that his work undermines objectivity and rationality of science.

Since the vocabularies in which they discuss such situations consist, however, predominantly of the same terms, they must be attaching some of those terms to nature differently, and their communication is inevitably only partial. As a result, the superiority of one theory to another is something that cannot be proved in the debate. Instead, I have insisted, each party must try, by persuasion, to convert the other. Only philosophers have seriously misconstrued the intent of these parts of my argument... More than any other parts of the book, the passages on which these misconstructions rest have been responsible for charges of irrationality (Kuhn 1970, 198 – 99, Postscript).

Kuhn, then, tells us why such an interpretation does not reflect his views:

Nothing about that relatively familiar thesis implies either that there are no good reasons for being persuaded or that those reasons are not ultimately decisive for the group. Nor does it even imply that the reasons for choice are different from those usually listed by philosophers of science: accuracy, simplicity, fruitfulness, and the like (Kuhn 1970, 199, Postscript).

Considering any two such theories, chosen from points not too near their origin, it should be easy to design a list of criteria that would enable an uncommitted observer to distinguish the earlier from the more recent theory time after time. Among the most useful would be: accuracy of prediction, particularly of quantitative prediction; the balance between esoteric and everyday subject matter; and the number of different problems solved... Later scientific theories are better than earlier ones for solving puzzles *in the often quite different environments* to which they are applied. That is not a relativist's position, and it displays the sense in which I am a convinced believer in scientific progress (Kuhn 1970, 206, Postscript, Italics are mine).

Notice that the most of good reasons in Kuhn's list are the ones philosophers have called super-empirical virtues of a theory and any of these reasons in the list, at least, at the time are not considered to imply empirical superiority.² What about 'predictive accuracy' in Kuhn's list? In the next passage, Kuhn says that he is objecting to a realist's position that predictive accuracy will entitle us to make claims about the ontology of a theory. However, in the quote above, it seems that it is not just the claims about ontology he is opposing. His sense of predictive accuracy is like his notion of 'better puzzle solver'. Perhaps the new paradigm is a better predictor and better puzzle solver but as he says in the quote often *in quite different environments*. This seems to indicate that accurate predictions that

² There is a connection between empirical success and simplicity but this has been discovered after Kuhn has published his work. See Forster and Sober (1994) for this issue.

a new paradigm makes are not about the same thing as those made by the old paradigm. Their predictions apply in different environments. Hence, after all, Kuhn *seems* to retain his thesis of incommensurability. On the other hand, philosophers of science in the opposing camp want to base objectivity and rationality of science on empirical tests between successive paradigms. Here is what Kuhn tells us about this issue:

If two men disagree, for example, about the relative fruitfulness of their theories, or if they agree about that but disagree about the relative importance of fruitfulness and, say, scope in reaching a choice, neither can be convicted of a mistake. Nor is either being unscientific. There is no neutral algorithm for theory-choice, no systematic decision procedure which, properly applied, must lead each individual in the group to the same decision (Kuhn 1970, 200, Postscript).

If by lack of algorithm Kuhn only means that there is no recursive procedure for theory-choice just as there is no such procedure to generate proofs in some branches of mathematics and logic, then no one would have taken any issue with what Kuhn said. My goal here is not to give an account of what Kuhn was really arguing for. For one thing, this is a very complex and complicated job because not only does it require reading very closely all of Kuhn's writings but also an interpretation of his writings. In any case, it is really hard to figure out what a philosopher actually meant by certain things when he wrote them. For a best account of Kuhn's views, see Paul Hoyningen-Huene (1993). Not only does he give a best account of Kuhn's views but in my opinion he also teaches us how to remain true to a Philosopher's views while at the same time providing illuminating interpretations of them. However, my goal in this paper is different. I am not claiming here that the arguments I construct are in fact the arguments Kuhn had in mind. Rather, I am after a common and wide spread perception of Kuhn's legacy that somehow theory-laden observations render strong incommensurability legitimate and what may have been responsible for such an interpretation in Kuhn's. So, whatever Kuhn might have had in mind, his notion of incommensurability had been taken to undermine the objectivity and rationality of science by many and the passages that I cited above may have motivated such a conclusion. It is also the case that the notion of theory-ladenness is playing a very important role in an argument whose conclusion is the claim that there cannot be an empirical common ground upon which to evaluate successive theories.

In this paper, I am primarily interested in the logic of the argument from a proposition that observations in science are almost always theory-laden to the conclusion that there is no empirical common ground upon which to evaluate successive theories that belong to different paradigms. Kuhn seems to be describing how members of different paradigms would not have a common empirical ground upon which to evaluate these paradigms because they attach different meanings to observational statements, and then making a logical point that theories belonging to different paradigms are incommensurable. I think this is a mistake because though the latter implies the former, the former cannot imply the latter. For just as people's attitudes, behaviors, and situations cannot make a statement true or false, their attitudes, behaviors and situations cannot make theories incommensurable. I call this a fallacy of deriving conclusions about theories from people's attitudes, behaviors or situations.³ There is an interesting philosophical problem to pursue here on its own independently of what Kuhn was arguing for. Those who are primarily interested in the logic of the argument whose main premise is „all observations are theory-laden“ and whose conclusion is „there is no empirical common ground upon which to evaluate successive theories that belong to different paradigms“ and who want to argue for the objectivity of science will have to deal with this problem.

The structure of my argument will be this: 1. I will argue that the term „theory-laden“ has three distinct meanings: psychological, epistemic and semantic. 2. I will argue that if it is used in a psychological or epistemic sense, the only conclusions one can derive are about whether scientific communities or epistemic subjects have a common ground upon which to evaluate successive theories that belong to different paradigms and that if one wants to make a logical point about theories being incommensurable then it is the semantic sense of theory-laden that one needs. 3. I will argue that there is a further distinction to be drawn between absolute and relative senses of theory-laden and that to derive the conclusion that there is no empirical common ground upon which to evaluate successive theories that belong to different paradigms one needs the absolute sense of theory-laden. But Kuhn himself takes „theo-

³ See Sober (2000, 28) for the importance of distinguishing between people and propositions.

ry-ladenness" to be a local phenomenon,⁴ so even he does not believe that observations are theory-laden in the absolute sense. Thus, I conclude that the argument from theory-ladenness does not establish its intended conclusion. 4. I will, then, consider an objection to the account I develop out of criticizing this argument and I will argue that perhaps there are no privileged observation statements that stand on their own independently of any theory. However, this does not show that in evaluating successive theories that belong to different paradigms there is no empirical common ground at all.

II

Kuhn extensively explains why observations are theory-laden but then he seems to derive from this that successive theories that belong to different paradigms are incommensurable. On the other hand, the link between these two propositions has not been explored in the studies of philosophers of science either. Some have argued that the conclusion does not follow and they gave their reasons why but none has actually constructed an argument step by step from premises that involve theory-ladenness and testability to the conclusion about incommensurability.⁵ This is where I will start; that is, I will construct an argument how from the premise that all observations are theory-laden, the conclusion that there is no empirical common ground upon which to evaluate successive theories that belong to different paradigms supposedly follows. However, before I do this, it is worth while to cite Kuhn about the three senses of incommensurable:

We have already seen several reasons why the proponents of competing paradigms must fail to make complete contact with each other's view points. Collectively these reasons have been described as the incommensurability of the

⁴ See Gurok Irzik and Teo Grunberg (1998, 215 – 219). They argue that Kuhn's semantic holism is local.

⁵ Alexander Bird (2000, 98) writes: „The empiricist view is that observation provides the raw material for such rules to process. Kuhn is saying, in effect, that even if there were such rules, there are no paradigm-independent observations for such rules to get to work on. Overall, the view can be summarized as: since observation is not paradigm-independent, observation is not, *pace* the empiricists, a common measure of the quality of theories. The view is thus an aspect of Kuhn's more general claim that paradigm theories are incommensurable.“

pre- and post revolutionary normal-scientific traditions... (Kuhn 1970, 148)
[First sense of incommensurability]

In the first place, the proponents of competing paradigms will often disagree about the list of problems that any candidate for paradigm must resolve. Their standards or their definitions of science are not the same (Kuhn 1970, 148) [Second sense of incommensurability]

More is involved, however, than the incommensurability of the standards. Since new paradigms are born from old ones, they ordinarily incorporate much of the vocabulary and apparatus, both conceptual and manipulative, that the traditional paradigm had previously employed. But they seldom employ these borrowed elements in quite the traditional way. Within the new paradigm, old terms, concepts, and experiments fall into new relationships one with the other. The inevitable result is what we must call, though the term is not quite right, a misunderstanding between the two competing schools (Kuhn 1970, 149)

These examples point to the third and most fundamental aspect of the incommensurability of competing paradigms. In a sense I am unable to explicate further, the proponents of competing paradigms practice their trades in different worlds (Kuhn 1970, 150)

Just because it is a transition between incommensurables, the transition between competing paradigms cannot be made a step at a time, forced by logic and neutral experience. Like the gestalt switch, it must occur all at once (though not necessarily in an instant) or not at all (Kuhn 1970, 150).⁶

In the last quote, Kuhn argues that scientists cannot have a neutral observational language between successive theories that belong to different paradigms because these theories are incommensurable and in the third quote, he gives his reason why they are incommensurable: observations are theory-laden. In what follows, I will take 'successive theories that belong to different paradigms are incommensurable' to mean 'there is no empirical common ground to test these theories'.⁷ The

⁶ For the development of Kuhn's views of incommensurability see Harold I. Brown (2005) and Eric Oberheim (2005). Brown presents Kuhn as opposing positivist philosophy of science. Though this is a common perception, Irzik and Grunberg (1995) convincingly argue that this is not the case. In fact, they think that similarities between Carnap and Kuhn are more evident and striking than the differences.

⁷ There may be other ways to formulate the thesis. For example, Sankey (1994) writes: „As it is generally understood, the incommensurability thesis combines these three claims. It is the thesis that the languages of some scientific theories are, at least in part, mutually untranslatable, and consequently there are no logical relations between them and their content is incomparable,“ (p. 2). And he later writes: „As against this tenet of empiricism, Kuhn and Feyerabend argued that observation is not itself an independent source of meaning and that the meaning observational vocabulary in fact depends on

clearest statement of the relation between theory-ladenness of observations and there being no empirical common ground between successive theories that belong to different paradigms that I can find in Kuhn is this:

If, as I have already urged, there can be no scientifically or empirically neutral system of language or concepts, then the proposed construction of alternate tests and theories must proceed from within one or another paradigm-based tradition. Thus restricted it would have no access to all possible experience or to all possible theories (Kuhn 1970, 146).

The argument for the thesis of incommensurability may be stated as follows, then:

- (i) All observations are theory-laden.
- (ii) If there is to be an empirical common ground upon which to evaluate successive theories that belong to different paradigms, then observations used in these tests must be neutral.
- (iii) If all observations are theory-laden, there are no theory-neutral observations.
- (iv) There are no theory-neutral observations (i, iii).
- (v) There is no empirical common ground upon which to evaluate successive scientific theories that belong to different paradigms (ii, iv).⁸

Though there is still some discussion about whether all observations are theory-laden and about the degree of theory-ladenness in cognitive

theory. So the incommensurability thesis arose historically as a rejection of the empiricist idea of an observation language shared by and capable of arbitrating between theories. This suggests another way to characterize the incommensurability thesis, viz. as the denial of the existence of a theory-neutral language in which the content of theories may be compared" (p. 3). In this paper, I adopt the second sense since I think this is what the debates about rationality and objectivity of science centered around.

⁸ Having defended Kuhn and Feyerabend against the critics and having proposed a positive account of the incommensurability, in the concluding paragraph of his book, Sankey (1994, 221) writes: „Where finally, does this leave the notion of incommensurability? Since so few of the radical claims associated with the incommensurability thesis are warranted by the phenomenon of conceptual change in science, it is not clear that there is anything left for the word ‘incommensurability’ to stand for.” However, the argument constructed above does not agree with this conclusion. Sankey does not focus on the relation between theory-ladenness of observations and the claim that there is no empirical common ground to evaluate successive theories that belong to different paradigms, and one reason, I think, he reaches the conclusion above has to do with his focus being elsewhere.

science, psychology and philosophy, let's grant that interesting observations used in testing theories in science are quite complicated and almost always are laden with a theory. The second premise seems intuitively plausible. Since premise (iv) is a logical consequence of (i) and (iii) and (v) is a logical consequence of (ii) and (iv), this leaves only premise (iii) to debate. If the claim that all observations are theory-laden entails that there are no theory-neutral observations, then we just have to bite the bullet and agree with Kuhn. Or do we? This is the question I would like to tackle in what follows.

I argue that there are different senses of 'theory-laden' and that without specifying which sense we have in mind in saying „all observations are theory-laden“, we don't know whether or not premise (iii) is true. The three senses I distinguish are psychological, epistemic, and semantic.

Psychological Sense of Theory-laden (PSYCH-TL): O is laden with T for S iff S's prior beliefs cause S to interpret O in accordance with T.

Epistemic Sense of Theory-laden (EPIST-TL): O is laden with T iff S cannot rationally believe O unless S already believes T.⁹

Semantic Sense of Theory-laden (SEMANT-TL): O is laden with T if the meaning of O is wholly or partially fixed by T.¹⁰

To convince the reader that these are *different* senses of theory-laden, I will show how each of these formulations of 'theory-laden' may have different consequences. I will, then, argue that it is the semantic sense that plays a crucial role in the above argument. Let's remind ourselves that the claim that two successive paradigms are incommensurable is about paradigms; that is, the things that are incommensurable are theories, not people.

If all observations are theory-laden in the PSYCH-TL sense, then the argument from theory-ladenness should be reformulated as follows:

- (i) All observations are theory-laden.
- (ii) If all observations are theory-laden, then no observation that S makes can be independent of S's prior beliefs.

⁹ I thank Elliott Sober for bringing this sense of 'theory-laden' into my attention.

¹⁰ To my knowledge, the clear statement of the distinction between psychological and semantic senses of theory-laden is in Irzik and Grünberg (1995, 293, footnote 2). They too think that it is the semantic sense that is at issue, although they acknowledge that Kuhn made use of psychological sense as well. However, they do not identify the epistemic sense.

- (iii) If no observation *S* makes can be independent of *S*'s prior beliefs, then no communities with different theories that belong to different paradigms can find neutral observations on which they can compare their competing theories on empirical grounds.
- (iv) If all observations are theory-laden, then no communities with different theories that belong to different paradigms can find neutral observations on which they can compare their competing theories on empirical grounds (ii, iii).
- (v) No communities with different theories that belong to different paradigms can find neutral observations on which they can compare their competing theories on empirical grounds (i, iv).

Notice that the conclusion of this argument is a statement about communities, not about theories. Thus, if we adopt the psychological sense of theory-laden, then Kuhn's thesis of incommensurability becomes a claim about what scientific communities are capable of achieving. We cannot say, according to this argument, that two successive paradigms are incommensurable (if this concept must be understood as above). What we should say is that it is psychologically impossible for two generations of scientists with different theories that belong to different paradigms to have a common ground on which they can inter-subjectively agree to compare their respective theories.

If all observations are theory-laden in the EPIST-TL sense, then the argument from theory-ladenness may be reformulated as follows:

- (i) All observations are theory-laden.
- (ii) If all observations are theory-laden, then there are no observations that *S* can rationally believe without already believing a particular theory.
- (iii) If there are no observations that *S* can rationally believe without already believing a particular theory, then there are no observations such that it is rational for *S* to use to empirically decide between a given theory and its alternatives in different paradigms.
- (iv) If all observations are theory-laden, then there are no observations such that it is rational for *S* to use to empirically decide between a given theory and its alternatives in different paradigms (ii, iii).

- (v) There are no observations such that it is rational for S to use to empirically decide between a given theory and its alternatives in different paradigms (i, iv).

Notice that the conclusion of this argument is about people, not about theories. It gives information about what an epistemic subject (scientist) is capable of achieving.

According to both the psychological and epistemological senses of theory-laden, the theories in question can be commensurable from a God's eye of view. For, according to the psychological sense of theory-laden, whether a pair of successive theories is incommensurable depends on communities and their beliefs. According to the epistemic sense of theory-laden, whether a pair of successive theories is commensurable depends on what a given subject already believes. Thus, in both cases, a pair of successive theories is incommensurable relative to people and their beliefs. However, the claim that a pair of successive theories is incommensurable is supposed to be a claim about theories, not about people and their beliefs. So, if we want incommensurability be a claim about theories and their logical relations, then what we need is a semantic sense of theory-laden. The first argument I presented, indeed, uses the semantic sense of theory-laden, and its conclusion is about theories, not about people.

What follows is this: the conclusion of the argument from the semantic sense of theory-laden entails the conclusions of the arguments from the psychological and the epistemic senses of theory-laden. However, the conclusion of the argument from the semantic sense of theory-laden is not entailed by the other two. This shows that the conclusion of the argument from the semantic sense of theory-laden unifies all of Kuhn's claims that he made both in *The Structure of Scientific Revolutions* and afterwards. However, the asymmetric relation between them shows that we cannot get equally good unification if we endorse either the psychological or the epistemic senses of theory-laden.

III

So far, I have argued that the term „theory-laden“ has three different meanings and that this is important for the argument from the theory-ladenness of observations to the conclusion that there is no empirical common ground upon which to evaluate successive theories that belong to different paradigms. In the remainder of the paper, I will show how

even if all observations are theory-laden, we can still test rival theories objectively. Elliott Sober (1994) develops an epistemology that incorporates both empiricist and realist ideals and he calls this epistemology 'Contrastive Empiricism' as opposed to 'Constructive Empiricism', according to which, the two views are impossible to reconcile. Central to Sober's argument is his distinction between the relative and absolute senses of theory-neutrality and this distinction is important for the argument that I develop in what follows:

The standard empiricist's claim about observation has a quantifier order worth noting:

(EA) There exists a set of observation statements, such that, for any two theories T and T' , if it is possible to say that T is more plausible than T' , then this will be because T and T' make incompatible predictions as to which members of that set are true.

A weaker thesis, which avoids an absolute distinction between theory and observation, has a different quantifier order:

(AE) For any two theories T and T' , if it is possible to say that T is more plausible than T' , then this will be because there exists a set of observation statements such that T and T' make incompatible predictions as to which members of that set are true (Sober 1994, 126).

In the same way, I say „all observations are theory-laden“ has two different readings:

- (1) There exists a theory such that every observation is ladened with it.
- (2) For every observation there is a theory such that the observation in question is ladened with it.

(1) Requires that there is only one theory in the background that determines the meaning of every observational statement. The truth of premise three (If all observations are theory-laden, then there are no theory-neutral observations on which we can test successive scientific theories that belong to different paradigms on empirical grounds) depends on whether (1) or (2) is true. (1) entails that both EA and AE are false. (2) is consistent with AE but not with EA. Since (2) is far more plausible than (1), all we can get from the claim that all observations are theory-laden is that there are no absolutely neutral observations (observations that are independent of all theory). However, according to (2), it is possible to have an observation which is ladened with a theory but not with any of

the competing theories under examination. In this case, the observation is said to be neutral relative to the theories under examination. For example, observations about Mercury's orbit used to test whether Relativity Theory or Newtonian Theory is correct can be said to be neutral with respect to these theories, while the meanings of these observations are fixed by some *other* theories—for example, by optical laws and laws of geometry. If General Relativity vs. Newtonian Theory is the pair we test, then observations used should not assume a particular geometry. However, Special Relativity can be tested against Newtonian Theory if both assume the same geometry.

One objection can be raised to the account that I have developed: you have shown that incommensurability cannot be derived from the semantic sense of theory-laden, but this shows only that it is not correct to say that theories are incommensurable. However, there is still an interesting and important issue about what we can derive from the psychological and epistemic senses of theory-laden and it is this: we can, for example, argue that if either the psychological or epistemic sense of theory-laden is true, then scientific communities won't have empirical common ground upon which to evaluate successive theories that belong to different paradigms; and that this will be sufficient for Kuhn's real thesis that empirical tests don't provide objective grounds for scientists to choose between these rival theories. The distinction between relative and absolute senses of theory-laden also applies to these two cases. It is not as if once a scientist adopts a new paradigm then every observation s/he makes gains meaning only in the light of this paradigm. This would have been the case had the absolute sense of theory-laden been true. It would be absurd to think that, for example, a committed Newtonian's observations of economic events would be laden with Newtonian mechanics. Hence, in the case of the psychological and epistemic senses of theory-laden too, observations are still only relatively laden with a theory.

The other objection is this: 'There exists a theory with which every observation is laden' entails 'there are no observations that are even relatively theory-neutral'. However, 'for every observation there is a theory with which that observation is laden' does not entail 'there are no theory-neutral observations at all'. Since I claimed that relative theory-ladenness is far more plausible and that even Kuhn does not believe in absolute theory-ladenness, the claim that there are no theory-neutral observations between successive theories that belong to different paradigms does not

follow from the fact that all observations are theory-laden. However, it may be said that I am committing the fallacy of denying the antecedent here; that is, I deny 'there exists a theory with which every observation is laden' (the antecedent) is true and then from this I conclude 'there are no theory-neutral observations at all' (the consequent) is false. My reply is that this is not how my argument works. I am claiming that the only reason to think that there are no observations that are even relatively theory-neutral is that observations are theory-laden in the absolute sense. However, this is not a good reason and besides no one believes it. Here is the clearest expression of my point: if we were to construct an argument from the premise 'there exists a theory with which every observation is laden' to the conclusion 'there are no theory-neutral observations at all', then my claim is that such an argument would not be sound. On the positive side of the argument, I claim that even if all observations are theory-laden in the relative sense, this still allows relatively theory-neutral observations and this would be enough to evaluate successive theories that belong to different paradigms on empirical grounds.

IV

I have argued that there are three distinct senses of theory-laden observations – semantic, epistemic and psychological – and that depending on which of these senses meant our conclusion about incommensurability may either be about psychological agents, epistemic subjects or theories. However, the issues surrounding incommensurability thesis have concerned with theories. Therefore, it is important carefully to distinguish these senses when we discuss issues about incommensurability. I further argued that the claim „all observations are theory-laden” can have two different readings – „there is a single theory such that all observations are laden with it” or „for every observation there is a theory such that this observation is laden with it”. I argued that while the former implies that there cannot even be relative theory-neutral observations, the latter allows such relative theory-neutral observations. I also argued that the latter is far more plausible than the former and that no one, including Kuhn himself, believes the former to be true. I concluded that relative theory-neutral observations are sufficient to undermine the strong incommensurability thesis. I now would like briefly to discuss some implications of this conclusion.

I believe Kuhn is right in thinking that scientific theorizing, experimenting or testing almost always requires observations that are really complex. This may be a reason for why observations in science are theory-laden. Whether this fact is true about all perception is a separate issue, but of course if it is true it gives support to this thesis. On the other hand, scientific theorizing, experimenting or testing is a lot more complicated than Kuhn and foundational empiricists have thought. Foundational empiricists believe that there are observations and theories. Observations are secured with direct testing methods and used in evaluating the results of indirect test methods. That is, in testing two rival theories, one is to deduce observational statements from them together with auxiliary hypotheses¹¹ and then to compare whether these deduced observational statements and direct observations fit together. Notice that direct observations are taken to be neutral between the rival theories in question. This is what Kuhn denied. He argued that there are no such observations because all of them are theory-laden. However, Kuhn seems to believe that only if there are absolutely theory-neutral observations in science can rival theories that belong to different paradigms be evaluated on empirical grounds. This is a foundationalist requirement for testability. Where Descartes finds the secure foundation in his cogito, foundational empiricists find it in basic observational statements. These basic observational statements are considered to be the final arbiter in deciding which rival theory or hypothesis is correct. When Kuhn claimed that all observation in science involves a theory, it is perhaps then thought that the immediate consequence of this is that science lacks the foundations that foundational empiricists believe exist.

With Kuhn, I believe that „all observations are theory-laden“ leads to the conclusion that there are no secure foundations in the sense of Descartes and foundational empiricists (see footnote 12, though, according to which, no one now in philosophy of science seems to be a foundational empiricist), but I disagree that this also means rival theories at the time of revolutions are incommensurable.¹² For, if the claim that all ob-

¹¹ I don't want to restrict testability to deductive models. Probabilistic models of testability have been developed in the recent philosophy of science literature. See, for example, Elliott Sober (1999, 2004) – he is not foundational empiricist though.

¹² Who are foundational empiricists? For long, it had been thought that positivists are foundational empiricists. But see, Friedman (1991) and Irzik and Grünberg (1995) for really good discussions of why positivists are not foundational empiricists. If not the positivists,

servations are theory-laden is true, then the claim that there is no set of observations such that they can be used to test any rival pair of theories is also true. However, in order to test rival pair of theories we need observation statements that are neutral between just these two and the claim about theory-ladenness understood correctly does not entail that such neutral observations statements don't exist. I conclude that even if all observations are theory-laden, there is still a way of testing successive theories on empirical grounds. Hence, the other lesson we learn is that foundationalist requirement for testability is too strong.¹³

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then who? Maybe no particular school is wholly committed to such a view. Maybe positivists come really close. Interestingly, though, philosophers of science believed such a position exists. Whether the position is defended by anybody is a separate question, but Kuhn might have thought that positivists are foundational empiricists.

¹³ The standard response to the incommensurability thesis so understood here was to say that though the meanings of observational statements may differ their reference would be the same. However, this response has been discussed extensively in the literature and many scholars have found it unsatisfactory (see Sankey 1994). The account presented here though is not affected by such considerations because its departure point has to do with the relation between theory-laden observations and their use in testing successive theories that belong to different paradigms.

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