

LAW, TRUTH AND PRESUPPOSITION¹

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1. Introduction

The objective of the present paper is to consider the question in what sense we know the laws of nature. On the one hand, science pretends to discover laws with a reliable method, and thereby to constitute genuine knowledge. On the other hand, there seem to be a gap between the supposed laws of nature and the laws of science. The latter may express the former inadequately. One reason to think so is the straightforward observation that science evolves and many of its laws have been revised throughout its history. Still, even if we find the scientific knowledge of the past inadequate, we call it knowledge. In our historical analyses we freely talk about “the state of knowledge of the day”. We confer thereby a high epistemic status on some outdated beliefs. And intuitively we are perfectly right in doing so, for clearly the science of the past, even when it went wrong, was much different from blind guesses, superstition or mere errors. According to Ryszard Wójcicki’s suggestion, the scientists of the past must have known something, although they expressed their knowledge inadequately.

Other reasons to think that there is a gap between the laws of science and the laws of nature, if there are such laws at all, were put forward by Nancy Cartwright in her challenging thesis that “the laws of physics lie”. In a nutshell, her claim is that universal explanatory laws cannot be true, for they always presuppose counterfactual situations that

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are never found in nature. In contrast, it is phenomenological, nonexplanatory laws that can be true of nature. Either truth or explanation, Cartwright claims. What has to be reconsidered in this connection is Cartwright's suggestion that universal explanatory laws serve as mere instruments for deriving true phenomenological laws. How can a lie, no matter how much it can explain, function as a (reliable) tool for obtaining truths? How can an explanatory device function so if it is a mere lie? If there is a grain of truth in Cartwright's account then universal explanatory laws have to have something to do with truth even if they are not true.

2. The revision of the tripartite definition of knowledge

To resolve these queries I shall push Wójcicki's idea a little further and suggest that some or most laws of science, whether outdated or not, count as knowledge even if they are not true, given their linguistic formulation. And the air of self-contradiction in the conception of untrue knowledge will be explained away in terms of a certain feature of language. The feature in question will appear responsible for the possibility of untrue knowledge as well as for the possibility of telling it from false beliefs that are not knowledge at all. Anyway, I am going to deny the tripartite definition of knowledge for quite a different reason than those that Gettier-like examples may suggest. Gettier-inspired analyses may be right in claiming that the conditions

- (i) $B_a p$ (*a* believes that *p*);
- (ii) $JB_a p$ (*a* is justified in believing that *p*);
- (iii) p (it is true that *p*).

are insufficient for $K_a p$ (*a*'s knowing that *p*). I claim, on the other hand, that they are too demanding as far as the questions raised above are concerned. To deal with them, I suggest that we relax (iii), i.e. replace (iii) with

- (iii*) p is not false,

before we consider possible additional requirements for knowledge. Well, is there any difference between true and not false beliefs or laws? It depends on the kind of analysis. Consider the law of Aristotle's physics: "Heavy bodies fall down". Clearly, it is not true for it presupposes that there is the (absolute) up-down direction in space. On the other hand, Aristotle's law is intuitively not as incorrect as its negation: "Heavy bodies do not fall down". For the latter implies much more obviously incorrect alternatives: "Heavy bodies move in the direction different than down", or "move irregularly", or "do not move at all". This intuitive difference between the law under consideration and its alternatives can be accounted for in the framework of the logic of presuppositions.

3. The concept of presupposition and its applications in epistemology

3.1 The logic of presuppositions

The logic of presuppositions comes from Strawson's analysis of the sentences with empty terms. This analysis was designed as an alternative to Russell's theory of descriptions. The latter saved bivalence at the cost of divorcing the grammatical and the logical form of a sentence. Peter Strawson remarried the grammatical and the logical form of a sentence at the cost of bivalence. A famous example is the sentence "The present king of France is bald". In Russell's analysis, the logical import of this sentence is "There is one and only one person who is the king of France now and this person is bald". Consequently, this sentence is false. Its grammatical negation, "The present king of France is not bald", is not its logical negation, and therefore can be false as well. The logical negation of the original (false) sentence is "Either there is now more than one king of France, or there is no king of France now, or there is one and only one person who is now the king of France and this person is not bald". To avoid such complexities, Strawson proposed that the sentence under consideration is meaningful due to its potential to be used to make true or false statements on some occasions rather than due its being true or false itself. The sentence "The present king of France is bald" presupposes "There is one and only one person who is the king of France now". The

original sentence can be used to make a true or false statement if and only if its presupposition is true.

Symbolically,

- $p > q$ (p presupposes q) if and only if
- (1) if p is true, then q is true and
 - (2) if p is false, then q again is true.

In other words, q is a condition for p 's having a truth-value. If q is not true then p is neither true nor false. Bivalence is sacrificed in order to do justice to the "logic" of grammar. In particular, negating the verb turns a sentence into its negation. Thus "The present king of France is not bald" counts as the negation of "The present king of France is bald". Both sentences, the original one and its negation, have the same presupposition: "There is one and only one person who is the king of France now". It is easy to see that

$$(p > q) \rightarrow (\neg p > q)$$

is a law of the logic of presuppositions, as developed e.g. by van Fraassen.

In these lights, condition (iii*) in the proposed revision of the tripartite definition of knowledge allows for knowing something that is not true if only the supposed known presupposes untrue presuppositions and is suitably justified. How may this work in application to the laws of science? Let us consider the question of how Aristotle might have known that "Heavy bodies fall down". As I suggested above, Aristotle's law presupposed that there is the up-down direction in space. Clearly, this conforms to a pattern of the presupposition relation that differs from that of the Russell-Strawson example. What is presupposed in the example is the existence and uniqueness of the referent of the object rather than of the subject of the sentence under consideration. To cover both, and possibly still other types of presuppositions, I suggest that we consider a more general pattern of presupposing.

Take an atomic sentence of the form " $p(a)$ ". Given a fixed predicate " p " of a natural language, some terms " a " will be said to stand in the so-called syntagmatic relation to " p ", some will not. (The term is borrowed from a linguistic theory of Porzig). For example, "dog" stands

in the syntagmatic relation to “bark”, “rose” does not. To acknowledge the presence of syntagmatic relations in natural languages, a feature that is normally neglected in logical analyses, I suggest to call the syntagmatic presupposition of the sentence “ $p(a)$ ” the sentence that says that “ a ” stands in the syntagmatic relation to “ p ”. Symbolically:

$$(\forall x \in K) [Tp(x) \vee T\neg p(x)]$$

where K is a certain kind of things and “T” stands for “it is true that”. For example, of any dog it is true that it is barking now or it is true that it is not barking now (“T” cannot be eliminated from the above formula without turning it to triviality, for excluded middle is a law of the logic of presuppositions). In contrast, insofar as “ K ” in our example can stand for dogs, or possibly for some other Canidae, to make the formula true, unlike for any kind that include roses, of any rose it is neither true nor false that it is barking now. This may seem puzzling, for one may be inclined to say that of any rose it is plainly false that it is barking. I suggest that we make a sacrifice of this intuition. We gain thereby an account of considerable explanatory power. Moreover, this sacrifice may well conform some other intuitions concerning everyday language. Consider the questions: “Is that dog barking?”, “Is that rose barking?”. The former is straightforwardly answered “Yes” or “No”. The latter is likely to be answered, not without hesitating, with “Well, roses are plants, and plants do not anything like barking”.

This feature of yes-or-no questions is reflected in erotetic logic with its concept of the presupposition of a question. A question presupposes that there is at least one direct true answer to it. In the case of yes-or-no questions, the only direct answers are “Yes” or “No”. The answer of the kind “Well, roses are plants...” is called a corrective answer, that is an answer that denies the presupposition of the question. Thus we are inclined to deny the presupposition of “Is that rose barking?” rather than to answer firmly “No”. Now, it is easy to see that the presupposition of a yes-or-no question is at the same time the presupposition of the sentence obtained by transforming the question under consideration to the affirmative (or negative) form. Therefore I am inclined to think that intuitions that one can find violated by the analysis in terms of (syntagmatic) presuppositions are not as important as those accounted for by that analysis.

The above considerations are easily generalized to sentences with many-placed predicates. Symbolically, the syntagmatic presupposition of the sentence “ $p(a, b, c\dots)$ ” has the form:

$$(\forall x_i \in K_i) [Tp(x_1, \dots, x_n) \vee T\neg p(x_1, \dots, x_n)]$$

where $K_i, i = 1, 2, \dots, n$, is a certain kind of things and “T” stands for “it is true that”.

3.2 Applications

Outdated knowledge

Now we are in the position to explain why Aristotle might have known that heavy bodies fall down. His law presupposes that “body” stands in the syntagmatic relation to “fall down”. This presupposition, in the light of the present knowledge, is not true. Consequently, Aristotle’s law is neither true nor false. It is not false, then. Insofar as this law was justifiably believed by him, the conditions of the revised tripartite definition of knowledge are satisfied. Therefore, Aristotle might have known this law even if it is not true. Possibly, some additional requirements have to be satisfied as well in order for Aristotle to have known his law. Let us postpone this question for the time being. Anyway, replacing truth-requirement with non-falsity-requirement permits of the explanation of how the laws of science, including those of outdated science, can constitute knowledge.

The brain-in-a-vat argument

Among the attractions of the present proposal, apart from the explanation outlined so far and to be developed more fully in the foregoing, there are the prospects of solving some persistent problems of general epistemology. One of them is the problem with the principle of closure. It says that if one knows that p and at the same time knows that if p then q , then one knows that q . Symbolically:

$$\{K_a p \wedge K_a(p \rightarrow q)\} \rightarrow K_a q$$

The principle seems intuitively obvious. In the contemporary version of the story of Cartesian demon, however, if we accept the principle of

closure we cannot know most of what we think we know. Assume that “*q*” says that I am not a brain in a vat filled with a nutrient liquid, which is plugged to a sophisticated apparatus by a crazy scientist who makes me, with this apparatus, have sensations so convincing as those one can have from stimuli coming from the real world. Sensations, then, cannot help me to decide whether I am or am not a brain in a vat. Consequently, I do not know that *q*. Assume, next, that “*p*” says that I am writing these words at my word processor now. If I am writing these words at my word processor, I am not a brain in a vat. For if I were a brain in a vat, I would be only under an illusion that I am writing these words at my word processor while in the reality I would be bathing in the nutrient. In other words, I know that if I am writing these words at my word processor, I am not a brain in a vat. If I knew, in addition, that I am writing these words at my word processor then, on the principle of closure, I would know thereby that I am not a brain in a vat. I cannot know this, however. Consequently, I do not know that I am writing these words at my word processor. By the same token I do not know many things I may think I do.

This general skeptical challenge can be easily met on the present account. In its lights, the sentence “I am writing these words at my word processor” presupposes the sentence “I am not a brain in a vat”, rather than entails it. The former would be false, if I did something else instead writing these words at my word processor: was playing chess, lying on the sofa or snowboarding or the like. If I am a brain in a vat, however, nothing of the sort is possible. No sentence that says that I am doing something that people sometimes do in the real world can be true – nor false – in the circumstances in which I am a brain in a vat rather than a human in the real world. Thus

$$p \rightarrow q$$

in the formula under discussion simply does not hold and has to be replaced with

$$p \succ q.$$

After this substitution is made, the brain-in-a-vat argument takes the form

$$\{K_a p \wedge K_a(p \supset q)\} \rightarrow K_a q$$

and, consequently, fails to be an instance of the principle of closure. Thus accepting the principle does not commit one to skepticism. More importantly, the formula obtained by the above substitution does not commit one to skepticism either, since – on the present analysis – it does not universally hold. To know that p , it is not necessary for a that “ p ” is true. Hence “ q ” may be false and therefore cannot be known. Thus I may know that I am writing these words at my word processor, provided that I am justified in believing that, without knowing that I am not a brain in a vat.

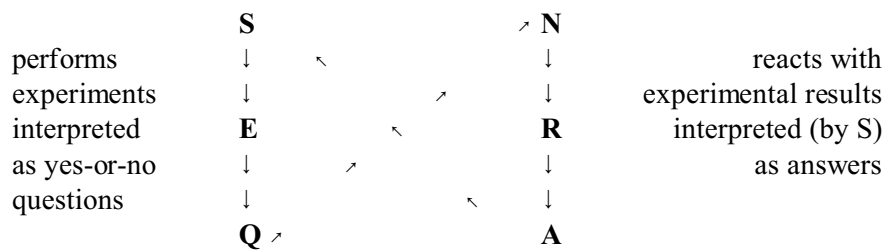
In claiming that my analysis helps to resist the skeptical challenge I do not suggest that there are no other solutions available. In my (2001), however, I argue that the solution on offer has many advantages over those hitherto discussed in the literature. Still, one may argue that even if the present proposal has its merits as far as the problems of closure or outdated knowledge are concerned, it is far from clear whether my revision of the tripartite definition of knowledge may contribute to a solution of Gettier problem. On the contrary, at first glance it may seem that relaxing the definition of knowledge makes it even more vulnerable to the Gettier-type counterexamples. The key to resist them lies, however, in the justification-component rather than truth-component of the concept of knowledge. This question requires further elaboration that goes beyond the scope of the present paper. For the sake of argument we may assume that, as far as the knowledge of laws is concerned, a scientific method does the job.

The growth of science

Now let us go back to the question of how outdated scientific knowledge is still knowledge. Or how our present-day scientific knowledge is knowledge even if it is liable to revisions in the future. Or, more generally, in what sense hypothetical knowledge is knowledge at all. Or, more specifically, how our knowledge of the laws of science is knowledge even if the laws of science “lie”. In an attempt to answer these queries, I shall propose a model of the growth of science.

Let us consider science as a game of questions and answers played between Scientist and Nature. The basic idea comes from Hintikka but it

is developed quite differently². For the first thing, Scientist does not ask his questions directly. Rather, he performs experiments that he interprets as yes-or-no questions. Similarly, Nature does not answer the questions directly. Instead, Nature reacts with experimental results that are interpreted as direct answers to his questions by Scientist. The game can be represented by the following schema:



Scientist's aim is to narrow down as much as possible the class of possible worlds in which all Nature's answers are true. Thus the game represents the search for truth: assuming that Nature's answers are always sincere, Scientist is able to decide ever more questions about the actual world and eliminate ever more possible worlds that differ from it. On the present account, unlike to Hintikka's approach, Nature's sincerity is not enough, though. For it is Scientist who interprets Nature's answers and his interpretation can be wrong. The picture requires some sophistication then.

Instead of a single game, let us take science as a cluster of interdependent games. Each game represents a suitable sub-branch of science. Scientist's interpretation rules in a particular game are theory-laden, that is dependent upon Scientist's gains in collateral games: hypotheses that are accepted at the moment as the best explanations of Nature's answers. Conversely, Scientist's gains in the game under consideration give support to his interpretation rules used in collateral games. Each game proceeds smoothly until Scientist becomes puzzled

² For the first time in (Grobler 1997). This version is not fully erotetic. A genuinely erotetic approach, in collaboration with A. Wiśniewski, is in progress. It will rely on Wiśniewski's concept of valid erotetic implication as introduced i.a. in his (1996).

with a contradiction that arises from some Nature's answers. On such occasion Scientist makes one of three kinds of moves:

- (1) introduces an auxiliary hypothesis that removes the contradiction;
- (2) revises interpretation rules used in one game, which results in reassessment of some of Nature's answers in that particular game and possibly in revision of some hypotheses put forward in collateral games;
- (3) revises some of the presuppositions of his questions, which results in rejecting those questions as ill-posed and reinterpreting Nature's answers to them as answer to other questions.

A good example of such a puzzle is the development in response to the result of Michelson-Morley's experiment. Its *prima facie* interpretation was that the velocity of Earth relative to the ether was zero. This, however, was incompatible with other considerations. In response, first the ether drag hypothesis was offered, which was a move of type (1). When this failed, Lorentz's contraction hypothesis was exercised. It entailed a reinterpretation of Michelson-Morley's experiment on which the latter had no bearing on the question of the velocity of Earth relative to ether at all – a move of type (2). Finally, after the falsification of Lorentz's hypothesis, Einstein's special relativity theory – a move of type (3) – rejected the presupposition to the effect that any sentence about the velocity of Earth relative to ether is either true or false. It rejected a few other presuppositions of Newtonian physics as well, most notably the presupposition that of any two events it is either true that they are (absolutely) simultaneous or it is true that they are not. I do not claim that this sketchy example is historically accurate. In particular, it is doubtful whether Einstein made any use of the Michelson-Morley result in his derivation of special relativity. This, however, is of secondary importance, for the aim of the present analysis is to uncover the logical structure of the growth of knowledge. Even if Einstein actually revised the presuppositions of Newtonian physics in response to other problems than the question of explaining Michelson-Morley result, he or other people might have used it, for the logical relation between his move and the result under discussion is what it is. Anyway, regardless of which puzzles Einstein actually intended to solve, he did it precisely by making a move of type (3).

Viewed at this way, the conventional picture of science as a self-correctible enterprise in Peircean or Popperian sense is enriched with the idea of the revision of presuppositions. This kind of revision usually

results in a substantial change of ontology of the theory under consideration, like the transition from Aristotelian unisotropic space to Newtonian isotropic one, or the transition from the absolute time to Einsteinian relativity. Still, the laws established under false presuppositions can be said to have been known or even still to be known. They have not been only the most plausible hypotheses of the day but they also can serve as reliable tools of solving problems at present. This feature possibly makes it quite intuitive to say that even now people know that heavy bodies fall down and therefore take efforts not to drop fragile things or that people know the principles of classical mechanics and are able to use it in engineering. The latter idea may seem to commit me to instrumentalism. But its combination with the requirement of non-falsity draws it towards realism or at least towards a middle ground between the two.

One instrumentalist motif that, in my view, has to be incorporated into the theory of knowledge is that one can hardly claim to know something before one is able to apply that something. For example, I may reliably receive a true piece of information, say about some parameters of my word processor, which may make little sense for me – it may be so detached from what I have known already that it brings me no profit at all. No profit at all can hardly be called an epistemic gain. Why then I should call it knowledge? Justification in terms of reliabilism is not enough. Thus we have arrived at a hint towards possible additional requirement for knowledge or justification, which at the moment is missing to account for Gettier paradoxes: to know something one has to be able to apply it to a problem. This idea is quite obvious as far as scientific knowledge is concerned, given a plethora of accounts that put stress on the role of problems in the growth of science. In particular, it is quite obvious in its application of the laws of science. Still, it might be useful to pursue this idea, however vague at the moment, in general epistemology that deals with everyday knowledge as well. In the present context, however, we may not bother about its possible clarifications, since in the case of the laws of science the suggested additional requirement for knowledge is obviously satisfied. It must be added, though, that applicability in the absence of justification and non-falsity does not make belief knowledge.

Further applications: justification, idealisation and abstraction

Let us briefly comment upon further applications of the concept of presupposition to the questions connected to the laws of science. As I repeatedly said, to be or have been known, on the present proposal, a law has to be justified, that is confirmed, corroborated, accepted on the ground of the principle of inference to best explanation or whatever. Some laws, as those of Aristotelian or Newtonian physics, are known to be untrue. The question is how something known to be untrue can be justified at the same time. My suggestion is that we take the very concept of justification to be presupposition-relative. Thus the conceptual conflict between “to have been known” and “to be known untrue” can be explained away. This is not at all as counterintuitive as it may seem, for it is quite natural to say that scientific hypotheses are accepted or rejected on the grounds acceptable on the presuppositions presupposed by the hypotheses in question. If those grounds do not constitute (presupposition-relative) justification, what does?

Note that, in this view, justification that supports some beliefs which turn out to be outdated knowledge is itself outdated justification. This point is of considerable importance for general epistemology. Justification is not just an addition to belief that makes it knowledge once for all. Instead, justification and knowledge are interdependent and both may become outdated. Still, outdated justification is not illusory just as outdated knowledge is not sheer error.

Next, laws of science are often said to differ from those of nature in that that the formers involve idealisations. This idea can be accommodated into the present account in a way that makes it overtly a brand of realism. Namely, idealisations can be viewed at as a sort of presuppositions. Suppose we consider a frictionless plane. This amounts to the assumption that the motion of a body on the plane can be correctly described by an equation in which friction does not figure as a parameter. Any such equation relates few parameters of a body. Thus the idealisation under discussion presupposes that some or other relation between those parameters holds³. Insofar as there are no frictionless planes, no relation of the required type holds and no equation of a corresponding type is true.

³ Hintikka considers a similar sub-species of presuppositions in his (1988).

Similarly, abstractions can be treated as a sort of presuppositions. Consider the concept of a mass-point. It amounts to the assumption that the motion of a body can be correctly described as a relation between a triple of its spatial co-ordinates and some other parameters like time, mass and force. The presupposition to the effect that such a relation exists may fail if the motion of the body in question depends additionally on the body's volume or shape.

Finally, if idealisations and abstractions are kinds of presuppositions, so *ceteris paribus* clauses are. Consequently, we may say that laws of science inevitably involve presuppositions. That is why they can be known even if they are not true. They do not lie either. The nature of their untruthfulness is quite different than that of a lie or mere error. Moreover, we may say that laws of nature are regulative ideals, something the laws of science converge to as subsequent presuppositions are falsified. They represent Peircean ideal limit of inquiry or Popperian regulative idea of truth.

This is how the concept of presupposition helps us to disclose more of the logic of language – whether natural language or the language of science – than classical logic does and at the same time helps us to better understand the nature of laws of nature.

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