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To Save Verisimilitude

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1. Sir Karl Popper has offered two different theories of scientific progress, his theory of conjectures and refutations and corroboration, as well as his theory of verisimilitude increase. The former was attacked by some old-fashioned inductivists, yet is triumphant; the latter has been refuted by Tichy and by Miller to Popper's own satisfaction. Oddly, however, the theory of verisimilitude was developed because of some deficiency in the theory of corroboration, and though in its present precise formulation it was refuted, Popper still holds it in general terms, and I think he still hopes to find a better precise formulation of it. My aims in the present note are to pin-point the deficiency of Popper's theory of corroboration and to use this for a precise formulation of verisimilitude increase acceptable to him. For my part, however, I see the situation in a different way, as will be indicated at the end of this note.

2. Popper's early view is that series of theories, each of which is corroborated and then refuted, comprise scientific progress: in that case, the evidence refuting the older theory has to follow from the newer theory. I will call such evidence crucial evidence even when it does not historically constitute results of crucial experiments. Progress, then, is indicated when all extant crucial evidence favours the new theory, and none the old. Put like that, however, the theory at once raises some doubts: we do not know that there is no crucial evidence going the other way. And, of course, according to Popper himself, when crucial evidence is found going both ways, then the degree of corroboration of the new theory, as well as of the old, is the lowest possible, and a search for a newer theory is on the way. Hence, the claim that there is progress in the transition from Newton to Einstein is conjectural. Contrary to many of his critics, Popper is not at all upset by the doubtful status of any specific claim that a given theory change is progressive. But this doubtfulness calls, he thinks, for a more objective criterion of progress -- not necessarily a criterion of assessment, but a criterion against which to pitch any criterion for assessment. The objective criterion, he says, is of increased Verisimilitude: progress must be towards the

truth. This much Popper has declared -- as his later view -- and he never withdrew it. But he also sought to offer a detailed explication of such progress, and in this he admitted he has failed.

3. To explicate his idea of verisimilitude, Popper has defined a theory's truth-contents -- all true statements that follow from it -- and its falsity-content -- all false statements that follow from it -- and postulated that increased verisimilitude is the transition from one theory to another such that the one's truth-content is included in the other, so that there is in the transition an increase in truth-content, while the other's falsity-content is included in the one, so that there is in the transition a decrease of falsity-content. But if the new theory is false, then by this criterion it follows from the old theory, since it belongs to its own falsity-content. This conflicts with Popper's earlier view according to which new theories should have higher content than the older ones (as content is initial degree of corroboration); it also conflicts with our view that there is progress from Galileo to Newton or from Newton to Einstein. Since we do claim Newton's theory to be false, more verisimilar than Galileo's, but not a corollary from it, Popper's explication of verisimilitude increase is thereby rejected. What went wrong?

4. Let us return to Popper's early view: progress is attained when extant crucial evidence points all in one direction. Is this also, by itself, increase of verisimilitude? Not necessarily, since crucial evidence may exist, unbeknown to us, pointing the other way. Let us, then, offer as a criterion of verisimilitude increase the claim -- conjectural, for sure -- that there is no such evidence, known or unknown. To nail things down a bit further, we may even confine our discussion to evidence we can procure by today's means (given current background-knowledge). The evidence procurable by today's means is one that Popper discusses when presenting both his ideas of degrees of testability and his idea of the difference between content and empirical content: Empirical content is defined as a class of evidence procurable today. If we confine our discussion of verisimilitude to empirical content, then our discussion will bring Popper's later views into a higher conformity with his earlier views. An objection to this move might be that a measure of objectivity is thereby lost, since a theory which does not have false empirical content by current empirical

standards may be false all the same, and even refutable by better empirical means which may be developed tomorrow. This objection is not serious, since Popper speaks of levels of reality, and, of course, a theory which gets at a deeper level of reality is nearer to the truth without being true, and has to be superseded if progress is to continue.

5. If we define, then, a theory's true empirical content and its false empirical content, we may want to define verisimilitude increase as the combination of an increase of true empirical content and a decrease of false empirical content. This, first of all, will dispense with the objection to Popper's definition of verisimilitude stated above: a false theory belongs to its own falsity-content, but usually not to its empirical content. Also, clearly, an increase of verisimilitude thus defined insures that there is no crucial evidence going the wrong way. Nevertheless, this definition is unsatisfactory, since it precludes a possibility which the content increase of scientific theory requires. For, content increase amounts to the possibility of refuting the new theory with evidence not relevant to the old. Thus, for all we know, all possible crucial evidence concerning Galileo and Newton goes Newton's way; the known refutations of Newton are not relevant to Galileo at all, then. The theory of verisimilitude increase should permit such cases. We may hide behind the fact that all such evidence is outside the field of empirical evidence that was available in the seventeenth century, when Newton competed with Galileo, and therefore not pertinent to our present discussion. This move will be valid for this example but to make it stick we must generalize it. The generalization amounts to the following hypothesis about empirical science:

(H) All refutations of scientific theory are by means not available when that theory won acceptability over its predecessor.

This hypothesis is extremely popular amongst physicists, and I tend to ascribe it to Werner Heisenberg. It is refuted by every important experiment performed by old or relatively primitive means, such as the Einstein-de Haas experiment.

6. We have, therefore, to narrow down the definition of verisimilitude increase explicitly to crucial evidence alone. We then have two definitions, side by side:

- (1) a theory is more empirically successful than its predecessor if and only if all known crucial evidence concerning the two goes its way;
- (2) a theory is more verisimilar than its predecessor if and only if all crucial evidence concerning the two goes its way.

Notice that the difference in the two defining clauses is that the word "known" occurs in (1) but not in (2). Notice also that crucial evidence is one procurable at present, whether actually procured or not.

7, Popper has never withdrawn his early view or his late view:

- (E) Progress is empirical success;
- (L) Progress is verisimilitude increase;

and since (2) above is the weakest possible definition of verisimilitude increase, he must accept the defining clause in it as necessary, though he may still wish to quarrel with my proposal to consider it sufficient. Hence, his endorsement of his early and of his late view together amount to the endorsement of the following hypothesis (which follows from (1), (2), (E), and (L)):

- (QI) When crucial evidence repeatedly points one way it is unlikely that it also point the other way.

This is the principle of quasi-induction adumbrated in the final section of Popper's classic *Logik der Forschung*, where he discusses the progress of science in the inductive direction. And so, the question is, does Popper give rise to a new form of the problem of induction? In his *Logik der Forschung* he said, as long a science is a going concern we have no need to trouble ourselves with the problem of legitimizing it. Later on he tried to legitimize science by its aims, which brought him to his theory of verisimilitude increase, which theory includes the hypothesis (QI). What, then, is the status of this very interesting hypothesis?

8. Thus far I have proposed a hypothesis as to why Popper has offered his late view of scientific progress (L) in addition to his early view (E), and I have offered a minimal

definition of verisimilitude increase (2). I have done so from a strictly Popperian viewpoint as best I understand it. The rest of this note is not written within this confine, though it is a comment on the fact that Popper has to endorse (QI), which, anyway I think he does, as well as on my claim that accepting it removes the deficiency in Popper's early view (E) and amounts to his late view (L). The question I wish to address now is, how satisfactory is it to accept (QI) as a remedy of the deficiency of (E)? Or, rather, is this move not *ad hoc*? For, when accepting (E) we were worried lest crucial evidence exists, unknown to us, pointing the wrong way; and (QI) merely says that such evidence is not likely. But, then, we may first ask, is (QI) true? And second, if it is true, why? I suggest that it does not much matter whether (QI) is true, since, when we find crucial evidence going the wrong way we simply reverse judgment. I suggest also that by and large we take (QI) to be true as a matter of course. For example, today no one expects any crucial evidence to turn up which goes Galileo's way. Finally, the question, why? is easily answerable: current scientific theory runs against the expectation that crucial evidence will go Galileo's way; for, that evidence would refute all later theories of gravitation, and this would be a major scientific upheaval. But Popper's theory of verisimilitude does not judge things from the viewpoint of any specific scientific theory; rather, it is both meta-scientific and ontic. This fact, I suggest, blocks the way to any answer to our question, why is (QI) true? For, meta-science with no metaphysics precludes all ontology.

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