『哲学・思想論叢』、第１号、1982 年 12 月、筑波大学哲学・思想学会
（MISCELLANEA PHILOSOPHICA, No. 1, 1982. ）

FALSIFICATIONISM VERSUS CORROBORATIONISM

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Aside from philosophers of science, even layman having little knowledge about the methodology of science immediately associate 'Popper' with 'falsificationism' and vice versa.

However, unexpectedly there are very few who understand falsificationism and its significance. Lakatos, who was universally admitted as a successor of Popper, misunderstood Popper's theory. Though the word 'unexpectedly' was used above, it might not be a surprise because even Popper himself seems not to understand the epoch-making significance of his theory.

When you read *Science in Flux*[1] by Agassi, a former disciple of Popper, you will come to the conclusion that Popper's successor was not Lakatos but Agassi. For Agassi detects the most important point of Popper's theory which Popper himself seems to overlook. In a way, it may be more proper to say that Agassi surpasses his master, Popper..

Viewing the recent trend of the philosophy of science - from the volume, *Criticism and the Growth of Knowledge*[2] (1970) to the volume, *Progress and Rationality in Science*[3](1978) - one gets a (wrong) impression that Popper's falsificationism has been criticized and replaced by Lakatos's methodology of scientific research programmes (MSRP), which is now regarded as representing the position of critical rationalism - simply speaking, the position which defends the rationality of science. Again the problem of evidential support becomes the central problem in the philosophy of science, though the import of the evidential support is changed from induction, through confirmation now to corroboration. You can notice the transition from falsificationism to corroborationism from the fact that the object of criticism has been changed from Popper to Lakatos. And Agassi is

completely neglected, especially in the volume, *Progress and Rationality in Science*.

In my opinion, this shift shows nothing but a degenerating problem shift, using Lakatos's terminology. In this short paper, some reasons against corroborationism will be offered.

By the way, from the fact that the concept of 'falsification' is closely related with the concept of 'truth' or 'falsity', it produces an epistemological problem: the problem of so-called empirical basis, i.e. the problem of the truth of basic statements, or the semantical problem: the problem of the semantical formulation of 'verisimilitude'. However, we shall not enter the former problem deeply nor treat the latter problem at all but limit our concern mainly to a methodological problem, i.e. how do we learn from experience? By falsification or by corroboration? In short, we shall treat only the empirical aspect of science.

I. ON THE THIRD REQUIREMENT

The recent concern of the philosophers of science is centered on corroboration - or exactly speaking excess corroboration - which Lakatos placed in the center of his methodology (MSRP). Lakatos writes, "Justificationists valued 'confirming' instances of a theory; naive falsificationists stressed 'refuting' instances; for the methodological falsificationists it is the - rather rare - corroborating instances of the *excess* information which are the crucial ones;… the few crucial *excess-verifying instances* are decisive." [4]

The start of it lies in that Popper added a famous 'third requirement' in an essay[5] which appeared in his work, *Conjectures and Refutations* (1963). In his work, *The Logic of Scientific Discovery*[6] (1959), the falsification of scientific theory being stressed, corroboration was not required. For Popper corroboration was only a critical report of the result that the attempted falsification failed. In *The Logic of Scientific Discovery*, knowledge grows by conjectures and refutations. For the growth of knowledge corroboration was unnecessary.

However, in the essay mentioned above, Popper added the third requirement for the growth of knowledge. He writes, "We require that the theory should *pass* some new, and severe, tests."[7] This seems to be a modification or a deviation from falsificationism. For this requirement

seems to claim that falsification is not enough for the growth of knowledge. Using Agassi's words,[8] Popper now thinks that conjectures, corroborations, and refutations are necessary conditions for the growth of knowledge. Agassi is opposed to the third requirement as that for the growth of knowledge.[9] On the other hand, Lakatos was willing to accept the requirement and modified it and named the modified one 'acceptability$_2$'.[10]

There are two problems concerning corroboration. Is corroboration indispensable for the growth of knowledge? Does corroboration have something to do with the empirical character of science?

II. IS COOROBORATION INDISPENSABLE FOR THE GROWTH OF KNOWLEDGE?

Before we examine Popper's arguments for the third requirement, we have to take note of two points. (1) Popper himself is aware of the strangeness of this requirement.[11] (2) He points out that this requirement clearly cannot be indispensable.[12] Rather, Popper is hesitating between falsificationism and corroborationism.

According to Popper, philosophers are classified as belonging to two main groups; (1) the verificationist philosophers of knowledge, (2) the falsificationist philosophers of knowledge.[13] Corroborationism is a residue of verificationist modes of thought,[14] not belonging to the group of falsificationism. Therefore, Popper cannot hold both falsificationism and corroborationism at the same time. He cannot be doubly blessed.

Popper's supportive arguments for the third requirement are divided mainly into two parts. A. factual or psychological arguments, B. logical or methodological arguments. Let us consider each argument in detail.

A.1 Without the third requirement, further progress in science would become impossible.[15]

However, the corroboration which is mentioned here is not the corroboration of a theory but that of new effects. Of course, the discovery of new facts is indispensable. But it has nothing to do with the corroboration of a theory.

A.2 Without the third requirement, science would stagnate, and lose its empirical character.[16]

In order to support this argument, Popper introduces a new kind of definition of ad hocness. If a theory which is independently testable should

not pass the independent test, it is ad hoc, for it is always possible, by a trivial stratagem, to make an ad hoc theory independently testable by connecting it with any testable but not yet tested *fantastic* ad hoc prediction which may occur to us (or to some *science fiction writer*).[17]

However, concerning the prediction of unknown facts, is it possible to know whether it is fantastic or not before testing? If it is known in advance, it is not independently testable, and if it is not known in advance, one cannot assert that it is a fantastic prediction. In connection with this argument, Popper, mentioning Giedymin's general methodological principle of empiricism: Nature must be able to defeat us at least sometimes, says that 'If we drop our third requirement, then we can always win.'[18] However, is not the third requirement rather a requirement that we sometimes have to win the battle with Nature? A theory which did not fulfill the third requirement, for example, the Bohr-Kramers-Slater theory, was defeated by Nature. Therefore, without the third requirement it is possible to lose all the time, but it is impossible to always win.

A theory, if it is *genuinely* independently testable, is not ad hoc at all.

A.3 Without the third requirement, a theory would be a mere instrument of exploration.[19]

However, for Popper the concept of 'truth' is a regulative principle or idea which is beyond human reach. Therefore, all theories which men invent cannot be true. That is, they are nothing but stepping stones, aiming at the truth and guessing about the structure of the world. In a sense, they may be instruments but they are instruments by which we try to get nearer to the truth. They are never instruments in terms of instrumentalism.[20]

A.4 If we should only succeed in refuting our theories but not in obtaining some verifications of predictions of a new kind, we might decide that our scientific problems have become too difficult for us because the structure (if any) of the world is beyond our powers of comprehension. Therefore, for us to fulfill the third requirement, we need a world whose mathematical structure is not so intricate as to make progress impossible.[21]

What on earth does this assertion mean? Does it mean that in order to succeed in corroboration, the world must not be so very different from the world as we know? Do not you think it is strange? We are going to show this strangeness by using Agassi's thought experiment.

Agassi says, 'Consider a universe in which science is almost like ours, with series of conjectures, some of which are tested, but in which, by luck or

otherwise, every test is successful; that is to say, in that universe every test refutes a theory. Query: does that universe have science proper or not? *Popper's answer must be in the affirmative*.'[22] However, as you know from Popper's above argument, his answer is unexpectedly *in the negative*!

Popper is aware of the fact that the arguments, which are examined above, have only psychological effects or encouragement.[23] Then he produces three more reasons for the third requirement, which, he insists, are logical or methodological.

B.1 We know that if we had an independently testable theory which *was, moreover, true*, then it would provide us with successful predictions (and only with successful ones). Successful predictions . . . are therefore at least necessary condition for the truth of an independently testable theory. In this sense - and only in this sense - our third requirement may even be said to be 'necessary', *if we seriously accept truth as a regulative idea*.[24]

This argument is connected with the former (A.3) argument. However, if we seriously accept truth as a regulative idea, we cannot obtain the comprehensively true theory. In other words, every theory is doomed to be refuted. It is a deviation from falsificationism to require the irrefutable, true theory.

B.2 If it is our aim to strengthen the verisimilitude of our theories, or to get nearer to the truth, then we should be anxious not only to reduce the falsity-content of our theories but also strengthen their truth-content.[25]

However, even if an independently testable theory is refuted by the first severe test, its truth-content as well increases. Lakatos has already compared two models of scientific growth, the Popperian model and the Agassite model. So we are going to use only the descriptive side of his comparisons.

(1) A major theory T_0, accepted$_2$, is refuted by a minor falsifying hypothesis f_1; which is also accepted$_2$. The (relevant part of the) body of science in both models consists of T_0 and f_1.

(2) T_1 is proposed. T_1 is bold, explains all the truth-content of T_0 as well as f_1; its excess content is e_1. But e_1 is 'fully refuted', T_1 is rejected. The refuting hypothesis is f_2 and it is accepted$_2$.

In the Popperian model the body of science now consists of T_0, f_1, f_2. In the Agassite model it consists of T_1 and f_2.

(3) T2 is proposed. T2 is bold, explains all the truth-content of T_1 as well as f_2; its excess content is e_2. But e_2 is 'fully refuted', T_2 is rejected. The

refuting hypothesis is f_3 and it is accepted$_2$.

In the Popperian model the body of science now consists of T_0, f_1, f_2, f_3. In the Agassite model it consists of T_2 and f_3. And so on.[26]

Even in the Agassite model, the truth-content of T_2 is greater than that of T_1, and T_2 is greater than T_0. For while T_0 fails to explain f_1, T_1 explains f_1, i.e. T_1 includes the truth-content of f_1. Similarly, while T_1 fails to explain f_2, T_2 explains f_2, i.e. T_2 includes the truth-content of T_1, f_2, or T_0, f_1, f_2.

B.3 In science crucial experiments are decisively important, but without the third requirement, it would be impossible to do crucial experiments.[27]

However, for example, there is a crucial experiment between T_0 and T_1. For while T_0 cannot explain f_1, T_1 explains f_1. Besides there is another crucial test of f_2 against T_1.

Incidentally, Lakatos proposes another argument for the third requirement. He argues as follows:

"Following the line of Agassi's argument, let us imagine that after T_0 and f_1, T_2 is immediately proposed. T_2 will then be accepted$_1$ and also accepted$_2$, for f_2 is part of its excess content. Now why should $\{T_0, T_1, T_2\}$ represent a degenerative shift when $\{T_0, T_2\}$ represents a progressive shift? The argument is interesting. But instead of being an argument *against* the 'Popperian model', it gives a final touch to its clarification. According to Popper, the essence of science is growth; fast potential growth (acceptability$_1$) and fast actual growth (acceptability$_2$). Slow growth is not good enough to live up to popper's ideal image of science. If imagination does not fly fast enough ahead of the discovery of facts, science degenerates."[28]

However, this requirement demands that man should be more imaginative or rather demands that the world should not be so intricate. This demand is strange, as we pointed out in A.4.

III. DOES CORROBORATION HAVE SOMETHING TO DO WITH THE EMPIRICAL CHARACTER OF SCIENCE?

So far we criticized mainly Popper's arguments for the third requirement one by one. However, there is a strong argument against the third requirement. Of course it is not our invention but Popper's. It is ironical

to use Popper's argument against Popper. Logically speaking, as Popper notices,[29] it is irrelevant whether supporting evidences precede or follow in time the invention of the theory. For the logical relation between the prediction of new facts and a theory and the logical relation between the explanation of the known facts and a theory are the same. Both are deducible from the theory plus the initial conditions. According to Popper, the statements of the predicted new facts and the statements of the explained known facts are both instantial statements of the theory which succeeded in prediction and explanation. And instantial statements do not have the empirical character of scientific theory.[30] For according to popper, the empirical content of a theory is determined by (and equal to) the class of those observational statements, or basic statements, which *contradict* the theory, *not* the class of all observational statements which *follow* from the theory.[31]

Successful predictions belong not to the empirical content of the theory but rather to its logical content. Therefore, successful predictions have nothing to do with the empirical character of a theory. So we cannot accept Popper's following statement.

"Yet I believe that we should feel that, especially for the functioning of its *empirical* side, both kinds of successes are essential: success in refuting our theories, and success on the part of some of our theories in resisting at least some of our most determined attempts to refute them."[32]

When a theory is falsified, i.e. its potential falsifiers turn out to be actual, they constitute the empirical content of the theory. Popper says, "de moritius nil nisi beme: once a theory is refuted, its empirical character is secure and shine without blemish."[33] On the other hand, when a theory is corroborated, i.e. its potential falsifiers turn out to be false, or negations of its potential falsifiers become actual, we find that they do not constitute the empirical content of the theory. Therefore, we do not obtain empirical knowledge from corroboration, the successful prediction, but only from falsification.

A word about rationality. From the corroborationist point of view it is rational for scientists to accept a theory as long as it is better corroborated than another theory or is excess corroborated. However, it is quite difficult to ascertain excess corroboration. For, as mentioned earlier, prediction and explanation have the same logical relation to a theory. It is usual that successful explanation of a known fact cannot be counted as corroboration

because there is no severe test for it. Then corroborationists have to distinguish the success of prediction from the explanation of known facts. They have to investigate which instances a scientist knew when he constructed his theory. In order to do that, they cannot hold a logical investigation. Thus the problem of the growth of knowledge has been shifted from a logical one to a socio-historical one.[34] However, for falsificationists it is possible to do logical analysis on the problem of the growth of knowledge. In the sense that falsification occurs in history, falsification has a historical character. But falsification is a falsification, whether it precedes or follows historically the construction of the theory. You do not have to adopt a historical, sociological approach. Therefore, for falsificationists the recent problem shift seems to be degenerating, or rather to be mistaken. Corroboration has nothing to do with empirical knowledge at all. It is nothing but an optical illusion as Popper asserted against induction.[35]

Does it mean the collapse of the rationality of science? For corroborationists it seems to be so. However, for falsificationists not at all. From the falsificationist point of view, it is rational for scientists to admit falsifications after they attempt to counter-criticize the falsifications, and then try to overcome the difficulties or problems which are produced from the falsifications. Some scientists may test the falsified theory as far as it has independently testable consequences. Or some may try to ascertain the limit of the explanatory power of a theory. Or some may boldly attempt to construct a new theory which will explain the mistakes of the previous theory and its falsifying instances, or a bolder theory which has independently testable consequences. It is possible to say that they are all rational in so far as they do not ignore various kinds of falsifications when they notice them. In short, it is rational to admit mistakes as mistakes.

However, some critics of falsificationism may ask how we can admit mistakes as mistakes. They may criticize falsificationism as follows. It might be true that concerning universal statements, by which scientific theories are formulated, there is an asymmetry between truth and falsity. For we cannot verify scientific theories but can falsify them. But how about basic statements, which we use as the means of testing a scientific theory? In order to falsify a basic statement, *we cannot but accept another basic statement as true*. Falsification of a basic statement presupposes verification of another statement. Without verification, falsification is

impossible. Therefore, if one cannot insist on the truth of a basic statement, one cannot insist on the falsity of another basic statement, either. Therefore, we can never identify that such and such statements are mistaken, i.e. false.

The point is this. While falsificationism depends on the doctrine of asymmetry between truth and falsity, its critics deny the asymmetry. Which is right? We can counter-criticize the denial of the asymmetry. As Popper says, any statements are transcendent from experience.[36] Therefore, there is always a possibility of errors in them. One can criticize them, i.e. we can insist on the falsity of them. Basic statements are not exception. We can criticize any basic statements when we doubt them. Sometimes criticism may succeed. Sometimes criticism may be rebutted by counter-criticism. Both criticism and counter-criticism are attempts at falsification. We can only say that the target for our criticism is doubtful or false. We do not have to assert that the statements, on which our criticism is based, are true. For when we accept some statements, we always accept them as the result of a critical examination, i.e. because of the failure of an attempted falsification. *We d o not accept as true*. On the other hand, when we reject some statements, we reject them as *false*. For, as Popper says, "such things as obscurity or confusion may indicate error, . . . incoherence and inconsistency do establish falsehood."[37] In each stage we can always adopt a negative or critical approach to any statements, without being committed to justification or verification of any kinds.

In science falsification is not a vice but virtue. We have to assign rather plus marks for falsification.[38] Rationality is defined by our ignorance, not by knowledge.

NOTES

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[1] Agassi, J., *Science in Flux*, [SF], Boston Studies in the Philosophy of Science, 28, edited by R. S. Cohen and M. W. Wartofsky, Dordrecht, Reidel, 1975.

[2] *Criticism and the Growth of Knowledge*, [CGK], edited by I. Lakatos and A. Musgrave, Cambridge University Press, 1970.

[3] Progress and Rationality in Science, [PRS], edited by R. S. Cohen and M. W. Wartofsky, Dordrecht, Reidel, 1978.

[4] Lakatos, I., Falsification and the Methodology of Scientific Research Programmes, in [CGK], p.120. Italics are original.

[5] Popper, K. R., Truth, Rationality, and the Growth of Scientific Knowledge, [TRG], in *Conjectures and Refutations*, [CR], London, Routledge, 1963.

[6] Popper, K. R., The Logic of Scientific Discovery, [LSD], London, Hutchinson, 1959.

[7] [TRG], p.242. Italics are mine.
[8] [SF], p.26.
[9] Ibid., p.27.
[10] Lakatos, I., Changes in the Problem of Inductive Logic, [CPI], in *The Problem of Inductive Logic*, edited by I. Lakatos, Amsterdam, North-Holland, 1968, pp.379-390.
[11] [TRG], p.247.
[12] Ibid., p.242.
[13] Ibid., p.228.
[14] Ibid., p.248, footnote 31. In response to Agassi's objection to the third requirement, Popper concedes that there is a whiff of verificationism in this requirement.
[15] Ibid., p.243.
[16] Ibid., p.244. Even here the corroboration is not that of a theory.
[17] Ibid., p.244. Italics are mine.
[18] Ibid., p.244, footnote 29.
[19] Ibid., p.245.
[20] This will be an answer to Popper's insistence that in Agassi's position there is a whiff of instrumentalism.
[21] Ibid., p.245.
[22] [SF], p.26. Italics are mine.
[23] [TRG], p.245.
[24] Ibid., p.246. Original italics are changed into mine.
[25] Ibid., pp.388-389.
[26] [CPI], pp.388-389.
[27] [TRG], p.247.
[28] [CPI], pp.389-390.
[29] [TRG], p.247.
[30] [LSD], p.258.
[31] [CR], p.385.
[32] [TRG], p.245. Italics are original.
[33] Ibid., p.240.
[34] This paragraph until here is a rough description about one of the problems which are discussed in [PRS].
[35] *The Philosophy of Karl Popper*, edited by P. A. Schilpp, La Salle, Illinois, 1974, vol. II, p.1015.
[36] [LSD], p.94.
[37] [CR], p.28.
[38] However, it is taken for granted to assign *minus* marks for falsification. For example, N. Koertige's paper in [PRS], p.271. Incidentally, the existence of anomalies is usually used as a criticism against falsificationism. However, for falsificationists the existence of anomalies is entertained because it shows some problems to be solved.