REVIEW ARTICLE

Refined Falsificationism Meets the Challenge from the Relativist Philosophy of Science


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Reflections in many other fields. It should be shown that their philosophy of science is untenable, this should have
be their claims reside in their work in the philosophy of science. It is
clear that the real significance of Kuhn's work is not to be found in
the history of science. However, the strength of the arguments upon which their adherents of
Critical Rationalism have based their claim that the critical rationalism is impossible is
much weakened by the fact that the critical rationalism is impossible. W. W. Bartley III argued that
Popper's notion of rationality can be combined with the work of K. R. Popper. If it could be shown that their philosophy of science is untenable, this should have
perceptions in many other fields.
Do the case studies which the 'New Philosophy of Science' has culled from the history of science show that the falsificationist methodology is unrealistic?

Gunnar Andersson (University of Umeå, Sweden) submits an answer to this question in his latest book. Before the case studies, he introduces a new framework for the logical structure of explanation, prediction and falsification. Andersson's book provides the first major improvement of falsificationist methodology since the 30s. For the first time, falsification arguments are provided with a nonlogical basis. The author also shows: (a) how unproblematic test statements can be deduced from problematic ones; (b) that empirical testing concerns theoretical systems as wholes; and (c) how Popper's view of auxiliary hypotheses and ad-hoc hypotheses can be improved. As a result of his investigations, Kuhn's criticism of falsificationist methodology collapses, and the so-called Incommensurability Thesis turns out to be false.

Chapter 1: The Critique of Falsificationist Methodology

Chapter 2: The Logical Structure of Explanation, Prediction and Falsification

Chapter 3: The Historical Context of the Various Case Studies

Chapter 4: The General Results of the Volume
Gerard Radnitzky and falsification on the one hand and explanation and prediction on the other hand. The author shows that, if predictive arguments are valid, certain types of falsificatory arguments are valid too, and vice versa. The formal proofs for these metalogical equivalences are gathered in an Appendix. It turns out that the two special types dealt with by Popper are not the only valid ones, that the idea of a falsificatory argument can be generalized—that many other forms are valid too. In order to appraise the criticism against falsificationism brought forward by Kuhn, Lakatos, Feyerabend and others, it is imperative to show how theoretical systems that consist of several general hypotheses can be falsified. After all, what is at stake in the history of science and the practice of science are very rarely isolated hypotheses, normally theoretical systems are at the center of interest.

With respect to his position vis-à-vis the second problem of the logical structure of predictions, the thesis that explanatory and predictive arguments have the same logical form does not hold in general. It only holds for explanation and for the deduction of unconditional predictions, but it does not hold for explanation and the deduction of conditional predictions. Explanations and arguments having a conditional prediction as conclusion are metalogically equivalent. The third chapter is devoted to Thomas Kuhn. It is shown that his criticism of falsificationism hinges on the position he takes vis-à-vis to two methodological problems: (1) What is the 'rational' reaction of researchers to a falsification? (2) What are the implications of the theory dependence of experience? From these two problems, (1) and (2), his position on the logical structure of predictions (conditional and unconditional) and the analysis of the structure of falsification arguments (Popper, Hempel, Oppenheim, Stegmüller, etc.) follow naturally. The author shows that Kuhnian key concepts like 'puzzle', 'counter example', 'paradigm', etc., are ambiguous and do not allow us to distinguish between the various positions. Kuhnian shows that a falsification argument is a special case of a conditional prediction argument, and that certain types of conditional predictions are equivalent to certain types of falsification arguments. The author shows that the criticism of falsificationism brought forward by Kuhn, Lakatos, Feyerabend and others is based on a misunderstanding of the logical structure of falsification arguments. The formal proofs for these equivalences are gathered in an Appendix. It turns out that these metalogical equivalences are valid, and vice versa, the formal proofs for the equivalences are gathered in an Appendix.
Refined Palsification Meets Relativist Philosophy of Science

The fourth chapter is devoted to an in-depth analysis of Kuhn's position in the context of 'normal science'. Lakatos accepts Kuhn's thesis that, in the context of 'normal science', theories are relatively immune against falsification, and he attempts to analyze the mechanism of such immunization strategies. Andersson shows that these criteria are problematic, because they involve an ex ante appraisal of the future potential of a research program and thereby introduce biases about the future success of various research strategies. Andersson argues that the decisive criticism of Kuhn's position is postponed to Chapters 6 and 7.

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Andersson proceeds by analyzing Feyerabend's case histories, in particular, Galileo's defense of the Copernican system by introducing new auxiliary hypotheses. Like Kuhn, Feyerabend uses the case studies to support the incommensurability thesis, in which the hypotheses introduce a new perspective to escape or reformulate the old hypotheses. The only thing according to him there are no objectively or general criteria. The only thing possible is an objective explanation of the idea of scientific progress—however, in the context of Feyerabend's incommensurability, it is not possible to define the hypothesis about the relativity of observations through a hypothesis about the relativity of the possibility of observing the hypothesis. 

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Refined Falsificationism Meets Relativist Philosophy of Science Challenge

... theoretical systems. That means that the challenge to falsificationism from the history of science is basically a discussion of methodological problems with the help of examples culled from the history of science. Thus, Andersson now turns to the analysis of these two basic methodological problems.

The sixth chapter is devoted to the problem solutions that Popper has offered to the so-called problem of the empirical base. Andersson shows that Popper's formal requirement that a basic statement should have the form of a 'there-is'-sentence has the unacceptable consequence that basic statements cannot contradict each other and therefore are unfalsifiable (and hence also non-scientific). Andersson shows that this difficulty can be overcome by a slight modification of the Popperian requirement, and he proposes that all sorts of singular sentences that are properly individuated and describe observable phenomena qualify as basic statements or as test statements. This proposal is supported by the metalogical equivalence between explanation and falsification (which has been demonstrated in the Appendix). For the empirical testing of theories the importance of the reproducibility of the effects described in the basic statements can scarcely be overrated.

Popper's basic statements follow from a conjunction of singular statements that describe the antecedent conditions and a negated unconditional prediction. It is appropriate to view a falsification argument as an argument whose premises consist of the antecedent conditions A and a negated unconditional prediction ¬P. This interpretation is preferable to the customary one according to which the premises consist of a single basic statement, mainly (but not exclusively) because thereby the relationship between falsification and the deduction of predictions is clearly shown: 'A, ¬P' being logically equivalent to 'A, ¬P, ¬P'. Hence, Andersson's explication of the concept of a falsifying argument is wider than that of Popper.

Popper claims that a critical discussion of theory-dependent test statements is possible, but he has given only some hints on how this could be done. Andersson shows in detail how unproblematic test statements can be derived from problematic ones with the help of auxiliary hypotheses. It is always possible from two theories that describe the same sort of phenomenon but are allegedly incommensurable to derive further test statements until one arrives at test statements that are neutral vis-à-vis the two competing theories. In order to substantiate this claim, Andersson analyzes some of Kuhn's and Feyerabend's historical case studies and demonstrates in detail how theories, which according to Kuhn and Feyerabend are allegedly incommensurable, can be made commensurable by deducing further test statements that are neutral vis-à-vis the two competing theories. Hence, Andersson shows that falsificationism, as refined by Popper, can be compared with each other. If two theories that can be described by two alternative theoretical systems are competing and the hypotheses of each theory are not contradictory, the first theory cannot be falsified by a single test statement that is incompatible with the second theory. Instead, the experimental data have to be interpreted in a way that makes both theories compatible. If the experimental data do not allow such an interpretation, then the first theory is falsified. The sixth chapter is devoted to the problem solutions that Popper has offered to the so-called problem of the empirical base. Andersson shows that Popper's proposal is supported by the metalogical equivalence between explanation and falsification. Hence, the relationship between falsification and the deduction of predictions is clearly shown: 'A, ¬P' being logically equivalent to 'A, ¬P, ¬P'. Hence, Andersson's explication of the concept of a falsifying argument is wider than that of Popper.
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remarking that it is the belief of "normal science" to change the theoretical system is insufficient to regard the new auxiliary hypotheses as a modification of the theoretical system and to test them as parts of the theoretical system. The falsificationist methodology only requires that, after a falsification, the theoretical system be modified; and this by no means entails that a falsified theoretical system has to be "rejected" in toto or "abandoned.

Thus, Kuhn's claim that in "normal science" scientists react to a falsification by modifying the falsified system but not by abandoning it is consistent with falsificationism. The conventionalist objections against falsificationism (which Lakatos accepted), namely the claim that falsifications can always be outmanoeuvred merely with the help of ad hoc hypotheses, is false. The only rational way of reacting to a falsification is by modifying the theoretical system; and the falsificationist methodology is compatible with falsificationism. The conventionalist hypothesis that auxiliary hypotheses should be independent of the falsified system is not conceivable, and the falsificationist methodology requires that auxiliary hypotheses be a part of the theoretical system. The falsificationist methodology only requires that, after a falsification, the theoretical system be modified; and this by no means entails that a falsified theoretical system has to be "rejected" in toto or "abandoned.

The second chapter is devoted to the problem of the modification of the theoretical system and the role of the auxiliary hypotheses. By contrast, auxiliary hypotheses should be independent of the falsified system. The falsificationist methodology requires that auxiliary hypotheses be a part of the theoretical system. The falsificationist methodology only requires that, after a falsification, the theoretical system be modified; and this by no means entails that a falsified theoretical system has to be "rejected" in toto or "abandoned.

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Refined Palsificationism Meets Relativist Philosophy of Science Challenge

A reliable instrument for astronomical observations, and his replacing the Aristotelean dynamics by different dynamical auxiliary hypotheses (circular inertia). Andersson shows that these auxiliary hypotheses did not function as devices that deflect criticism or neutralize the falsified theoretical system but to be created in some way. It could not be ascertained that these auxiliary hypotheses were consistently derived from problematic ones. The research strategies of Kuhn for normal science, i.e., reacting to a falsified theoretical system by attempting to modify the theoretical system hit by the falsifications by arriving at new dynamical hypotheses that Galileo used to explain the tower experiment. Feyerabend regards Galileo's hypotheses as ad hoc in an objectionable sense, because Galileo introduced them after the alleged falsification of the traditional assumptions about free fall. Feyerabend is right. The introduction of new auxiliary hypotheses modifies the theoretical system concerned, but it is not evident whether these auxiliary hypotheses are consistent or not. The research strategies of Kuhn for normal science, i.e., reacting to a falsified theoretical system by attempting to modify the theoretical system hit by the falsifications by arriving at new dynamical hypotheses that Galileo used to explain the tower experiment. Feyerabend regards Galileo's hypotheses as ad hoc in an objectionable sense, because Galileo introduced them after the alleged falsification of the traditional assumptions about free fall. Feyerabend is right. The introduction of new auxiliary hypotheses modifies the theoretical system concerned, but it is not evident whether these auxiliary hypotheses are consistent or not.

The challenge to falsificationist methodology from examples culled from the history of science has proved a powerful incendiary for critics to score the two methodologies essential in the philosophy of science. What psychological motives may have prompted the researcher to introduce an auxiliary hypothesis has been questioned, and it is also reasonable that the auxiliary hypothesis was supposed to be a part of the theoretical system to be tested or an hypothesis introduced after the alleged falsification of the theoretical system. The same holds. auxiliary hypotheses, and equally important, they make explicit the theoretical system, and equally important, they make explicit the theoretical system.

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Gerard Radnitzky

advice as to the best way of reacting, to a falsification, whether a minor modification of the old theoretical system or a complete replacement by a new one will lead to scientific progress. There is no 'logic' of scientific discovery in the sense of an algorithm.

In the 20th century, the philosophy of science has produced three important 'schools' or styles: positivism, Wittgenstein's later philosophy, and Critical Rationalism. Popper and Wittgenstein II are both critics of positivism. Popper criticized positivism much earlier than Wittgenstein did. Yet, Wittgenstein is still widely seen as the main critic of positivism.

The 'new philosophy of science' criticizes the positivist approach to the philosophy of science, and it wrongly views Popper as a positivist. It starts from the practice of research, and it draws attention to weak spots in the methodology of Critical Rationalism. Popper has only dealt with the empirical testing of isolated universal statements. He has not considered the methodology of Critical Rationalism, which is the subject of Popper's later philosophy.

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Refined Falsificationism Meets Relativist Philosophy of Science

In summary, Andersson has solved two important methodological problems. This made it possible to meet the challenge to the methodology of Critical Rationalism from the history of science. The methodological problems have been solved by processing the methodology of Critical Rationalism. In its capacity to solve methodological problems the revised version of Critical Rationalism is far superior to both positivism and Wittgensteinian relativism. Refuting the claims of relativism with respect to methodology will have important implications for the discussion of relativism in moral and political philosophy. Critical argumentation has been shown to possess a greater problem solving capability than propaganda, persuasion, or other non-rational methods.

The challenge to falsificationism from the history of science has led to intellectual progress, i.e., to the processing of falsificationist methodology. Like Popper's classic of 1934 Andersson's book will make an impact only when it has become available in the new lingua franca. It is to be hoped that it will not have to wait for an English translation as long as Popper's volume.

GERARD RADNITZKY

University of Trier, West Germany

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Regarded Falsificationism Meets Relativist Philosophy of Science, Challenge 283
Gerard Radnitzky


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