Realism, Method and Truth[1]

Howard Sankey

Department of History and Philosophy of Science
University of Melbourne

1. Introduction

Rational scientific inquiry is governed by the rules of scientific method. Adherence to the rules of scientific method warrants the rational acceptance of experimental results and scientific theory. Scientists who accept results or theories licensed by the rules of method do so on a rational basis. Thus, rational justification in science is closely connected with scientific method.

But while it is evident that there is a close relation between method and rational justification, substantive questions remain about the relation between method and truth. For example, are scientists whom method licenses in accepting a theory or experimental result thereby licensed in accepting the theory or result as true? Does use of scientific method lead scientists to discover the truth about the world? Questions such as these are questions about the truth-conduciveness of method. While they relate directly to the epistemic status of method, they bear indirectly on the nature of rational justification. For if use of method conduces to truth, then, given the relation between method and justification, the warrant provided by method is warrant with respect to truth.

Questions about the relation between method and truth divide scientific realism from anti-realism in the philosophy of science. On the one side, scientific realists take the aim of science to be discovery of the truth about the world. Realists defend the view that employment of the methods of science promotes the aim of truth. On the other side, anti-realists in the philosophy of science deny the connection which realists see between method and truth. Anti-realists typically agree that method underwrites the rationality of science. Some anti-realists deny that there are good grounds for taking use of method to lead to the realist aim of truth. Other anti-realists object to the realist conception of truth, and deny that method promotes truth in the sense intended by realists.

In the present context, the key question that divides scientific realism from anti-realism about science is whether employment of method advances the realist aim of truth. This is a question about whether a proposed means for the achievement of a given end is in fact a means conducive to that end. More specifically, it is the question of whether good grounds may be given for taking the methods of science to promote the realist aim of truth.

My aim in this paper is to defend the realist response to this question by arguing that there are strong abductive grounds for taking the methods of science to be truth-conducive. Before I turn to that task, let me first address the relation between method and rational justification in somewhat greater detail.

2. Scientific Method and Rational Justification in Science

In this paper, I assume a traditional view of the relation between scientific method and rational justification in science. On such a view, there is a close connection between scientific method and the rational acceptance of scientific theories and experimental results. In particular, compliance by a scientist with the rules of scientific method rationally justifies the scientist's acceptance of a theory or result. A scientist whose acceptance of a theory or result fails to comply with the rules of method thereby fails to accept the theory or result on a rational basis.

However, while I assume a traditional view of the relation between method and rational justification, I do not assume a traditional view of the nature of method itself. The traditional view of method is a monistic view, according to which there is a single, historically invariant method, the use of which is the characteristic feature that distinguishes science from non-science. By contrast with the traditional monistic view, I adopt a position of methodological pluralism according to which there is a set of methodological rules which scientists employ in the evaluation of alternative theories and the acceptance of results. These rules are subject to variation in the history of science, and different rules may be employed in different fields of science. Given the plurality of rules, scientists may diverge in the rules they employ, with the result that there may be rational disagreement among scientists on matters of fact and choice of theory. On such a pluralist view of science, while no single method is characteristic of science, the sciences are generally characterized by possession of a set of methodological rules which inform the factual and theoretical decisions of scientists.[2]

Much remains to be said about the relation between method and rational justification. However, for present purposes, I will assume that the relation between method and rational justification is straightforward. The purpose of this paper is to examine the relation between method and truth. Even if we assume that compliance with the rules of method justifies acceptance of a theory or result, the question remains of whether the theory or result is to be accepted as true. There is an epistemic gap between method and truth. My aim is to bridge this gap.

3. The Realist Conception of Truth

It is often said that the conception of truth best-suited to realism is a correspondence conception of truth. On such a conception, truth is a property which a statement has in virtue of a relation of correspondence that holds between the statement and the way the world is. A statement is true just in case what the statement claims to be the case is in fact the case. The relation of correspondence is, therefore, a relation between language and reality. For it is a relation between a statement couched in a language and an extralinguistic state of affairs that obtains in reality.

Since a statement is true just in case the state of affairs to which it corresponds obtains, the correspondence conception satisfies the equivalence condition specified by Tarski's T-scheme:

(T) 'P' is true iff P.

While the T-scheme is not a definition of truth, it provides a minimal condition of adequacy that must be satisfied by any account of truth. However truth is conceived, the truth-predicate must behave in accordance with the T-scheme. Rather than a definition, the T-scheme is a schema on the basis of which metalinguistic statements of truth-conditions may be formulated for sentences of an object-language.[3] For example, replacing 'P' in (T) by 'Electrons have negative charge' yields as statement of the truth-conditions of 'Electrons have negative charge' the T-sentence:

(E) 'Electrons have negative charge' is true iff electrons have negative charge.

Statements such as this assert the material equivalence of sentences that predicate truth and the sentences of which truth is predicated. The T-scheme thereby specifies a correlation between the truth of statements and the states of affairs that statements report. For it stipulates that, for any sentence 'P', 'P' is true just in case a given state of affairs obtains, viz., the state of affairs that P.

But to capture the thought behind the realist conception of truth, it is not enough to say that a statement is true just in case a given state of affairs obtains. That suggests that the relation that obtains between the truth of a statement and the state of affairs that it reports might be a mere accidental correlation. But it is no accident that a statement that reports a state of affairs is true if, and only if, the state of affairs it reports does in fact obtain. For it is precisely the fact that the state of affairs obtains that makes the statement true. It is *because* electrons in fact have negative charge that the statement that electrons have negative charge is true.

Yet even if we insist that statements be made true by extralinguistic states of affairs this does not suffice for a realist conception of truth. More must be said about the nature of the extralinguistic reality that makes statements true. There are any number of non-realist positions for which statements are made true by extralinguistic states of affairs. The idealist who takes the world to be ideas in the mind of God may say that statements are made true by ideas in the mind of God. The phenomenalist who identifies reality with the permanent possibility of experience may say that statements are made true by the permanent possibility of experience. But the realist can accept neither the idealist nor the phenomenalist scenario. For it is a defining feature of realism that the reality investigated by science is an objective reality that is neither constituted nor determined by thought or experience.

To rule out such mentalistic scenarios, the realist must insist that what makes statements true or false are states of affairs whose existence is in no way dependent on the mental. To qualify as a realist conception of truth, the correspondence theory of truth must be supplemented with the metaphysical realist assumption of a mind-independent reality. On the realist conception of truth that results, truth consists in correspondence between a linguistically formulated statement of fact and an extralinguistic state of affairs, where the state of affairs that makes a statement true is a mind-independent state of affairs. If it is true that electrons have negative charge, then this is due to the fact that, independently of anything we think about the matter, there are electrons, and they do indeed have negative charge.[4]

4. The Non-Epistemic Nature of Realist Truth

The realist conception of truth is a non-epistemic conception of truth, which enforces a sharp divide between truth and rational justification. One may rationally believe a proposition that is false, just as

there may fail to be rational grounds to believe a proposition that is in fact true. Far from being an absurd consequence of realism, as some may think,[5] the non-epistemic character of truth crucially underlies the central epistemological claim of scientific realism, namely that there is an epistemic gap between method and truth which is best spanned by means of realist resources.

It is important to distinguish between two different senses in which the realist conception of truth is a non-epistemic conception of truth. The first sense is a metaphysical sense, which derives from the mind-independence of the states of affairs that make statements true. The second sense is a conceptual one, which is due to the lack of a conceptual relation between truth and rational justification.

In the first sense, the non-epistemic nature of realist truth derives specifically from the mind-independent status of the truth-makers. The point turns on the ontological independence of thought and reality, rather than on any epistemic aspect of the relation between thought and reality. For the truth of claims about the world is solely determined by the existence of states of affairs which obtain independently of human thought or experience. Hence, the belief that a given state of affairs obtains does not itself — i.e., *qua* belief — have any effect on the truth or falsity of that belief. The state of affairs may obtain, or fail to obtain, whether or not anyone believes that it does. This remains the case regardless of how well justified the belief may be. Thus, given the mind-independence of the truth-makers, it is entirely possible for rationally justified beliefs about the world to be false. Indeed, given such mind-independence, the *entirety* of such beliefs might be false.

The second source of the non-epistemic character of realist truth is the lack of a conceptual relation between the concept of truth and concepts of epistemic justification. On the realist conception of truth, truth is a relation of correspondence that obtains between statements and mind-independent states of affairs that obtain in the world. A statement is true just in case an appropriate state of affairs obtains. Thus, truth depends solely on the way the world is, whether or not the world is rationally believed to be that way. As such, no epistemic condition enters into the realist conception of truth.

More specifically, to be true in the realist sense a statement need not fulfill any epistemic condition, such as evidential support or the satisfaction of methodological rules. It need only reflect the way the world is. Nor is any epistemic concept built into the realist conception of truth, since formulation of the latter makes no use of concepts of rational justification or methodology. Hence, a

statement may be epistemically well-justified, in the sense of satisfying relevant methodological rules, and yet fail to be true. Indeed, a statement may be *ideally* justified and not be true, since no entailment from epistemic justification to truth is licensed by the realist conception of truth.

Both of the foregoing senses in which realist truth is non-epistemic reflect important principles of realism. The first reflects the fundamental metaphysical tenet of realism that the world investigated by science is an objective reality that lies beyond the control (though not the reach) of human thought. The second stems from the realist view that the truth of a claim about the world consists in correspondence with such an objective reality, rather than in satisfaction of criteria of epistemic evaluation.

In light of the non-epistemic nature of realist truth, the basis of the epistemic gap between method and truth is now apparent. It is not just that it is an intelligible question whether a belief warranted by the rules of method is to be accepted as true. The point is deeper than that. Because truth depends on a mind-independent reality, and is not defined in terms of epistemic criteria, a theory might fully satisfy relevant criteria and still be false. Conversely, a theory or claim about the world might be true even though it fails to fully satisfy applicable rules of method. Given the non-epistemic nature of truth, there is no logical relation between method and truth. The question must inevitably remain open whether the methods employed in science really do lead to truth.

5. Two Anti-Realist Strategies

I will now consider two of the principal anti-realist strategies for dealing with the relation between method and truth. Since my aim is to provide a realist bridge between method and truth, I will not attempt a detailed examination of anti-realism here. Still, to understand the realist project, it is important to contrast it with alternative approaches to the problem.

The two strategies to be considered here represent opposing anti-realist tendencies. They are the Scylla and Charybdis between which the realist must steer a course. The first strategy is that of the *internal realism* proposed by Hilary Putnam and Brian Ellis. The internal realist strategy is to bridge the epistemic gap by defining truth in terms of method, which creates an analytic relation between method and truth.[6] The second strategy, found in Bas van Fraassen and Larry Laudan, is one that I refer to as *scientific scepticism.* The sceptical strategy treats the gap between method and truth

as one that cannot be bridged. It denies that satisfaction of method licenses rational belief in truth. Instead of truth, scientific sceptics offer alternative epistemic aims which they take to be achievable using the methods of science.

While detailed critique of either form of anti-realism lies beyond the scope of this paper, it is worthwhile situating the two positions with respect to realism. By contrast with realism, the internalist denies that there is a gap between method and truth, whereas the sceptic denies that we have the epistemic means to bridge the gap. I will argue that neither anti-realist strategy yields an acceptable account of scientific knowledge of an objective world. The internalist strategy loses sight of reality, while the sceptical strategy fails to provide a sustainable account of the relation between evidence and theory.

6. Internal Realism

Internal realism is characterized by an epistemic conception of truth. On such a conception, truth is identified with satisfaction of criteria of epistemic appraisal. According to Hilary Putnam, for example,

> 'Truth', in an internalist view, is some sort of (idealized) rational acceptability — some sort of ideal coherence of our beliefs with each other and with our experiences *as those experiences are themselves represented in our belief system*... (1981, pp. 49-50)

Similarly, for Brian Ellis, 'truth is what is right epistemically to believe' (1990, p. 10). It 'is what it is ultimately right for anyone to believe, given [our natural] system of [epistemic] values' (1990, p. 11). Thus, according to internal realists, for a claim or theory about the world to be true is for it to be ideally justified or for it to maximize epistemic value.

For the internalist, there is an analytic or conceptual relation between method and truth. Truth consists in appropriate satisfaction of epistemic norms. Accordingly, no problem arises for the internalist of an epistemic gap between method and truth. A theory which is ideally justified, or which maximizes epistemic value, just is a true theory. Nor does any problem arise relating use of the scientific method to advance on truth. If use of scientific method leads to theories which increasingly satisfy the rules of method, it follows immediately that science advances on truth. Given that truth

consists in satisfaction of the rules of method, an increase in the level of satisfaction of such rules constitutes advance on truth.

The trouble with internal realism is that it is an inherently idealist doctrine. The epistemic conception of truth entails the mind-dependence of the states of affairs that make our claims about the world true. This may be shown by means of the T-scheme:

(1) 'P' is true iff P.

Given the internal realist identification of truth with epistemic justification, to be true just is to be epistemically justified. Hence,

(2) 'P' is true iff 'P' is epistemically justified.

From (1) and (2), it follows that:

(3) 'P' is epistemically justified iff P.

This means that the state of affairs that P obtains just in case the claim 'P' is epistemically justified. Thus, what (3) says, in effect, is that the existence of a truth-making state of affairs depends on it being epistemically justified to believe that the state of affairs obtains.

This reveals the idealism at the heart of internal realism. If truth is epistemic justification, the states of affairs that make claims true necessarily fail to be objective, mind-independent states of affairs. To revert to an earlier example, suppose it is true that electrons have negative charge. For the internalist, this means that electrons have negative charge just in case we are epistemically justified in believing that electrons have negative charge. But this has the consequence that electrons only have negative charge if we are justified in believing that they do. Thus, for the internalist, the way the world is is not something that is independent of what we think. Rather, the way the world is depends on our being justified in thinking that it is a certain way. Despite promising to span the epistemic gap, internalism therefore fails to provide an account of how scientific knowledge of an objective world is possible.

7. Scientific Scepticism

While the internalist adopts an optimistic view of the relation between method and truth, the view of the scientific sceptic is a decidedly pessimistic one. Both van Fraassen and Laudan maintain that scientists may have good grounds for the acceptance of theories, but deny that rational credence

extends to the truth of the transempirical content of theories. Thus, both authors defend a selective scepticism which denies theoretical knowledge while granting credence to observation.

For van Fraassen, the purpose of the scientific enterprise is not to discover truth, but to construct theories that are empirically adequate:

> Science aims to give us theories which are empirically adequate; and acceptance of a theory involves as belief only that it is empirically adequate. (1980, p. 12)

A theory is empirically adequate, according to van Fraassen, "exactly if what it says about the observable things and events in the world is true — exactly if it 'saves the phenomena'" (1980, p. 12). Van Fraassen does not deny that theories make truth-valued assertions about unobservable items. What he denies is that empirical evidence may provide support for the truth of such claims about unobservables.

For his part, Laudan holds that scientific theories may be epistemically warranted, but denies that such warrant extends to their truth. In Laudan's view, 'knowledge of a theory's truth is radically transcendent' (1996, p. 195). Laudan contrasts the transcendent property of truth, which he takes to be 'closed to epistemic access', with other properties which he considers to be 'immanent', such as well-testedness, predictive novelty and problem-solving effectiveness (1996, p. 78). The principal basis for his rejection of a warranted presumption of theoretical truth lies in his historical critique of the convergent realist claim that there is a correlation between the success of theories and their reference and approximate truth which is best explained by realist means. For Laudan, the fact that there is no way to bridge the epistemic gap between method and theoretical truth is simply a hard fact of the history of science.[7]

The trouble with the sceptical denial of an epistemic connection between method and truth resides in the attempt to combine metaphysical realism with the possibility of a limited epistemic warrant for theories. The scientific sceptic allows that there may be epistemic grounds that warrant acceptance of a theory, but denies that such warrant extends to the truth of the transempirical content of theory. But the sceptic does not deny that scientific theories are capable of being true. Indeed, neither van Fraassen nor Laudan provide grounds for denying that there are facts about the world which make our theoretical claims about the world true or false.

But it is not possible *both* to allow that theories are made true or false by the way the world is *and* to deny that evidential support extends to the theoretical content of theories. If empirical facts about the world are capable of providing evidential support for theories, then such evidential support cannot be restricted to the non-theoretical content of theories. The reason has to do with the nature of the relationship between the empirical facts which provide support and the theories for which such facts provide support.

Scientific theories make claims about both observable and unobservable states of affairs. Among the claims which theories make about observable states of affairs are predictions of observable phenomena that are made on the basis of hypotheses about unobservable portions of reality. In the case of evidence based on the confirmation of such predictions, the predicted phenomena are events that, according to the theory, are brought about by unobservable causal processes. Because such observable events are supposed to be produced by unobservable causal processes, the evidence derived from such observable events has direct relevance to the theoretical hypotheses upon which the predictions of such phenomena are based. Indeed, given that hypotheses about unobservable processes may be the sole basis for prediction of the observable phenomena, the non-empirical content of the theory is directly implicated in the evidential relation between observed fact and warranted theory.

In view of the failure of scientific scepticism to adequately account for the relation between evidence and theory, and the idealism inherent in internal realism, I conclude that neither position provides an acceptable account of scientific knowledge of an objective reality. I will now present the outlines of the scientific realist theory of the relation between method and truth that I propose.

8. A Realist Theory of MethodThe realist theory of method that I propose consists of three key components:

> *Epistemic naturalism:* normative epistemological questions about rational justification are empirical questions about the best means of conducting inquiry into the objective natural world.
>
> *Methodological instrumentalism:* the rules of scientific method are ‘cognitive tools’ or ‘instruments of inquiry’, which serve as means for the realization of epistemic ends.

> *Abductive realism*: the best explanation of the cognitive and pragmatic success of scientific theory and practice is that the rules of scientific method are genuinely truth-conducive tools, which serve as reliable means for obtaining truth.

These three elements of a realist theory of scientific method form part of a generally naturalistic, non-anthropocentric picture of the world, and of our epistemic relationship to it. We find ourselves embedded in a natural world which we did not create, and over whose fundamental character and structure we have no control. In order to survive, we must form beliefs about the world, and causally interact with it by means of action that is guided by such beliefs. Given the independence of reality from thought, the beliefs that we form about the world do not necessarily correspond to the way that the world in fact is. In such a world, we do not know in advance of inquiry how to proceed to insure survival. Nor can we know by *a priori* means how best to pursue inquiry into the nature of reality. Thus, the question of how to learn about the world is a question about the contingent nature of our epistemic capacities and the relation of such capacities to the world. Such a question is an empirical question that can only be answered on the basis of empirical investigation into the nature of inquiry.

More specifically, on the instrumentalist conception of method that I favour, the rules of method are to be understood as means for the achievement of epistemic ends. In this I follow Larry Laudan, who has argued that the rules of method may be construed as empirical claims about means to ends. In particular, they may be expressed as hypothetical imperatives of the form, 'If one wishes to achieve aim A, then one should employ method M'. For example, Popper's rule against *ad hoc* hypotheses may be formulated as the hypothetical imperative, 'If one seeks well-tested theories, then one should avoid *ad hoc* hypotheses'.[8]

The instrumentalist construal of method reveals how the normative rules of method may be subject to empirical evaluation. If method M is proposed as a means of achieving epistemic aim A, then it is an empirical question whether use of M reliably conduces to realization of aim A. For example, as Laudan argues, one may consult the history of science for evidence that use of a given method in the past has led reliably to the achievement of given epistemic aims. Thus, the instrumentalist conception of method illustrates the ability of epistemic naturalism to account for the normative force of rules of scientific method. Because the rules of method may be treated as empirically evaluable means to epistemic ends, the epistemic warrant of such rules may be grounded

in empirical facts about the nature of inquiry. As such, the normativity of the rules of method derives from empirical facts of procedural efficacy and reliability.

The problem remains, however, of the relation between method and truth. One cannot directly observe that use of the rules of scientific method leads to true scientific theories. The truth of the non-observational content of theories transcends empirical verification, hence cannot be established by direct observational means. It is at this point that appeal is to be made to the scientific realist argument that realism is the best explanation of the success of science. But where the success argument is usually employed to argue for the approximate truth of theories, I extend the argument to the truth-conduciveness of rules of method. I will now sketch the position of abductive realism, which seeks to bridge the gap between method and truth.

9. Abductive Realism

On the scientific realist picture that I propose, the relation between method and truth is not an analytic, conceptual relation, as the internal realist suggests, but a synthetic, empirical relation. It is a contingent relation between epistemic means and ends, which may be known in the *a posteriori* manner suggested by epistemic naturalism. But the attempt to combine a naturalistic account of epistemic warrant with the realist view of truth as the aim of science must face the problem that no empirical evidence may show directly or conclusively that use of a methodological rule yields theoretical truth. In the absence of direct or conclusive evidence, why should use of a rule of method be taken to conduce to truth?[9]

This is where abductive realism enters the picture. In the absence of direct or conclusive evidence linking method to truth, the grounds for such a link may be at best abductive ones. More specifically, the realist claim that application of rules of method leads to progress toward truth rests on an inference to the best explanation of scientific success. What best explains why scientific theories satisfy the rules of method is that they are close to truth.

Suppose, for example, that there is some theory which satisfies a broad range of rules of method to an extraordinarily high degree. The theory is supported by all available evidence. It successfully predicts a great many previously unknown and surprising novel facts. It unifies previously disparate domains. And it does all of this in a manner which maximizes simplicity and

coherence. Clearly, any theory which so impressively satisfies the rules of scientific method is a highly successful theory indeed.

How is such success to be explained? Where a theory impressively satisfies a broad range of methodological rules, the best explanation of such success is that the theory provides an approximately true description of the way the world is. In light of such success, we may infer not only that the entities postulated by the theory exist in roughly the form stated by the theory, but that the underlying causal mechanisms and processes described by the theory really do bring about observable events in the general manner specified by the theory.

It is important to emphasize that the level of descriptive accuracy to which such an inference is committed is that of approximate truth only. While the precise natures of the postulated entities, mechanisms and processes may fail to be known either in detail or in their entirety, it may nevertheless be the case that such entities, processes and mechanisms really do exist, in a form which is close to that described by the theory. Given such approximate accuracy, it must also be emphasized that the theoretical description of the postulated entities, mechanisms and processes remains open to possible revision in the light of further inquiry.[10]

But my point is not simply that the best explanation of the success of a theory, as measured by satisfaction of methodological rules, is the approximate truth of the theory. The crucial point relates to the truth-conduciveness of methods rather than to the approximate truth of theory. Given the critical role played by the rules of method in the process of theory selection, the implications of the success of science for the approximate truth of theory apply with equal force to the rules of method themselves.

In particular, the rules of method are employed by scientists to eliminate theories that are unlikely to be true in favour of theories that are likely candidates for truth. Since the best explanation of satisfaction of rules of method is the approximate truth of theory, and since the rules of method play a critical role in arriving at such approximately true theories, it follows that use of the rules of method is responsible for arriving at theories that are approximately true. Given this, the best explanation of the role played by the rules of method is that the rules are employed in a rigorous selection process which eliminates false theories in favour of theories that are closer to the truth. That

is, the rules of method are rules that 'screen for truth' — or, in other words, the rules of method reliably conduce to truth.

Such an abductive realist account of the truth-conduciveness of method has implications as well for the realist view of scientific progress as convergence on truth. Suppose there is a sequence of scientific theories which displays an increasingly high level of satisfaction of the rules of method. According to abductive realism, increased satisfaction of the rules of method is to be attributed to convergence on truth. Where a sequence of theories displays an increasingly high level of satisfaction of the rules of method, the best explanation is that the sequence of theories is advancing progressively closer to the truth.

Thus, on the view I propose, what best explains satisfaction of the rules of method is that the rules are truth-conducive, and what best explains increased satisfaction of such rules is convergence on truth. It is in this sense that I wish to claim that what is needed to bridge the gap between method and truth is an abductive argument to the best explanation of the success of science.[11]

10. Realism or Sheer Luck?

It is, of course, a legitimate question why truth and approximate truth should play the role which I ascribe to them as the best explanation of satisfaction of rules of method. To demonstrate that satisfaction of the rules of method is best explained by the truth-conduciveness of such rules would require an exhaustive elimination of alternative explanations. I cannot undertake that task here. But it is instructive to consider a stark anti-realist alternative that is contrary to the abductive realist thesis that the rules of method are truth-conducive rules whose use promotes the discovery of truth about the world. By eliminating this alternative a large and particularly salient class of anti-realist alternatives may also be eliminated.

To generate such a contrary to abductive realism, let us consider the following scenario. Consider, as we did before, a scientific theory which impressively satisfies a great variety of methodological rules. The theory is descriptively accurate and well-confirmed by all observational tests. It predicts surprising novel facts in an accurate and reliable manner. It unifies phenomena from domains previously thought to contain disparate and unrelated phenomena. On top of all this, the theory is also maximally simple and coherent.

This time, however, let us also suppose that despite impressively satisfying all the methodological rules the theory is in fact *totally and utterly false at the transempirical level.* None of the unobservable entities, mechanisms or processes postulated by the theory exist. Moreover, the theory erroneously imposes unity on unrelated domains which in fact have nothing in common. In short, let us suppose that the theory satisfies all empirical and formal methodological constraints to a very high degree, yet at the level of the descriptive accuracy of its claims about the underlying nature of reality it is simply false.

If such a situation were to obtain, it would be sheer luck that the theory has any success at all. This may be seen most clearly in the case of predictive success, and, in particular, in the case of accurate and reliable prediction of previously unknown and otherwise entirely unexpected phenomena. Either predictive success of this kind is the result of sheer luck, or else there is some benevolent force whose action makes the theory's predictions turn out to be true despite the fact that the transempirical claims of the theory are completely false.

There are, I suppose, possible worlds in which lucky guesses are routinely rewarded with predictive success. But we do not live in such a world. Occasional guesses may succeed. But if a scientific theory reliably produces accurate predictions of novel facts, the best explanation of such predictive success is not that we live in a world that rewards luck. The best explanation is that the theory is at least an approximately correct description of the unobservable entities whose behaviour underlies the observed phenomena predicted by the theory. For this reason, we may conclude that satisfaction of methodological rules provides a reliable indication of advance on truth. The rules of method are a guide to the truth. They are a guide to the truth, not in the sense that truth consists in satisfaction of the rules of method, but in the sense that a theory that satisfies such rules has a good chance of being at least approximately true. If a theory which satisfies the rules of method did not have a good chance of being at least approximately true, the satisfaction of the rules of method would be completely inexplicable.

Notes

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[2] The methodological pluralist approach outlined here owes much to the work of Feyerabend (1975), Kuhn (1970) and Laudan (1984). As is well-known, methodological pluralism gives rises to the spectre of epistemological relativism. I have sought to dispel this spectre elsewhere. In this paper, I am concerned with the relation between method and truth, rather than the nature of rational justification or the variation of the rules of method. For further development of the methodological pluralist approach specifically as it relates to the issue of epistemological relativism, see my (1997) and (2000).

[3] The point that the T-scheme is not a definition of truth is made by Tarski: 'neither the expression (T) itself (which is not a sentence, but only a schema of a sentence), nor any particular instance of the form (T) can be regarded as a definition of truth' (1943/1994, p. 110). It might perhaps be thought that a deflationary conception of truth such as Horwich's minimalism does treat the T-scheme as a definition of truth. But Horwich himself notes that deflationism 'does not provide an explicit definition, but relies on a schema to characterize the notion of truth' (1994, p. xv).

[4] My insistence that the realist conception of truth requires that claims about the world be made true by mind-independent states of affairs raises the question of the status of claims about mental states and artifacts. Since minds do not exist independently of minds, and artifacts are the product of intentional human action, claims about minds or artifacts would seem incapable of being true in the realist sense. Yet presumably the realist should allow that, at least in principle, such claims might be true. To adequately address this concern would require an analysis of the concept of independence of the mental on the basis of which it may be said that claims about mental states or artifacts are made true by states of affairs that obtain independently of the mental in the appropriate sense. No such analysis can be provided here. But, fortunately, the issue may be set aside for present purposes. The kinds of claims about the world that are of principal concern here are the observational and theoretical claims of the natural sciences. I take it to be highly plausible indeed to say that such claims are made true (or made false) by the way things stand in the world independently of what we humans think about the matter.

[5] Cf. Ellis (1990, p. 187) and Putnam (1978, p. 127).

[6] When I speak here of the 'internal realist strategy', I mean to restrict attention specifically to the internal realist epistemic conception of truth which defines truth in terms of method or rational justification. As Brian Ellis has pointed out to me, internal realism properly understood is a substantive metaphysical position which is not restricted to an epistemic conception of truth. In particular, the internal realist position is a neo-Kantian position which denies epistemic access to a realm of noumenal objects, and treats objects, reference and reality as relative to conceptual scheme. Suffice to say that it is the relation between method and truth, rather than any more substantive metaphysical views, that are of relevance for present purposes.

[7] See Laudan (1981), reprinted as the final chapter of his (1984).

[8] For the suggestion that methodological rules may be construed as hypothetical imperatives, see Laudan (1996, pp. 132-4). Laudan's hypothetical imperative analysis of methodological rules has been the subject of searching criticism (e.g., Doppelt, 1990, Siegel, 1990). In my view, the most challenging objection relates to the source of the epistemic normativity of methodological rules within the hypothetical imperative analysis. The rules of method may only derive normative force by way of the goals toward which such rules are directed. But the source of the epistemic value of such goals remains mysterious. The hypothetical imperative analysis, considered strictly as such, provides no basis on which to evaluate the epistemic merits of any particular epistemic goal. This problem is resolved within the framework adumbrated here by treating truth as the ultimate goal of scientific inquiry from which the value of lower order epistemic goals is derived. For further discussion of this approach, see my (2000).

[9] The objection that there may be no direct or conclusive evidence to the effect that use of a rule of method conduces to theoretical truth is due to Laudan (1984, p. 53; 1996, p. 261, fn.19). While I agree that there may be no direct evidence that use of a rule of method yields theoretical truth, I hold that there may be indirect evidence that use of such rules leads to truth at the transempirical level. For development and defense of this idea, see my (2000).

[10] In holding there to be a reasonably clear sense of 'approximate truth' which relates to the general ontological claims of theory, and does not require explication by means of a technical concept of verisimilitude or closeness to truth, I follow Ernan McMullin's discussion in his (1984, pp. 35-6, and 1987, pp. 59-60).

[11] The strategy described here as 'abductive realism' is not without precedent in the epistemology of science. Broadly understood as inference to the best explanation of the success of science applied at the level of method, the strategy is employed by such authors as Boyd (1984, 58-9), Kornblith (1993, 41-2), and Rescher (1977, 81 ff). For discussion of related uses of inference to best the explanation, see Day and Kincaid (1994, 271-3).