



THEORY AND OBSERVATION: A CRITICAL ISSUE IN THE PHILOSOPHY OF SCIENCE

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I. Introduction

It has long been thought that scientific theories or hypotheses are capable of being tested for their truth. When incompatible theories or hypotheses compete for acceptance, the choice between them, it has long been supposed, turns on which is better able to account for or explain the observed phenomena, which is better either at “fitting the facts” or “saving the appearances,” which escapes being falsified or repudiated by some observed phenomenon that is clearly inconsistent with what the given theory or hypothesis

leads us to expect should be the case.

As the language of the foregoing statement indicates, logicians and philosophers of science have had different ways of formulating the precise way in which scientific theories or hypotheses are put to the test, empirically or experimentally. Nevertheless, from the beginnings of modern science and of attempts to understand its aims and methods, they have been in complete agreement on the cardinal tenet that there are criteria for deciding on the relative truth and falsity of competing theories or hypotheses. In addition, their view has become the generally prevalent view of the scientific enterprise as one in which the rejection of one theory and the adoption of another, as the result of their being tested empirically or experimentally, constitutes an advance toward the truth. What has been achieved in such a transition, it is generally thought, is not the final truth about the matters under investigation, but a better approximation to the truth about them, a more accurate or satisfactory account of them.

If asked whether scientific theories can be tested or whether an otherwise interesting and attractive hypothesis can be killed by an obdurate fact that it cannot explain away, the intelligent layman who has unconsciously absorbed the traditional view of the scientific enterprise would answer without hesitation in the affirmative. If it were proposed to him that the choice between competing scientific theories might be made on other grounds, such as their intellectual beauty, their logical elegance, or their satisfaction of interests other than a desire to get at the truth of the matters under consideration, he would reply that the suggested proposal erased the line that he had always thought divided the work of the scientist from the work of the artist. In saying this, he would, of course, be reflecting the predominant view held by philosophers of science for many centuries now, a view most emphatically expressed recently in the writings of Sir Karl Popper—that the line of demarcation which divides a scientific from a non-scientific statement of any kind is that the former can be and the latter cannot be put to an empirical test.

Let us for the moment table the question of how we shall describe the factor in terms of which scientific theories are to be tested—”the appearances,” “the phenomena,” “the facts,” “experience,” “experiments,” “data,” etc. Whatever description or phrasing is adopted, it will involve that phase of scientific enterprise that is called “observation,” as distinguished from another part of the process that can be called “hypothesis construction” or “theory building.” Simplifying the matter in this way for the time being

enables us to express a thesis that is fundamental to the traditional and generally accepted view concerning the testability of scientific theories; namely, that scientific observations are sufficiently independent of scientific theories to serve as the factor by which they can be tested.

Two things should be noted at once. It is not and need not be said that scientific observations at a given time are totally independent of the various theories or hypotheses then being proposed by scientists or employed by them in their work. Unquestionably, theories have a directive and a suggestive influence on the observational process. They may turn the scientist's attention in one direction or another, suggest one line of experimentation rather than another, or even lead to, concentration on one type of phenomena to the exclusion of interest in another. But admitting all this does not make the observational process so totally dependent on theory that it becomes impossible to appeal to observation in order to test the relative truth or falsity of competing theories. Only if it could be shown that a theory in the saddle so controls or colors the observations made by scientists working with it that no independent factor remains to perform the function of testing it, would there be grounds for abandoning the traditional and generally accepted view that scientific theories can be tested empirically.

Startling as it may appear to be to the lay readers of this essay, that revolutionary view of observation in relation to theory has recently been advanced in the philosophy of science. To use the language of the leading exponents of that view, it is claimed that observations are "theory-laden" rather than "theory-independent." In consequence, it is held that scientific theories cannot be empirically tested in one or another of the ways that philosophers of sciences, for the last three centuries, have supposed to be pivotal in the scientific enterprise. When one scientific theory is given up and replaced by another, the transition in scientific thought cannot, therefore, be regarded as in any way an advance in the order of truth, the achievement of a better approximation to the truth, an account of the phenomena under investigation that is both a more accurate description of them and a more complete explanation of them. Since the relative truth or falsity of the theories in question cannot be the criterion on the basis of which scientists replace one with another, the basis for such choice must be found elsewhere—in some other aspect of the scientific enterprise as a whole. Some other interest, some other consideration, must be decisive.

I think nothing more need be said to persuade the reader of this essay of the critical importance of this issue, which has so recently

come to the fore in the philosophy of science. If he has held the traditional view that scientific theories can be empirically tested by observations sufficiently independent to perform that function, as I think is likely to be the case with most readers of this essay, then the view recently advanced, that observations are not sufficiently independent to decide between competing theories, must constitute a serious challenge to his understanding of the scientific enterprise. He will, quite justifiably, be reluctant to abandon a view that has been habitual with him and has recommended itself to him as making good sense, and to substitute for it a view that turns science upside down, or into something that is the very opposite of what science has always been supposed to be. He will certainly want to know more about the exponents of this new revolutionary view, what their credentials are, and what arguments they advance for it. He will, in addition, wish to have his memory refreshed concerning the traditional view that he has, consciously or unconsciously, adopted. And after the issue has been clearly drawn for him by a careful summary of the two positions that are opposed, he will want to know whether it can be shown that one side or the other has the stronger arguments in its favor.

This essay will attempt to satisfy the reader on these various points, and do so in the order mentioned. Section II will briefly report the recent literature in which the new revolutionary view has been set forth, describing the exponents of the view and stating their arguments. Section III will then refresh the reader's memory of the traditional view, by a brief summary of the common tenets held by the earlier philosophers of science. With the issue clear, Section IV will weigh the arguments advanced on each side, and try to say why one side has the stronger case.

On this last point, there is no need to keep the reader in suspense. The author of this essay thinks that he can show why the traditional view is the sounder of the two. He will attempt to do so while, at the same time, trying to be as fair as possible to the view that he repudiates. It is not entirely wrong; it has the merit of calling attention to certain aspects of the scientific enterprise that have either been neglected or unduly minimized; but, in the final analysis, none of its most telling points requires the abandonment of the traditional view that scientific theories can be tested, that observations are involved in the testing process, and that, as the result of such testing, a choice can be made between competing theories that decides in favor of the one that is, relatively, truer or nearer to the truth.

Archivist's Note: (c. 1960) The rationale for this date is Dr. Adler's reference to the ideas "...expressed recently in the writings of Sir

Karl Popper..." which may refer to Popper's book, *The Logic of Scientific Discovery* issued in English in 1958 and reissued in 1959. The reader will note that this is intended to be a 4-part work. To date, only the Introduction has been located.

SCIENCE TODAY

The word "science" has changed its meaning as we pass from antiquity and the Middle Ages to modern times, especially to the nineteenth and twentieth centuries.

Today it means the observational or investigative sciences, sometimes called the empirical and experimental sciences. It must be added that the word "science" is also used to refer to mathematics, which is clearly nonempirical and noninvestigative.

The adjective "scientific" is used as a term of praise conferred on other disciplines; such disciplines employ methods which have a certain objectivity in their appeal to evidence which sets them apart from mere, unfounded opinion. Though history is not a science, nor is philosophy, nevertheless as branches of humanistic scholarship, both can be conducted in a manner that is praised when they are called scientific.

The word "science" derives from the Latin word "scientia," for which the Greek equivalent is either "episteme" or "doxa." In antiquity and the Middle Ages, the various branches of philosophy were called sciences. Today, from the point of view of the empirical sciences, when philosophers employ a praiseworthy method they are called scientific.

With the rise of positivism in the nineteenth and twentieth centuries, which asserts that empirically reliable knowledge is to be found only in the empirical and experimental sciences, it has become necessary to set investigative science apart from history, from mathematics, and from philosophy.

I have explained elsewhere in what manner the branches of philosophy, especially metaphysics (or philosophical theology) and philosophical psychology, can be properly compared with the empirical and experimental sciences with regard to agreement and disagreement, progress, and the criteria of truth and falsity.

It is of great interest that all the disciplines being compared (the empirical sciences, mathematics, history, and philosophy) have a

history and a philosophy, but no science (in the modern, positivistic sense) that is applicable to the understanding of the sciences themselves. There is no science of science.

If philosophy did not exist, we would have no moral philosophy as a branch of knowledge and we would have no understanding of science itself, for when scientists write about science, they do so as philosophers, not as scientists.

HISTORY, SCIENCE, PHILOSOPHY AND RELIGION

Ultimately there can be no disagreement between history, science, philosophy, and religion. Where there is disagreement, there is either ignorance or error.

Each of these four major branches of seeking knowledge of reality have different objects of study, and different methods of inquiry. Even within the individual sciences for example; astronomy can answer questions and refute answers about the celestial bodies and their movements, but it cannot answer questions or refute answers about anthropology and vice versa.

Only when one branch either becomes imperialistic or prejudicially ignores another branches findings do these problems arise.

For example (in brief):

HISTORY: Its object is the past. Its method is research, utilizing testimony, documents, and remains.

SCIENCE: Its object is phenomena and their appearances. Its method is observation, investigation and/or experimentation—reason serves the senses. It describes the facts.

PHILOSOPHY: Its object is reality and causes. Its method is reflective—senses serve reason. It provides an understanding of the facts.

RELIGION: Its object is ultimate mysteries. Its method is receptive—reason serves revelation. It accepts and believes.

The knowledge we can derive from science and history, are limited to first-order knowledge by their investigative mode of inquiry.

They are incapable of enlarging our understanding by the second-order work, or philosophical analysis, with respect to ideas and all branches of knowledge. Without the contributions made by philosophy, we would be left with voids that science and history cannot fill.

Even in the one sphere in which the contributions of science and philosophy are comparable—our knowledge of reality—philosophy, because it is noninvestigative, can answer questions that are beyond the reach of investigative science—questions that are more profound and penetrating than any questions answerable by science. By virtue of its being investigative, science is limited to the experienceable world of physical nature. Philosophical thought can extend its inquiries into transempirical reality. It is philosophy, not science, that takes the overall view.

Furthermore, when there is an apparent conflict between science and philosophy, it is to philosophy that we must turn for the resolution. Science cannot provide it. When scientists such as Einstein, Bohr, and Heisenberg become involved with mixed questions, they must philosophize. They cannot discuss these questions merely as scientists; the principles for the statement and solution of such problems come from philosophy, not from science.

For all these reasons, I think we are compelled to regard the contributions of philosophy as having greater value for us than the contributions of science. I say this even though we must all gratefully acknowledge the benefits that science and its technological applications confer upon us. The power that science gives us over our environment, health, and lives can, as we all know, be either misused and misdirected, or used with good purpose and results. Without the prescriptive knowledge given us by ethical and political philosophy, we have no guidance in the use of that power, directing it to the ends of a good life and a good society. The more power science and technology confer upon us, the more dangerous and malevolent that power may become unless its use is checked and guided by moral obligations stemming from our philosophical knowledge of how we ought to conduct our lives and our society. 📖

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