# AN APPROPRIATE METHODOLOGY FOR THE SOCIAL SCIENCES[1]

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The positivist doctrine is the philosophical position with which most American social scientists are acquainted. Unfortunately, there is little awareness of the limitations and implications of the positivist position, or of any viable alternative to it. There are many difficulties created by an embracement of the positivist position; some of them are especially inhibiting to psychological and social research. This paper will attempt to present a sketch of an alternative view of proper scientific procedure that would not inhibit us so unduly in our theoretical and research efforts.

The discussion presented will draw heavily from the works of Karl Popper: The Open Society and Its Enemies, 1950, The Poverty of Historicism, 1957, The Logic of Scientific Discovery, 1959, and Conjectures and Refutations, 1962. The writings of Popper are extremely relevant to contemporary styles of thought in the American social sciences. He has provided over the last thirty years a vigorous and comprehensive critique of the positivist doctrine. His writings, and also the writings of many others associated with the University of London, constitute a strong challenge to some of our most basic assumptions about proper scientific procedure. Popper's critique of contemporary practices flows from a consideration of the logic of scientific discovery and validation, and not simply from what he might wish scientific activity to be. His viewpoint is derived from a consideration of what is logically entailed in certain kinds of statements we might choose to make. An implication of his approach is that we need to accept very few principles from the philosophy of science. The two most basic principles are: (1) Our theories and statements must always be open to empirical testing (falsifiability) and to free, critical discussion; and (2) We must specify the universe to which we wish to generalize from our sample data.

The first requirement, that of submitting our theories to empirical test, is simply a convention we have adopted. The adoption of this convention has been very fruitful, and we could adopt other conventions to help us decide which theory should be regarded as the best. However, I would argue that we should retain this convention and continually strive to put our ideas, and hypotheses, into empirically testable forms.

In any event, we need not accept a doctrine of positivism which restricts us in our research, and dampens the sociological imagination. Besides, much of the philosophy of science talked about today is at least twenty years out of date. We need a methodology relevant to our problems, and I think that with a new view of what science is all about, we can begin to develop a methodology that helps instead of hinders. To present this new view, we begin with the problem of induction.

## The Problem of Induction, or: The Non-Recognition of Using Other Information

A common procedure in the social sciences is to take a sample of observations or perform an experiment, and from the results obtained, to make inference about a "population." This is a process of inductive inference, and is regarded as proper scientific procedure. We state that on the basis of our sample, we can make such-and-such statements about the population. However, consider the following example. Suppose that I have collected the traditional epistemological sample of ravens, and all of them are black. This information by itself does not provide any basis for making inferences about the blackness of ravens elsewhere, or at different times. It is on the basis of other information that inferences from a sample of observations to the unobserved elements in a population can be made. In fact, a great deal of other information is needed simply to determine what to specify as being the universe or "population." It is only with other information that we can generalize beyond our sample of observations. There is no principle of induction which permits this great leap. Even Hume rejected induction as a form of valid inference. "Hume, I felt, was perfectly right in pointing out that induction cannot be logically justified. He held that there can be no valid logical arguments allowing us to establish 'that those instances, of which we have had no experience, resemble those, of which we have had experience'" (Popper, 1962, p. 42).

Often, in place of other information, a certain assumption is made. This assumption is that the conditions under which the individuals in our sample were functioning are the same conditions under which the remaining individuals in the population function. It is our failure to recognize the utilization of this assumption, or the use of other information, that leads us to believe in the validity of induction as a proper form of generalization.

This use of inductive inference involves an additional, and very serious disadvantage, namely: that by not specifying the conditions under which our inductive inference is to hold, and under which conditions it is not to hold, we are not able to determine functional or ecological relationships. We are then confined to making "abstractions," or statements about the properties of the objects in the sample. For example, if we were to examine the conditions under which ravens are black, and when they are not black, we might find that blackness in ravens is a function of climate, or of diet, or of genetic mechanisms. The inductive procedure, and its abstractive counterpart, seems to be part and parcel of the Aristotelian procedure that Kurt Lewin (1935) criticized so severely. This belief in "abstraction" as a proper form of generalization from a sample to a population effectively prevents us from determining the ecological or environmental determinants of human conduct. A common practice is to obtain a correlation coefficient indicating the degree of relationship between two processes. This correlation coefficient is a summary statement, and it alone provides no information other than an estimate of the degree of relationship. It would seem more fruitful to determine the situations within which the relationship holds, and those in which it doesn't hold.

An illustration of the non-generalizability via inductive procedures would be the "Back from Mars" game. Suppose that an unmanned space ship has

probed the surface of Mars. On its return, the ship was destroyed before reaching earth, but was able to relay ahead the information that in a set of n objects, each had the property y. This alone is very meager information, and nothing much could be inferred from it. We would need a great deal of other information to learn anything about these objects, such as: the length of time the ship was on Mars, the extent and nature of the area probed, conditions in the ship, the length of time the ship had traveled, other information relayed home, etc. It is important to notice that the comparing of different types of information, all focussed on one problem, is a deductive, analytical procedure, and is certainly not an inductive process.

I know that the story of the ravens is ridiculously simple, and no one today would believe in this simple form of inductive inference. Also, probability theory and statistical procedures are much more complicated than my arguments here imply. However, inductive inference is often reintroduced through the use of probability notions. To illustrate this, let me use an example taken from Popper (1957a).

Suppose that we have flipped a coin one million times, and the number of heads obtained is about one-half the number of flips. If we are asked to estimate the probability of getting heads on another toss of the coin, we would most likely say that it is one-half. But this probability estimate is based on our assumption that the ecology will remain constant. That is, we assume an unbiased coin, and a flat landing surface. We could construct an ecology so that the coin always lands on edge, and a head or tail is never obtained. A table could be made with deep, narrow slots that are wide at the mouth, so that the coin always slides into a slot and comes to rest upon its edge. With this ecology, the probability of getting heads is zero. The importance of this example is to illustrate that we cannot smuggle in inductive styles of inference via probability notions. Our inferences concerning the behavior of an object are based upon assumptions or information we have about its ecology. The ecology, or experimental set-up generates the obtained probabilities. In addition to the invalidity of simple inductive inference, it often keeps us from undertaking a critical analysis of ecological structure, even with such a simple ecology as that used in coin-tossing.

However, a certain kind of statement can properly be made from a sample of observations. We will see that the only proper statement is one which falsifies or refutes a general statement, but does not verify a general statement.

## Universalistic vs. Existentialistic Statements, and Falsifiability vs. Verifiability

We can clarify the type of statements that are permissible from finite samples by distinguishing universalistic from existentialistic statements. A universalistic statement is here defined as one asserting "for all places and for all times."

An existentialistic statement on the other hand, is one which asserts only that something exists, or that something has occurred, or that a certain finite set of objects have certain properties. For example,

suppose that we have collected our favorite sample of ravens again, in which all or some of them are black. Then, we have verified the existentialistic statement that there exist some black ravens, but we have falsified the universalistic statement that all ravens are white. Existentialistic statements can be verified, but not falsified. To falsify an existentialistic statement would necessitate an examination of the entire universe. That is, to falsify the statement that "there exist white ravens," would require, logically, looking into every nook and cranny of the universe to see if any can be found. On the other hand, universalistic statements can be falsified, but not verified. The mark of a universalistic statement is its falsifiability. This flows logically from its quality of "allness." This "allness" permits us, as is well known, to falsify a universalistic statement with a single case.

It is important to mention that although we speak of "universalistic" statements, the universe referred to must be specified. That is, we might specify universes such as: all females, all Europeans, all English-speaking persons, all the members of a given culture, all persons exposed to certain experimental conditions, and so forth. A certain confusion might occur between strictly universalistic and numerically universalistic statements. The term "all Europeans" could refer to all Europeans presently living. This would be a numerically universal statement. Or, the term "all Europeans" could refer to Europeans who lived in the past, those now alive, and those in future times. This latter is a strictly universal use of the term "all Europeans." In any event, the "allness" of a universalistic statement refers to all possible cases within the boundaries of the specified universe.

The term "universalistic" does not refer to how frequently some event will occur, nor does it imply that something occurs throughout the universe. The term "universalistic" should indicate that under certain specified conditions (no matter how rare or infrequent these conditions might be) certain events will universally occur. We can again use our ravens as an example. The statement that "all ravens are black" implies that if you find a raven, you will universally find it to be black. The statement does not assert anything about how many ravens (if any) exist in the world, nor does it assert that they exist universally throughout the world.

Many theories in the social sciences are in a universalistic form, although limits or boundaries are unspecified, or are silently assumed. A neglected but very enlightening enterprise is to consider why we should expect an assertion to hold only within specified boundaries. The boundaries might delimit a universe which includes only college sophomores, enrolled in Psychology 1A, attempting to act as they think they should in the psychological laboratory. Or, the universe might include only white, English-speaking, middle-class, Protestant Americans. Consider some of the many possible universes one might be referring to when making an assertion about human conduct. The assertion could refer to: (1) All humans, (2) all humans within a given historical period; (3) all humans within a given culture or society, (4) all humans within a certain sector of society, say lower-class persons, (5) all humans with a given characteristic, say those scoring over 100 on an I.Q. test, or (6) all the behavior of a single individual, (7) all the behavior that occurs in a certain type of situation,

say the school classroom; and so forth. We should always attempt to specify the universe. We should not assume that our assertion will hold beyond the specified universe, and we should investigate to find out where our assertion holds and where it doesn't hold. The investigation may prove to be devastating to our theories, but should prove illuminating to ourselves and to our colleagues.

A theoretical statement, then, is a statement which refers to a specified universe, and is stated in such a way that operations can be undertaken in an attempt to falsify the statement. A strong theory is one that has withstood severe criticism and many attempts at falsification. Its strength is in having survived many attacks upon it. However, the surviving of numerous critical tests does not verify, confirm, or prove the theory. A scientific theory is one that remains open to criticism and attempts at falsification. Once a theory is regarded as proven or verified, it is thereby removed from the scientific arena, from the arena of critical debate and empirical testing.

It may be very disturbing to realize that a powerful theory asserts very little, but denies a great deal. An example could be made using again our sample of ravens. The statement that "all ravens are black" has more power or informative content than the statement "all ravens are non-white." In the latter statement we are denying only that white ravens will be found, but in asserting that "all ravens are black," we are also denying that any green, red, yellow, blue, brown, purple, or other non-black ravens shall be found.

We are disturbed by the suggestion that a theory denies certain events, because of our mistaken belief that theories can be verified. It might prove even more disturbing to realize that a powerful or informative theory is also very improbable. Consider this example adapted from Popper (1962, pp. 217-218). I might assert that it will rain on Friday, and this assertion has a certain objective probability. That is, we can estimate, from weather bureau records and reports, the probability of rain on Friday. I might further assert that it will rain on Friday, and it will rain between 2 p.m. and 3 p.m. This assertion has a smaller objective probability, but greater informative content. I might further assert that it will rain on Friday, between 2 and 3 p.m., and that it will rain more than one inch. As the content of a theory increases, its objective probability decreases.

It should be clear that the use of operational definitions, although very useful in specifying what research procedures we have followed should not be used to define concepts or to define variables. The logic of operational definition and the logic of inductive inference are the same. We cannot validly generalize from a very specific situation or arrangement of conditions to a concept or a universal statement. If our goal is the formation of scientific theory (i.e.--universalistic statements), then we must avoid the use of inductive procedures. Inductive inference could be described as "intellectual provincialism," in that the use of induction assumes that the limited portion one has seen of the world is true elsewhere, without one having been elsewhere to see if this inference is true or not.

There are very few universalistic statements in a clear, testable form to be found in the social sciences. These statements are very difficult

to construct when one is concerned with problems of social behavior. The difficulties which arise are too well known to require mention. In fact, one writer, R. S. Peters, has asserted that psychology will never have highly general theories (i.e. universalistic statements). The reason for his assertion is not that practical and experimental problems are overwhelming, but that these highly general theories are logically impossible. ". . . the role of the Galileo of psychology must be forever unoccupied. Psychology has not soared into its Galilean period as is often thought, through lack of bright ideas, experimental ingenuity, or methodological rigour. It has remained earth-bound in mazes and Skinner boxes because the highly general theories which, it was hoped, would emerge, are logically impossible" (R. S. Peters, 1960, p. 1956).

Although universalistic statements may be rare in the social sciences, we are, however, accumulating a fund of existentialistic statements. In this manner, we are building a body of knowledge. Because these statements are not universalistic ones, we should not belittle them, nor should we underrate their power. These existentialistic statements can, it must be remembered, falsify universalistic statements. It is in their role as potential falsifiers of sweeping general statements that our body of existential statements can play a most important role. Consider the great mass of myths, superstitions, prejudices, so-called "common sense," and unexamined assumptions that flourish outside (and inside) the world of social science. As examples, take certain beliefs about race or beliefs about "human nature." The role of social science has been to caution us about making any easy generalizations about human behavior. We have become aware of the extreme complexity, variability, and adaptability of human behavior. Many social scientists are now engaged in research in areas where previously only untested theorizing and unquestioned assumptions held sway. Such areas as race relations, belief systems, social stratification, social deviance, and so forth, are the areas now under the critical scrutiny of the social scientist. In particular, the role of social sciences has been a most significant one in the investigation of fascistic beliefs during World War II, and, during the last decade, in producing evidence to support the many desegregation decisions of the federal courts.

We do not, then, have a tidy set of universalistic statements that we can parade before the world. But we do have a set of existentialistic statements, gathered from such diverse sources as the psychological laboratory and the anthropological field study. All of our sources indicate to us the great variety found in human affairs. Our fund of existentialistic statements comprises a critique of all statements that have the form: "Man is . . ." The "man is" statement, when given without qualification, has the form of an "all," or universalistic statement referring to "all humans at all times and places." If someone asserts that "man is rational," we can always point to examples of irrationality. The same case holds if someone asserts in a universalistic manner that "man is irrational." Our commitment and devotion to inductive procedures in the social sciences has blinded us concerning the importance of the type of evidence we have been producing.

## The Context of Invention and the Context of Testing

There still exists a proper use of inductive procedures in science or in any human enterprise. I have discussed and critized the use of inductive procedures in hypothesis testing. However, within the context of hypothesis formation, inductive inferences and all forms of intuitive processes should be encouraged. The confusion concerning the use of inductive inference stems from a failure to distinguish clearly the context of hypothesis invention from the context of hypothesis testing. The two terms, "discovery" and "justification" are usually utilized in making this distinction, stemming from Reichenbach. However, both terms seem improper and misleading. In the first case, hypotheses are certainly not discovered, but invented, as George Kelly (1960) has emphasized. In the second case, hypotheses are not to be justified, but to be tested. Within the context of hypothesis invention, we can and should utilize whatever inductive hunches and ideas we might have. But, within the context of hypothesis testing, there exists no inductive procedure which provides a degree of validity to our hypotheses, without the use of certain assumptions, or the use of other information.

The context of invention refers to the source and formation of our ideas, guesses, hunches, theories, conjectures, and hypotheses. The only policy we should take regarding the source of our hypotheses is that they should come from any source. We should use and develop whatever imagination, intuition, creativity, skills, experience, and sensitivities we might possess to aid us in the creation and formation of our hypotheses. The production of ideas and hypotheses is not a logical or epistemological problem, but a problem for social and psychological study, the study of scientific and artistic creativity.

## The Two Kinds of Empiricism

There remains one more issue to be discussed before we come to the summary and conclusion of this paper. This issue is: What should we regard as proper empirical method in science?

There are two very different ways in which we can interpret the empirical method: (1) We can regard the source of our knowledge as deriving solely from sensory experience and observation. Our hypotheses, generalizations, and laws are then derived from abstractions or inferences made from these observations. This viewpoint will be called "pure empiricism," and is part of the positivist doctrine criticized in this paper. (2) In contrast to the position of pure empiricism, we can regard observation as the method by which we test our theories, hunches, conjectures, and hypotheses. In this view, knowledge can have any source. However, it is by empirical methods that our knowledge is tested or criticized. The empirical procedure is a convention employed to serve as an arbiter between contending theories. This viewpoint will be called "critical empiricism," and is the viewpoint propounded in this paper.

The critical empiricist takes the position that the laboratory (or the experimental situation) is not a unique source for the creation and development of theory. Theories can have any source, and any relevant empirical method can test them. A critical empiricist would want to confine

all discussion concerned with "rigor" and the like, to the context of testing, and leave the scientific worker free to invent and create in whatever manner he finds to be most comfortable.

It may very well be that some of the most exciting scientific theories in the future will be derived from very unusual sources. But if we are squeamish about the source of our theories, instead of with their clarity and testability, we may poison the wells of creativity. The approach of critical empiricism, although it demands severe testing of our hypotheses, pleads for complete freedom in the invention and creation of hypotheses. There remains, of course, the process of transforming the original, crude hypothesis into a clear, testable form. This process, however, usually demands a great deal of imagination, and only a minimum of "rigor."

## Summary and Concluding Remarks

This paper has provided a mere sketch of an alternative to the positivist philosophy. The positivist position contains many prescriptions which are especially restrictive to social science research.

We have seen the poverty of inductive procedures, and the impossibility of proving or verifying a theory. We have thrown out the destructive belief that our hypotheses must be derived only from observation, and have come to see that ideas and theories can derive from a variety of sources.

It was argued that very few requirements need to be met, for an activity to be labelled as scientific. However, these few requirements are strict ones, and derive from the logical implications of the assertion being made. The universalistic assertion is logically falsifiable within its specified universe. The existentialistic statement, which asserts only that something exists or has occurred, can falsify a universal statement, but cannot logically verify a general statement. These strict requirements may help instead of hinder, by alleviating some of the verbal diarrhea that is so pronounced in the social sciences.

Many persons may find disturbing the suggestion that social science will produce very few laws or universalistic statements. This uneasiness is aroused when we compare our results with what has been achieved in the physical sciences. Perhaps we will not be able to produce any laws that can withstand genuine attempts at falsification. Some researchers may wish to produce only existentialistic statements to be used as falsifying evidence against certain myths and unquestioned assumptions. This approach should not be regarded as secondary to theory construction. In the social sciences, our role for some time to come may be that of the critic or gadfly, subjecting the most cherished beliefs of our society to a critical and systematic investigation.

There has been lately a massive identification of science with its gadgets, its technology, its impressive creations, and its white-coated laboratorians. With such an identification of what to regard as scientific, the social sciences will always be regarded somewhat contemptuously. Science should not be identified as technology but as the acceptance and application of the critical attitude. If we see that science is a method, a method of free and critical discussion (and the utilization of empirical

tests when appropriate), we may be able to convince ourselves and others that freedom of discussion is not a mere frill, but is the very essence of science. We need a philosophy of science that is appropriate to the investigation of social and psychological problems, and we also need the conditions in which we can examine these problems freely and critically.

## NOTE

[1]This paper is a slightly revised version of a talk given at the Eighth Annual Kroeber Anthropological Society Meetings, Berkeley, California, April 25, 1964. This paper was written during the author's fellowship (NIMH grant: 1 T1 MH 8104-01) with the Behavioral Science Project, School of Public Health, University of California, Berkeley. I would like to thank my colleagues on the Project, especially Octavio Romano and Ronald Dillehay, for many exciting discussions which led to the writing of this paper.

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