Psychology and Scientific Research. III. The Transactional View in Psychological Research

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WHEN PSYCHOLOGY EMANCIPATES ITSELF from dependence on interactionism alone by taking a transactional view of the phenomena which come within its province, we should expect that the division of psychologists into schools would rapidly disappear. Schools (Gestalt, behaviorism, psychoanalysis, etc.) would disappear not because they are "wrong" or "have been overthrown" but because the formulations of each school that meet empirical tests would be encompassed within wider formulations of problems. What are some ways to speed this development?

First of all, the psychologist must not only realize intellectually, but must make a part of his functional assumptive world, the idea that man's thought and behavior can be understood only as processes of a "full situation of organism-environment." The point has been made by H. A. Murray and collaborators in their contention that "the main body of psychology started its career by putting the wrong foot forward and it has been out of step with the march of science much of the time. Instead of beginning with studies of the whole person adjusting to a natural environment, it began with studies of a segment of a person responding to a physical stimulus in an unnatural laboratory environment" (*10,* 466). Brunswik, in his "ecological analysis," has pointed out the need to understand the complete "representativeness of circumstances" operative in any situation under observation (*2*). But while an increasing number of psychologists are calling for a revision in traditional psychological procedure, their voices are still those of men crying in the wilderness of the universe which constitutes so much of psychological inquiry today. The psychological investigator, of all people, cannot separate the observer from what is being observed, the process of knowing from what is known, what is "out there" from whatever goes on in the experiencing organism. Psychology must disavow completely any "field theory" which implies that an environmental field acts *on* a person rather than *through* a person.

Because man inevitably builds up for himself an assumptive world in carrying out his purposive activities, the world he is related to, the world he sees, the world he is operating on, and the world that is operating on him is the result of a transactional process in which man himself plays an active role. Man carries out his activities in the midst of concrete events which themselves delimit the significances he must deal with.

In the process man is himself changed in greater or lesser degree by having his own assumptive world changed through confirmation or denial as a result of action. In his immediate activity man abstracts from the immediate situation certain determined aspects according to his assumptive world. And this, as we indicated, includes far more than the immediate occasion: it is a continuum which includes the past and the future, a storehouse of both past experience and ideals. As Bentley has pointed out, "Behaviors are present events converging pasts into futures. They cannot be reduced to successions of instants nor to successions of locations. They themselves span extension and duration. The pasts and the futures are rather phases of behavior than its control" (*1,* 485). Psychologists must be constantly aware of the effects man's own actions have both on his assumptive world —confirming or denying certain aspects of it—and concurrently on the "environment out there" as it is perceived and experienced.

Another implication of the transactional mode of observation is that the psychologist, like any other scientific investigator, must be sensitive to the pitfalls involved in reifying anything as an entity that has been given a proper name—a pitfall that philosophers since Plato have inveighed against. Psychologists, like other scientists, must become increasingly self-conscious of the dangers to their scientific progress inherent in catchwords, whose use, as Dewey and Bentley point out, "shatters the subject matter into fragments in advance of inquiry and thus destroys instead of furthering comprehensive observation for it" (*6,* 243). Any uncritical use of traditional abstractions makes it difficult or impossible to see together what has already been taken apart.

While academic psychologists have long since given up the entity of the *soul,* and while most of them, at least in their professional writing, refuse to talk of the

mind,[1] many other entities have slipped into the professional jargon of psychology to make transactional observation difficult. We have, for example, *need, I. Q., schizophrenic, trait, attitude, Oedipus complex,* and *mesomorph.* The uncritical use of such words as specifications can easily lead to redundancy and double talk.

Psychology runs the risk of retarding its discovery of new bases for psychological standards through the use of bases for standards employed successfully in the past by the physical sciences. For example, psychologists refer to "the size of the retinal image," "visual angles," "intensity of opinion," "field forces," "gradients," "positive or negative valences," "vectors," "depth psychology," and some even search for the physical dimensions of consciousness, limiting physical dimensions to a handful of constructs. Psychology has by no means emancipated itself yet from the standards of the physical sciences and is not rapidly enough discovering standards appropriate for the phenomena with which it deals.[2] By refusing to place firm reliance on standards whose bases are necessarily subjective, psychology sometimes complacently throws out some of the most important problems with which it should be concerned. Nouns such as *surety, anxiety, ego-involvement, expectancy, happiness,* imply adjectival or adverbial relationships that are purely subjective. There are plenty of bases available for standards if the psychologist dares use them as he becomes sensitive to the importance of the problem of selecting bases for standards appropriate for the inquiry at hand.

It has become increasingly clear in recent years in the fields of chemistry and biology, for example, that standards appropriate to the subject matter of investigation must be sought and that reliance on the standards of classical or modern physics alone will hamper investigation. For example, J. G. Hoffman, a professor of biophysics, has recently noted that "the word biophysics . . . is a ridiculous combination of incongruous extremes. Disciplined scientific thought has never taken more diverse forms than it has in the fundamental modes of thinking in biology and in physics" (*8,* 7). In pointing out the limitations of a physical mode of observation for the study of living systems, Hoffman quotes Delbrück's statement that "instead of aiming at the whole of the phenomena exhibited by the living cell we now expect to find natural limits and, thereby, implicitly, new virgin territories, on which laws may hold which are independent of those of physics, by virtue of the fact that they relate to phenomena whose appearance is conditioned on *not* making observations of the type needed for applying atomic physics" (*8,* 14).

There is also a tendency in psychology to use catchwords in labeling the fields of social, clinical, educational, or industrial as "applied" fields of psychology and to separate them from the more traditional "experimental" psychology. Any such division is absurd unless the person who uses it consciously reserves it for rough descriptive purposes. Investigators in these fields must, of course, also rely on experiments. But beyond that, any such distinction acts as a deterrent in the search for more adequate formulations which will better account for human behavior, whether in the laboratory, the clinic, the factory or in everyday social life. It is especially in fields such as these that one encounters hitches in interpretation because of the huge number of variables involved in the concrete situations that constitute each of the areas of inquiry. When such hitches are encountered, the investigator does not merely "apply" to their resolution some theory he has read in a book or learned from laboratory experiments. To be sure, he brings such knowledge and experience into the process of hypothesis formation. But the chances are very high indeed that any theory which is not itself based in large part upon the understanding of similar full-bodied concrete situations will turn out to be extremely inadequate.

We can illustrate the way in which psychological inquiry has been restricted by the use of terms with reference to the field of perception, which has so often been a weathervane in psychology. In working on perception, psychologists early found that certain variations in objective or physiological factors produced marked subjective variations. This naturally led to the idea of correspondence between subjective factors on the one hand and objective and physiological factors on the other hand. Since an alteration of objective and physiological factors could so easily be shown to cause subjective effects and since the converse could not so easily be demonstrated, the assumption was built up that the subjective aspects of perception had their origin largely in the corresponding objective factors and the accompanying physiological disturbances they caused. Studies of perception have thus concentrated largely on the analysis of ob-

[1] A good example of a scientist who used the transactional method of observation was G. E. Coghill, who taught himself to see every organism in terms of a manifold of three inseparable constituents—structure, function, and mentation. The word *mentation* Coghill used as a substitute for *mind,* to connote the constant organism-environment transaction (*7,* 198).

[2] It is significant that psychological terms describing capacities of human beings are occasionally used by natural scientists as rough specifications of certain phenomena they encounter. For example, mathematical physicists, in describing the behavior of some of their electronic computing machines when they become overloaded, call them "neurotic"; while biologists occasionally speak of the phenomenal "memory" which the cells of the body exhibit for certain stimuli.

jective and physiological factors. And since these objective or physiological factors could be varied quantitatively, scientific methodology in psychology tended to become identified with measurement alone.

This led to a long neglect of those factors not amenable to precise measurement. These neglected factors were, of course, subjective factors described by such symbols as past experience, loyalties, expectancy, and purpose, whether these were operating consciously or unconsciously. This methodological dam has recently been cracked, largely through research in social and clinical psychology, where the effects of subjective factors on perception are especially obvious. More recently, in an attempt to liberate investigators somewhat from correspondence between subjective and objective or physiological factors, the Hanover Institute has designed demonstrations of perceptual phenomena which deliberately make use of illusions. By using illusions, the investigator gains more freedom to understand the nature of the functional activities that are involved in the scientific inquiry of perception and thereby gets a better toehold on the function of perception in man's purposive behavior. For example, it can be demonstrated that the perception of *where* a thing is depends upon the perception of *what* a thing is and on *when* it is perceived. Carr has pointed out that "illusions contrasted with correct perceptions are the experimental variants that reveal the common principle involved in both" (*4*, 326).

On the basis of an interactional view alone, an investigator could study the interdependence of various aspects of a perception forever and never get at the reason for such relationships until he asked himself what function such an interrelationship of phenomena served in the transaction of living. When he asks himself this question it appears that variables such as size and distance are experientially related because it is only through their relationship in past experiences that high prognostic reliability is built up. Prognostic reliability becomes itself, then, a new dimension of experience, a new basis for a standard the psychologist can use for experimentation. And if the investigator continues, as he must, to ask the next question concerning the function of prognostic reliability in a life transaction, the apparent answer is that prognostic reliability of a perception increases effective action. So the effectiveness of action becomes another variable that can be used as a basis for a standard in experimentation. And there must follow, of course, the question: Effective action for what? We then see that we cannot understand even the simplest perception without bringing in the variable of purpose.

The transactional mode of observation seems, then, to be peculiarly appropriate for psychologists if they are going to seek what Collingwood has called more abstract, more universal "logical grounds" for the understanding of subordinate abstractions or phenomena (*5*). Obviously, if we do not understand the logical ground that causes relevant variables to be relevant, then our scientific methods will be sterile indeed. Hence progress in psychology is to be measured largely in terms of the discovery of logical grounds which increase our understanding because of their intrinsic reasonableness and the possiblity they hold out of verification by experimental methods. Many of the abstractions Freud created are a case in point.

The transactional view has a third implication for psychology which concerns the method of experimentation that must be involved in real research. Different subjects for scientific inquiry pose different kinds of problems that can only be solved by adapting or creating methods appropriate to them. In saying that any one scientific discipline has special circumstances of its own which determine the techniques to be used, we are not in any way denying the indispensability of the universal characteristic of scientific method: the controlled experiment. All we are saying is that we must increase our self-consciousness and our ingenuity concerning the use and meaning of *controlled* and not claim that we are undertaking controlled scientific investigation when our assumptive world artificially limits the number of potential controls we are aware of.

One difficulty in the use of experimental techniques in psychology and the social sciences is that of approximating in a controlled experiment any concrete situation in which thought and behavior normally occur. Although this has been pointed out many times, and although the difficulty is easily recognizable, psychologists must be particularly on their guard to see that, in the experimental situations they devise, they have not left out so many of the subjective variables involved in normal experience that their experimental results will have little subsumptive power.

A second and much less frequently realized difficulty is that in dealing with the human organism we are dealing with a particular variety of "world stuff" which perceives complicated significances. Unless we make a special effort to understand the particular significance a particular organism at a particular time and place attaches to all the stimuli involved in our investigations, we shall again have abstracted out of the situation perhaps the most important variables for study. In psychology it is imperative that the investigator be as aware as possible of the unconscious assumptions brought by his subject to any experimental situation. Otherwise he will not have the slightest idea of what aspects of the

phenomenon under investigation are most important. This awareness of assumptions is as important for the psychologist to have in mind in understanding the perception of a chair as it is in understanding social perceptions.

Still another difficulty facing the psychologist is the comparative lack of any agreed-upon bases for standards by means of which experimental situations can be described and repeated and results can be interpreted. The search for appropriate bases for standards is obviously one which requires great caution and wisdom in an area such as psychology because of the number of unknown variables apt to be involved in any standards set. Much careful research is still needed to discover what variables should be used as the bases for standards to provide the most useful analysis of man's experience.

Value Judgments and "Objectivity"

A great deal of discussion has taken place in recent years concerning the possibility or the desirability of complete "objectivity" in science. The publication of Karl Pearson's *Grammar of science* in 1892, (*11*) with its contention that an understanding of scientific method can train "the mind to an exact and impartial analysis of facts" and can free the individual from bias in the formation of judgments gave a great boost to the myth that real scientific inquiry somehow goes on in a world devoid of personal judgments. The contrasting point of view has been expressed by Whitehead (*12,* 228 f.):

> Judgments of worth are no part of the texture of physical science, but they are part of the motive of its production. Mankind have raised the edifice of science, because they have judged it worth while. In other words, the motives involve innumerable judgments of value. Again, there has been conscious selection of the parts of the scientific fields to be cultivated, and this conscious selection involves judgments of value. These values may be aesthetic, or moral, or utilitarian, namely, judgments as to the beauty of the structure, or as to the duty of exploring the truth, or as to utility in the satisfaction of physical wants. But whatever the motive, without judgments of value there would have been no science.

It is becoming increasingly clear that the process of mentation involved in scientific inquiry is not a simple one of bringing "impartial analysis" to bear on a set of conditions. The scientist's own value judgments are involved in (1) sensing the inadequacy of his conceptual structure—posing a problem for himself; (2) sensing the functional activities or subphenomena which may be involved in the phenomenon that has caused the original hitch; (3) deciding on which aspects of a phenomenon (variables) can fruitfully be used as bases for standards in experimentation; and (4) designing an experimental procedure to test the validity of these bases for standards. Scientific research thus involves an elaborate process of weighing and integrating which may take place largely on an unconscious level.

In this process, all of the unconscious assumptions, all of the awarenesses, and all of the conceptual abstractions of the individual investigator's assumptive world are operative. Whether any scientist likes to admit it or not, any interpretation he makes must be regarded as a value judgment. To be sure, rational thought and the conscious intellectual manipulation of abstracted variables can, often do, and obviously should, play a most important role in the process of scientific inquiry. But to assume that rational thought and conscious manipulation alone are the determinants of the judgments involved in scientific research is to go against the overwhelming evidence already obtained from scientific research itself. The dictionary definition of the word *objective,* in the sense it is used in discussions concerning the objectivity of science, is: "Emphasizing or expressing the nature of reality as it is apart from self-consciousness; treating events or phenomena as external rather than as affected by one's reflections or feelings." For example, our knowledge of perception, showing that "the nature of reality" as we experience it would not exist *except for* the assumptive world we bring to a concrete situation, flatly contradicts the contention that the scientist can be objective in any such sense.

The objectivity of science can therefore only refer to the use of accepted rules of empirical research *after* the problem, the variables, and the experimental design have been decided upon. Here the scientific investigator takes every precaution he can to see that he does not misinterpret what he observes by allowing any subjective bias to enter into the actual conduct of the experiment itself.

Not only is objectivity illusory in the sense of eliminating personal bias: it is also undesirable. We cannot improve on the conclusion reached by Herrick (*7,* 180 f.) after a lifetime of productive research in neurology:

> The bias which arises from unrecognized personal attitudes, interests, and preconceptions is the most treacherous of all the subversive enemies of sound scientific progress; yet these attitudes and interests are the key factors in all really original scientific investigation. This issue must be faced frankly and courageously. The easy way out is to ignore the troublesome personal ingredients of the problem and say that science has no concern with them. This is now generally regarded as the standard or normal scientific method. But actually this cannot be done, and we cannot afford to try to do it; for the interests and the attitudes of the inquirer shape the whole course of the investigation, without which it is meaningless and fruitless. To neglect these components of sci-

entific work and the satisfactions of a successful outcome is to sterilize not only the process but also the results of the inquiry. The vital germ of untrammeled imaginative thinking is thrown into the discard, and too often we seem quite content with the dead husk which is so easily weighed, measured, classified, and then stowed away in the warehouse.

In the social sciences, Robert Lynd has made the same point in his plea for "outrageous hypotheses" (*9*).

The myth that "science is objective" may tend to be fostered in most cultures today in an attempt to preserve whatever status quo exists by giving it scientific blessing. But any scientist will resent boundaries placed on his thinking by social, economic, political, religious, or any other ideological barriers and taboos. This danger is especially prevalent in the field of inquiry labeled "social psychology" and in the social sciences, where the data gathered have been largely determined and preconditioned by the purposes and conditions within which the investigator has worked.

Psychologists and social scientists who honestly try to bring their most mature value judgments to bear on concrete social problems are all too frequently labeled as biased, crackpot reformers if they even implicitly criticize existing social relationships. Yet it is because scientific inquiry is shot through with value judgments that no scientist can avoid some responsibility for the judgments he makes. And because value judgments play so important a role in scientific thinking, ways and means must be discovered of making value judgments themselves the subject matter for scientific inquiry (*3*). Value judgments concern the significance of the constant emergents which are not subject to explanation in determined and verifiable terms. Here the scientist has a freedom of choice; here conscience, the "sense of oughtness," must be recognized as the highest standard for effective action. When the subject matter with which the scientist deals consists of human beings trying to act effectively to carry out their purposes, then the social responsibility of anyone who pretends to be an expert obviously becomes very great indeed.

Accelerating Research in Psychology

Our recurring theme has been that any truly scientific investigation involves much more than the use of an accepted methodology of experimentation. We have tried to show why the progress men hope for in their understanding of themselves can come about only to the extent that those who are professionally concerned with such an understanding become increasingly sensitive to the problem of problemization.

But readers already sympathetic with our emphasis may be reminded of the dramatic critic who, after pointing out the second-rate quality of then current productions, ended his comments with the statement that what we need are better plays. Are there any concrete suggestions which might speed up the search for more and more adequate formulations psychologists would seek to verify experimentally? A few have occurred to us.

We have pointed out that scientific inquiry, like any inquiry, begins when we meet a hitch, when we sense the limitations of or doubt the adequacy and reliability of our assumptive worlds as we try to act effectively. From this it follows that every attempt must be made to increase an investigator's consciousness of the range of hitches that must be faced and that are inherent in attempts to resolve problems. We must get across the notion that hitches are not obstacles to be avoided but, on the other hand, challenges which alone make productive research possible. No one can be "trained" to do research merely by having a set of rules spelled out for him. A good investigator, like a good clinician, a good advertising man, or a good labor leader, will be produced only when there is a real desire and ability to use ingenuity in meeting the hitches that occur in carrying out purposive action.

It has long been apparent that no one person today can be thoroughly competent, knowledgeable, and experienced in the diversified areas of inquiry that impinge on and are necessary for a proper understanding of man. More than mere cross-fertilization or broadened specialization is needed. Can ways and means be found to make it possible to bring together investigators who agree on the probable common significance of the hitches they face and on the probable order of importance of the hitches that must be resolved for improved understanding? Perhaps informal organizations are required which will make it possible for men of diverse experience to work and commune together as the occasion demands, on common problems and on the same level without reliance on one another's authority and unrestricted by limitations of time or any goal other than the search for more adequate concepts. Psychologists and social scientists will have to work out organizational and communicating techniques so their search for the more adequate conceptualizations people expect of them will not be hampered by formalities or administrative duties.

All investigators are caught in and influenced by a traditional mode of thinking and teaching cluttered up with catchwords, with an emphasis on the interaction of variables, with an overconcentration on methodology for its own sake. In academic circles the tendency all too often is to feel that the student—and the professor—have essentially "covered" the prob-

lem of formulation if various systems and theories of psychology have been reviewed. The psychologist's relative lack of concern with the problem of more adequately formulating emerging problems is often reflected in what seems to be his extreme self-consciousness in respect to the short history of his discipline.

We are not in the least denying, of course, that rigorous methodological standards must be insisted upon or that the history of the subject should be reviewed. But we do feel that progress in psychology can be brought about more rapidly only if methodological procedures are considered in relation to concrete problems and if the history of psychological investigations can be viewed from the perspective of problems that now seem significant, rather than vice versa. Whitehead has nicely stated both points in his dicta that "the main evidence a methodology is worn out comes when progress within it no longer deals with main issues" (*13,* 13) and that "a science which hesitates to forget its own history is lost" (*12,* 162).

(*This is the third of a series of three articles.*)

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The 112th Annual Meeting of the British Association for the Advancement of Science

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THE 112TH ANNUAL MEETING of the British Association for the Advancement of Science was held in the heavily industrialized northern England town of Newcastle-upon-Tyne, in the first week in September. Some 3,500 persons—scientists and science-minded citizens—were present.

This area has a great technological tradition, for—as Pierre Auger, head of Unesco's Natural Sciences Department, pointed out in an official address—"It was in this ancient city of Newcastle that the world-famous engineer George Stephenson, a century and a quarter ago, established the iron works where were built the first steam engines that went puffing into history between Stockton and Darlington, and Manchester and Liverpool—and began a new and splendid phase in industrial development."

The theme for this meeting was set by Sir John Russell, who devoted his presidential address to a review of the world's food and population problems. He pointed out that the present population of the world—2,300,000,000—was increasing by 20 millions a year. That meant an average addition of two every three seconds, day and night, year after year, and these two might become more as science advanced, social services improved, and international organizations became fully operative.

About 11 billion acres of the world are climatically suited to crop growth, he said: but of this area, only 3 to 4 billion acres are used—7 to 10 percent of the world's land surface—for both food and industrial crops. There is no need, however, for gloom. Science is continuously opening up new possibilities. For example, thyroxin, or iodated protein, fed to cows by mouth, can increase the fat content of milk and augment the yield by another 20 percent. Even more dramatic is the use of a synthetic estrogen (the female sex hormone) introduced under the skin, for inducing lactation in virgin heifers or barren cows. This is the first stage in making the male redundant.