

THE PSYCHICAL AS A BIOLOGICAL DIRECTIVE

H. HEATH BAWDEN

I. THE PSYCHOPHYSICAL

It is a happy circumstance that this important aspect of method should be brought to our attention by a distinguished scientist in the field of biology. In the past any reference to the "psychical" by the scientific methodologist has been regarded as a dubious departure from his strict routine. But the recognition, finally, by a man of science, of the aleatory, autonomous character of a spontaneous universe, disclosed in biological directives as well as in the dynamics of the atom, is a stimulating enhancement of that philosophy which, as Dewey says, is "the critical theory of methods of criticism."

In his recent book on "General Biology and the Philosophy of Organism" Ralph S. Lillie insists, not only on the psychophysical nature of the organism, but even goes so far as to suggest that there is an intra-atomic fertility which may account for the novelty, initiative, and progress of an emergent evolution. In this book the author has raised an important question which has always baffled the biologist, and his effort to arrive at an answer which will deal adequately with all the facts, is highly commendable. This answer cannot be arrived at in terms of the nomenclature of a dualistic psychology. It becomes possible only by developing the concept of the dynamic in biology and psychology to include those tentative incipient modes of response which are the organic equivalent of the potential versus the kinetic in the science of physics. This not only explains the facts misinterpreted by a dualistic psychology, but enriches the content of our physical science terminology.

The honest confrontation of the facts and the assiduous efforts to make the old dualism mean something in the new scientific situation are a great credit to the author of this book, and if there were any trail of truth in the antiquated dualism he certainly would have found it. But, as he points out on pp. 53, 72, 101, the fundamental defect of such a dualism is the original setting up of two artificial abstractions—a purely psychical and a purely physical, ontological fictions—instead of sticking to the concrete interactions of the objective situation.

As he formulates it, the problem which confronts the biologist and psychologist today is one of finding, not only some common terminology for the two fields, but a basis of activities which both explain adaptive organic behavior and are, at least theoretically, quantifiable.

In this book an heroic effort is made in this direction. The author says that the psychical is not only necessary to explain biological phenomena, but that it is a complementary aspect which, taken together with the physical, is necessary to give us an adequate knowledge of the real world. His aim is to give an account of those functions in the life of an organism which are not adequately accounted for by what is called a mechanical or physical science explanation—factors which are being stressed by such terms as "psychosomatic" and "psychobiological." He even goes so far as to suggest a pan-psychic interpretation of the facts (pp. 72,

77) in order somehow to keep the two aspects subject to a common methodology. He says the telic is computable. Its power is not measurable in the same way as that of physical energy, but it has its electro-magnetic field, and this is sufficient to put it among the scientific categories. When an overt act is arrested and transformed into a tensional opposition or balance of tendencies-to-act (what are called attitudes), the technique of measurement of such a field of energy is highly complicated, but it falls within the scope of precise measurement in the same sense that we speak of measuring the potential of a Leyden jar. But at the crucial point of finding a common basis of activities which will adequately cover both aspects, he admits that scientific method so far has failed (cf. p. 77).

II. STATEMENT OF THE PROBLEM

One of the methodological perplexities of the problem appears in the insistence, throughout the book, on the one hand (1) that the psychical and the physical are just aspects of the same thing (allied, concurrent, etc.), and, on the other hand, (2) that they are so fundamentally different that physical science cannot deal with the psychical, e.g., with the character of feeling.

(1) Their unity and interdependence is assumed in his description of the organism "as a psychophysical system, i.e., as a natural entity or existent in which physical and psychical characters coexist in intimate union" (100). He devotes a chapter to "Psychophysical Interconnections" (chapter VI), maintaining "the unity and inseparability of the psychical and the physical" (105). "The living system is a psychophysical rather than a merely physical system" (72), "because it is a development from a nature which is psychophysical" (76). The "dual property appears rather to be a fundamental condition which has to be accepted as part of the innate constitution of nature" (76). "To derive psychical qualities from exclusively physical factors, or the reverse, does not appear scientifically possible. In experience they are conjoined; and to regard either as having an existence of its own, entirely independent of the other, is a feat of abstraction which does violence to the experienced reality" (77). "In those natural systems which we recognize as 'living' the physical and the psychical factors are to be regarded as continually influencing one another; . . . as biological factors they are mutually supplementary" (186). But, as he also adds, "just how or why they have diverged so sharply from a common background is not easy to understand" (100).

(2) The differences between the psychical and the physical are also indicated. The physical, he says, has the "permanent retention of a certain constant state or property" (100). In its essential nature it is "permanent, fixed, or established" (101). It is a "residue from past activity" (103), "a system of events that happen in the same way at one time as at another" (101)—hence the laws of causal efficacy and the conservation of energy.

The psychical, on the other hand, is "transient in character," "lacks conservation" (100), is "participial rather than substantive," a "presentational immediacy" rather than a causal efficacy (101). "Psychical events, when they happen, are always novel and in the present" (104). He says a feeling is a

psychical, not a physical entity (75). He even suggests a correlation of the psychical with the sub-microscopic quantum jumps (40). The biological directiveness of organisms he attributes to the presence of a special regulative non-physical factor (87-88). This he calls psychical directiveness (89). Nature, he says, is "not a closed system" (118). "Every time a natural event repeats itself there is some variation" (122). This initiating or novelty element, he suggests, may be intra-atomic, and even non-spatial (130-132). Causation holds for mass phenomena, but not for the individual event which is unique (107). There is some element of indeterminacy.

"The general biological problem, therefore, is: How are we to conceive scientifically the nature of the psychical field and its relations to the physical field?" (183). "There is a scientific impasse here" (185). "How can a condition which is not physical effect physical change?" (162). "In some unknown manner the psychic aim determines that events take a special and definite course, rather than one of many others which are possible in the physical sense; there is a selection out of a wide range of possibilities" (181). On pages 120 and 122 the statement is made that there is a certain element of uniqueness or self-determination which enters in each individual event, although in most cases, especially in non-living things, determination is predominantly from the outside. There is the fact of individuality to be taken into account. "Indeed, any distinguishable natural entity or individual, even the simplest, appears on close examination to have in it some element of constitution or behavior which is not entirely law-abiding or predictable" (120).

III. THE ROLE OF THE PSYCHICAL

It would seem from various suggestions offered in this book that the role of the psychical in relation to the physical (in the living organism) is essentially the relation of the potential or incipient to kinetic or overt action. When I drive a team of horses with the reins in one hand and guide the plow with the other, what I am doing is called physical. But when, in place of these overt activities, I use the articulomotor apparatus of sub-vocal speech to symbolically construct a tractor to take the place of the horses, I am engaged in activities which, in contrast with plowing, are called tentative, nascent, incipient, potential, symbolic. The only difference in the activities lies in the behavior mechanisms involved. Instead of the gross musculatures of locomotion and manipulation involved in driving the team and handling the plow, the activities are the outwardly mute, but inwardly resonant, interplay of verbal forms. When I return to the house after the day's plowing I get out my science books and study the internal combustion engine and the Diesel tractor. I discuss the subject with my next door neighbor and draw diagrams and plans for reconstructing my farming activities in terms of motor power. When I go to bed at night I keep turning over the matter in what is called my mind—using the same minor musculatures involved in speaking and reading and writing, only now the reading is in terms of what I can remember on the printed page, the writing is upon imaginary paper, and the speaking is sub-vocal—what the new psychology says is the real nature of

thinking. Of course, this is what is usually called the psychical, and there is no objection to the use of that term if it is made clear that there is no more difference between my thinking and my acting than there is between the potential and the kinetic energy of the physicist.

And so, with such terms as purpose, teleology, voluntary action, free will, etc., by means of the symbol, in terms of this sub-vocal exercise of the speaking muscles, the impending situation is dealt with in a preliminary and, as Dewey says, a retrievable way, before the necessity for overt action arises. There is no difference in the type of activity, except that, by the use of the symbol, a wider range of alternatives is dealt with than would be the case if one were plunged directly into the baffling objective situation. Even if we dealt with the situation exclusively in terms of our major muscles, a baffling situation would arouse a limited variety of conflicting responses. There is no occult or mystic influence at work. The situation in its more accessible, symbolic form is dealt with as it would be in its overt form, provided there were time for consideration of the alternatives in terms of the relevant stimuli. And there is no objection to the use of the descriptive terms purpose, freedom of the will, conscious voluntary action, choice, if here also it is made clear that the directive character of the symbolic, in relation to the overt, situation is merely a dealing with it in terms of our minor muscles (and their incipient attitudes) before we deal with it in terms of our major ones (whose action is always overt).

Purpose is not a transcendental, occult, or mystical factor, but merely the final overt act in its initial, incipient, phase in the minor muscles. By means of the symbol I am able to deal with aspects of the situation in a preliminary way, with the sub-vocal processes called thinking, before the demands of the overt situation become imperative. I pro-pono, put before myself, aspects of the situation, in terms of words, whether mumbled or fully articulated, which can be dealt with verbally as they never could be dealt with in the overt performance by the major muscles. Yet this preliminary symbolic performance of the act is perfectly continuous with its objective performance, its directive, purposive, or free-will character consisting in that control of the conditions of action made possible by facing the situation in terms of the secondary, before dealing with it in terms of primary behavior.

The truth is, in our scientific terminology we are gradually learning that the physical contains all the characters that in the ignorant past we have ascribed to a separate realm called the psychical; and it is this expansion of the content and meaning of the word "physical" which has refuted the alleged materialism of the physical sciences. There is no reason why the word "psychical" should not remain in our vocabulary if it is either technically defined as the function of certain minor muscles involved in our secondary behavior, or relegated, along with such terms as "sunrise" and "sunset" to the realm of poetry and legend. But in technical discussions it would seem preferable to use some such term as secondary versus primary, and incipient versus overt, behavior, since this avoids entirely any of the mystical and metaphysical implications in the past history of the term. It is quite relevant to insist that our human behavior is psychophysi-

cal, since in the normal individual there is always a certain amount of retrospective and anticipative response in terms of symbols. But to extend the psychophysical principle to pan-psychic dimensions appears to be unwarranted, since the secondary behavior is almost wholly lacking even in the highest of the sub-human mammals. And to identify the psychical with such terms as voluntary selection, free will, choice, purpose, teleology, and biological directiveness, without indicating its role in the reorganization of primary behavior through the use of the symbol in so-called thinking, is just a perpetuation of the traditional dualism that has corrupted our religion and our ethics (cf. p. 163). Of course, the whole of reality is a mystery: what it is, how it came into being, and the why of it all. But there is no reason for making a special mystery of the psychical any more than there would be for making a mystery of the emergence of water when H_2 and O get together.

The animal is alert, active, curious, aware, sensitive to its surroundings, but this is all primary behavior. It does not have the secondary behavior which has been called mind. It is not aware that it is aware. It senses its world, but it does not reflect upon the fact. It knows, but it does not know that it knows; it is scious, but not con-scious. One living cell divided into two or united with another cell, and the race began. Certain protein organizations developed chromosomes, genes, enzymes, hormones, and even manufactured vitamins in the digestive tract. In a world of spontaneous variations and random reactions anything could happen, and we are an example of what did happen. There is no scientific evidence that what happened was the result of a premeditated design. Adaptation of means and ends took place in the same fortuitous way that a spinning proton will enter the nucleus of an atom, turning it into an isotope, or a spinning neutron will throw off a revolving electron, thus altering its electrodynamic status. Stable genes gave continuity to evolution and relative fixity to genera and species. Unstable ones were responsible for the mutations, sports, variations, of evolution. That this instability of the genes probably goes back to the disintegration of the nucleus of the atom and quantum-jumps is suggested by the experimental production of new growth and mutations in plants and animals by artificial radiation in their germinal stages.

These invisible but demonstrable events are examples of what are called the directive forces in nature. But their directive character is no different from that of a meteor or a stroke of lightning. The so-called law of chance accounts for the facts of nature up to the point where human nature steps in to intentionally redirect its forces, and this is done by the operation of that secondary behavior called mental, whereby consequences are anticipated and modified symbolically before they are controlled and transformed overtly. There is purpose or directive principle in that part of nature which we call human nature. The alleged teleological adaptation of means to ends in sub-human nature is a result of the operation of the principle of random distribution which, among the infinity of the variations of nature's forces, does at times achieve what we regard as relevant results.

Whether it is a spinning proton, a revolving electron, a chemical catalyzer, a

pattern of genes, the whim of a "free moral agent," a spark of divinity, is still a mystery. In the absence of data as to the nature of the causal factor, science restricts its account to a description of how biological and psychological processes take place. In accordance with a field-theory concept, it is possible that the search for a cause is irrelevant, anyway, the activating principle consisting rather in the dynamic spread of a new arrangement of factors. Star-suns are turning into novae, cosmic rays penetrate our atmosphere, splitting atoms in the sun release the terrific energies of solar heat and light which, not only pour in upon our plant and animal life, but determine the electro-magnetic potentials of the stratosphere. Every twenty-two years our weather and our health are affected by the sun's flaming corona. Bacteria, animalcules, viruses, worms swarm in the warm moist layer of humus that rims our lithosphere. Fish populate the hydrosphere. Insects, birds, reptiles, mammals and man inhabit the atmosphere. The spores and pollen of plants and the spermatozoa of animals emanate everywhere. Nature is a vast chaos of over-production whose transient happy hits science calls a cosmos.

The biological directiveness of organisms is present in our secondary behavior just as it is in our primary, but in no different sense. What the activating principle or force is which has been called life, science does not know and does not undertake to state. Some day when we have worked out the formula for the artificial production of protoplasm, we may discover that the problem is merely one of chemical-physical synthesis, in which we shall have to widen the scope of these two sciences to include what today we vaguely call the vital or the organic. A so-called directive principle in organic evolution is merely the recognition that sequences are consecutive and, at times, culminate in results which, viewed from the consummative phase, appear purposive. But there is no reason for supposing that the determination of an effect by what we call a cause is predetermined. What has been called the psychical, down through the history of philosophical and psychological speculation, is merely hypostasizing a final effect as a "final cause." The mental emerges only, as Mead says, when the individual, in acting with reference to the environment, as part of that action, includes himself as an object (*Philosophy of the Act*, p. 367). There is no mystic force; there is merely a concurrent knowing which we call con-sciousness.

IV. ABSTRACTIONS

When the author states that the psychical and the physical are artificial abstractions, this is more relevant in the field of philosophy than of science. The average scientist ignores the psychical rather than deliberately abstracts from it. He is concerned primarily with those phases of reality which are subject to experimental tests and concerning which he can generalize observed uniformities as laws. Only for the scientific methodologist might it be true that the psychical and the physical are abstractions and he is concerned primarily with the concrete actuality from which the abstractions are made. The continuities, uniformities, and stabilities are abstracted from the deviations, variabilities, and the precarious aspects of experience (cf. pp. 118-119). Physical science concerns itself

with the first set of abstractions. Its generalizations in this field are all conditioned by the fact that it is dealing, not with experience as a whole, but with an abstracted aspect only. The truth of generalizations derived from such abstractions can only be determined by comparing them with complementary abstractions from the same concrete experience. If the complementary abstractions (in this case, the psychical) do not dovetail with those made by physical science, then both sets must be subjected to the methodological test of objective experimentation—that is, the abstractions (ideas) are put to the test of the concrete experience in its most objective form (the act).

If there is uniformity, continuity, and stability, it is because they are observed among the variabilities, instabilities, and discontinuities of nature. Lumping the variabilities and irregularities into the term "psychical" does not get rid of them, nor discredit them; it only classifies them. They are still attributes of the concrete whole from which the abstractions were made. The problem of a scientific methodology, therefore, is to seek for a synthesis of the facts which will account adequately for both abstracted aspects. This does not mean that one aspect is to be reduced to terms of the other, but that both are to be reinterpreted in terms of each other and in terms of the concrete whole from which the abstractions were made.

The author insists, in various passages (cf. pp. 93, 96) that the psychical and the physical are one in their action, and this is as it should be, for it implies that the difference between them is a functional, not an ontological one. When, through the use of the symbol, in terms of minor muscular coordinations, such as those of the articulomotor apparatus, I am able to experience vicariously in a tentative way an event which has not yet happened in an objective overt form, this preliminary rehearsal of the subsequent experience often leads to a modification of the fore-seen and anticipated event. There is here no distinction between two orders of reality. The only distinction is that between the operation of a primary and a secondary type of behavior. The interpolation of the experience of the event in terms of articulomotor substitutes (the symbol) before it is experienced in an objectively overt form, is merely the difference between a tentative attitude and a completed act, between a secondary, derivative, and anticipative foresight, and the final consummation. The effect of this fore-sight, which naturally would lead to fore-action, in changing the final outcome, may be called psychical, volitional, teleological, but these are just words describing the culmination of a tentative preparatory behavior in a conclusive consummative act.

There is no objection to the use of the traditional word, "psychical," to describe this functional difference, so long as it is recognized, like the "physical," as a merely descriptive term for a correlative set of phenomena. What we call the "physical", the overt objective outcome of an act, is a continuous series with its incipient beginnings in the minor musculatures of what we call thinking or symbolic activity. There is nothing miraculous about intentional, directional, teleological activity; or perhaps one should say, no more miraculous than all the other activities of nature—since the retrievable, anticipative effect of the

secondary upon the primary behavior takes place in accordance with all the known laws of what we call the physical. Scientists have to admit that in our unconscious abstractionism we have identified the physical with the uniform, whereas the fact is that the physical, in the ordinary scientific use of the term, is not an artificial counterpart of something called the psychical, but a comprehensive term descriptive of the cosmos or universe. Practically, the scientist does not begin with the physical as an abstraction, but as the concrete actuality which contains all the factors of what we call the real. Therefore, what in the past has been allocated to the psychical must henceforth find its place in the physical. And, as a fact, this is taking place. When deviations occur in the intra-atomic field, such terms as the quantum jump and the uncertainty principle are used. The term psychical is not used (cf. footnote 12, on p. 81).

The secondary behavior called psychical does not act independently of the stabilities already in existence. It merely selects among anticipated probable consequences certain ones toward which to move in accordance with natural laws. There is nothing supernatural about this selecting, any more than when hydrochloric acid in the stomach digests proteins. The secondary (psychical) is the primary (physical) at the juncture of reconversion; not a different entity, but merely a different phase of its continuity—a phasic difference, a functional difference, the difference between the overt and the incipient.

Out of what we call the physical emerged the psychical, or, more accurately, out of a pre-reflective unity there emerged a being capable of reflection—man—who distinguishes between the psychical and the physical. He reads back this distinction into the past of evolution and calls that evolution physical, whereas, as a fact, in man, both emerged from it. There is no more sense in calling external nature merely physical than in calling what we name the inwardness of man psychical. Both are abstractions. What we should do is to find their interconnections and stress them, or rather state them both in terms of some synthesis which will give them complementary meanings in a unitary system. The distinction of primary and secondary behavior does this.

In the case of the lower animals, they react to the stimulus without much hesitation or elaboration in the interval before the response. In the case of man, with his utilization of the significant symbol (the word) to stand for a remote or progressive stimulation and for a postponed response, he is able to anticipate the consequences of the response and modify, control, and redirect it in terms of the articulomotor mechanism of secondary behavior which has been built up within the primary. It is this secondary, implicit behavior of attitudes, this nascent, incipient, instead of overt, explicit act, that is responsible for that arresting, modification, postponing, selecting, control, and redirecting, known as conscious and voluntary action—the psychical.

The so-called inwardness of an organism is merely a matter of incipient, nascent, implicit, versus overt movements. There is no more mystery about inwardness than about outwardness. Both are "physical" in the physicist's sense, but the word must be widened to include these organic potentials. The physical is *dunamis* as well as *stasis*. Any physical complex of structure and energies may

have an inwardness, but this inwardness is not recognized as such unless there is a mechanism for communication between one center and another. This mechanism, from the point of view of the particular organism as a center, consists of speech; in relation to environing centers, we speak of society. What gives importance to this inwardness of the individual is his ability, by means of the significant symbol, to interpret a part of what goes on within his organism in terms of similar activities in other organisms. By intercommunication these organic centers become what we call selves.

The author says the living organism is the center of experience (p. 55). This means that a system of secondary behavior has been set up within the primary. Instead of being just a mechanism responding to stimulus, it is a mechanism modifying and selecting the stimulus, arresting and postponing the response, and setting up a reverberatory and an anticipatory tensional interaction between the two, in terms of anticipated consequences—this anticipation being made possible by the vicariating function of the significant symbol. (What makes the symbol significant is, of course, the meaning it acquires through the social process of communication. The organism, at least the human organism, is a bio-social entity.)

V. CONCRETE ACTUALITY

Let us approach the concrete actuality of the universe of which we are a part, as far as possible, without any of the traditional abstractions that ordinarily confuse and obstruct the first steps of a scientific methodology. Let us decline to be influenced by the Cartesian *res extensa* and *res cogitans* or by the dualism of an alleged psychical and physical, but just approach the actuality of our universe in its concrete inclusiveness of whatever characteristics we discover (cf. p. 53).

We begin by observing what we designate as relatively static and dynamic systems of activities, but soon discover that this difference is not what, on the surface, it appears to be, since continued investigation shows that even so-called stasis is but an equilibrium of forces, and that the most stable entity is a dynamic center of radiating energies. We observe a wave traveling in concentric rings when we throw a stone into the water. We see a vortex of dust traveling across the highway, a waterspout on the ocean, a cyclonic tornado sweeping across the country, a genus or species of animals dominating a phyletic era, a complex of genes constituting an individual organism which, because of certain characteristic traits, we call a person.

There has been no occasion so far for invoking any of the current abstractions which vitiate so much of our scientific and philosophical thinking. Just because an ecclesiastical and metaphysical dualism has shaped our thinking during the long period of our pre-scientific groping, is no reason why it should influence our scientific methodology today, except as a warning signal to keep clear of such artificial abstractions. Scientific methodology, of course, is a progressive series of abstractions, but these are consciously and deliberately made, for definite experimental purposes, not accepted uncritically from a mystical occultism and an ethico-religious folklore.

It follows, therefore, that such a dualism as that of mind and matter, or the psychical and the physical, in its traditional implications, is wholly irrelevant in scientific method. Whatever differences there are among the complicated dynamic systems which we discover in the concrete actuality of nature, will be explained in terms of the facts our experimental investigations disclose, not in terms of vague metaphysical and psychological categories coined under the influence of an Aristotelian metaphysics or an Augustinian theology.

Proceeding, therefore, in accordance with a disinterested, impartial scientific methodology, all the differences we discover in our concrete actual world, which we signify by such terms as mechanical, chemical, electrical, magnetic, organic, personal, social, are to be explained in terms of a common process and in terms of each other, not by leaps in the dark across metaphysical chasms so wide and so deep that one only lands in a bottomless abyss.

Consider the phenomenon in the organic, personal, social part of our concrete actual universe which we call directional or purposive. We do not have to resort to philosophical folklore to explain it. At the risk of some repetition, let us analyze once more in terms of a behavior psychology what we mean by purpose. Purposive behavior is anticipative behavior, and anticipative behavior is made possible by means of the symbol, an image of some sort, by which the overt end-result is represented in the tentative attitudes of the sub-vocal symbolizing process. Purpose involves the retrievable rehearsal of an overt act before it is performed. Nothing psychical about it any more than when I hesitate, in delivering a tennis-ball, to adjust my racquet to make the delivery effective.

When our animal ancestor began to use his gestures, grunts, and grimaces, to stand for objects, acts, or situations, so that he might, in terms of these symbols rehearse a deed before it is done, he was engaged in what a mentalistic psychology would call a voluntary or purposive procedure, culminating in an act of volition, choice, and free-will decision. But the truth is, the only difference between such a preliminary performance and the final one, is the fact of the use of certain accessory muscles (of gesture or vocalization) in the earlier stages of a process which finally culminates in the employment of the grosser musculatures involved in the final act.

There is no intervention at any point in this process, of anything called the psychical, unless that word is used to describe merely the difference between secondary and primary behavior—tentative, incipient, nascent (and, in the case of symbols, vicarious) stages of the same process which in the final stages we call the physical act. Of course, it is quite legitimate to use a different term to describe a distinct stage of a process, and if this is all that the term "psychical" signifies, there is no metaphysical problem involved, since minor or accessory muscles operate in accordance with the same physico-chemical principles as the major or fundamental ones. There is no metaphysical chasm between preparatory and consummative behavior. We simply haven't developed an adequate nomenclature for our intelligent acts, and so we fall back upon the mystical folklore words of a pre-scientific age. When my behavior is perseverative and anticipative, this is no more of a mystery than when a piece of iron changes its

temper and perhaps becomes magnetized when it is subjected to continuous impact. We do not need to turn to the words "psychical" and "spiritual" when some new marvel of nature appears. Everyday science is disclosing new wonders in what we call the physical world. The more we learn about what we call the material world, the less necessity is there for having recourse to these ancient terms, for matter itself turns out to be energy, and energy has the dynamic qualities which, in the past, have been attributed to mind and the psychical.

I am engaged in doing something, let us say, planting my garden. As I go about the digging, raking, and marking off the furrows for the seed, I go over "in my mind" (as it is usually phrased) the seeds I intend to plant. I find myself repeating the words ("mentally", i.e., in terms of sub-vocal speech) which stand for the seeds: lettuce, beets, carrots, turnips, parsley, onions, etc. Translating this into behaviorist terms, what I am doing is using the minor musculatures of sub-vocal speech to initiate an orderly series of activities, first in terms of these tentative attitudes of the minor muscles which stand for overt activities to be performed later (and are therefore called symbols), and then, secondly, the consummation of this preparatory behavior in terms of the performance of the actual planting of the seeds by the major muscles of locomotion and manipulation, called gardening.

The earlier stage of this behavior (called the purpose, intent, or volition), from the standpoint of a scientific psychology, is no different in character from the final overt performance. Both are muscular activities expressing the hereditary trends and the acquired drives of the organism, the difference being merely that the one is tentative, anticipatory, and, since it results in a modification of the overt performance, is called directive, while the other is the same activity in its culminating or consummative phase. I start to do something, and, in the initial phases of the doing (which takes place in the optico- and articulo-motor stages), as its various phases unfold in terms of symbols, by analysis and synthesis I arrive at a conclusive activity which adequately deals with the situation. The fact that the activity of the minor muscles (involving symbols) leads to a definite selection of alternatives in the conclusive act merely means that in the preliminary activity of the minor muscles a wider field of facts comes under survey, with the result that the conclusive act is the effect of a wider range of selection than would be the case if this preliminary verbal symbolic stage had not intervened.

All this is merely an attempt to state the situation in terms of primary and secondary behavior without resorting to the traditional psychical and teleological categories of consciousness, attention, intent, purpose, choice, volition, free-will, which usually presuppose what is called a mental or subjective realm of being. The symbol, the word, in this instance, is the present substitute for the anticipated overt act; it is a tentative attitude or twitching of a minor muscle which stands for the as yet unfulfilled performance by the major muscles. It is therefore a preliminary antecedent stage of a process which naturally will undergo modification if it is not foreseen as leading successfully to the final act.

I catch my foot in the railroad track and behold a train arriving in the distance. Certain opticomotor attitudes (we call them images) which have to do with the shoe and my pocket-knife, evoke certain manual motor attitudes which are envisaged as cutting the leather of the shoe so as to release the foot. Here, again, is prevision of the consequences, purpose, intent, and anticipatory alteration of those consequences as the (secondary) behavior of purpose, determination, decision, passes over into the (primary) act of cutting and releasing the foot.

The only difference between this and the instance in which I find my dog has caught his foot in a trap set for coyotes, is that the dog, because he has no equipment of secondary behavior, employs only primary behavior in his wild efforts to free himself, whereas I, a human being, equipped with the elaborate accumulation of symbols, and some experience in the use of tools, am able to see the situation in terms of other situations, which in turn leads to the use of methods employed in previous situations, to deal with this one. If there is a jump from the physical world of constants, invariables, and interconvertibility of energy, to a world of immediate, intentional redirection of that energy, it is psychical only in the sense of the employment of a system of latent attitudes (expressed by the symbols) to guide and control the overt action of an emergency situation.

What the whole situation of the psychical and the physical demands, therefore, is a reconstruction of the methodology of the mechanical or inorganic sciences so as to incorporate the new factors which are emerging, not only in biology, psychology, and sociology, but in electronics, radionics, and intra-atomic physics. The attempt to fit together the two distorted abstractions, which have come down to us from a mystical and metaphysical past, is no solution of the problem. Whitehead comes nearer to a true solution in his demand that nature be conceived biologically as well as physico-chemically. And, with the advance of the psychological and sociological sciences, probably a similar demand will be made to further widen, deepen, and enrich the concrete natural actuality which is the subject-matter (object-matter) with which science deals.

Escondido, Calif.