CHAPTER II

THE EXISTENTIAL MATRIX OF INQUIRY: BIOLOGICAL

THIS CHAPTER and the following one are occupied with development of the statement that logic is naturalistic. The present chapter is concerned with the biological natural foundations of inquiry. It is obvious without argument that when men inquire they employ their eyes and ears, their hands and their brains. These organs, sensory, motor or central, are biological. Hence, although biological operations and structures are not sufficient conditions of inquiry, they are necessary conditions. The fact that inquiry involves the use of biological factors is usually supposed to pose a special metaphysical or epistomological problem, that of the mind-body relation. When thus shunted off into a special domain, its import for logical theory is ignored. When, however, biological functions are recognized to be indispensable constituents of inquiry, logic does not need to get enmeshed in the intricacies of different theories regarding the relations of mind and body. It suffices to accept the undeniable fact that they are necessary factors in inquiry, and then consider how they operate in its conduct. The purpose of the following discussion is to show that biological functions and structures prepare the way for deliberate inquiry and how they foreshadow its pattern.

The primary postulate of a naturalistic theory of logic is continuity of the lower (less complex) and the higher (more complex) activities and forms. The idea of continuity is not self-explanatory. But its meaning excludes complete rupture on one side and mere repetition of identities on the other; it precludes reduction of the "higher" to the "lower" just as it precludes complete breaks and gaps. The growth and development of any living organism from seed to maturity illustrates the meaning of continuity. The method by which development takes place is some-

thing to be determined by a study of what actually occurs. It is not to be determined by prior conceptual constructions, even though such constructions may be helpful as hypotheses when they are used to direct observation and experimentation.

We cannot, for example, say in advance that development proceeds by minute increments or by abrupt mutations; that it proceeds from the part to the whole by means of compounding of elements, or that it proceeds by differentiation of gross wholes into definite related parts. None of these possibilities are excluded as *hypotheses* to be tested by the results of investigation. What *is* excluded by the postulate of continuity is the appearance upon the scene of a totally new outside force as a cause of changes that occur. Perhaps from mutations that are due to some form of radio-activity a strikingly new form emerges. But radio-activity is not invented *ad hoc* and introduced from without in order to account for such transformation. It is first known to exist in nature, and then, if this particular theory of the origin of mutations is confirmed, is found actually to occur in biological phenomena and to be operative among them in observable and describable fashion. On the other hand, should the conclusion of scientific investigation be that development proceeds by minute increments, no amount of addition of such increments will constitute *development* save when their cumulative effect generates something new and different.

The application of the postulate of continuity to discussion of logical subject-matter means, therefore, negatively, that in order to account for the distinctive, and unique, characters of logical subject-matter we shall not suddenly evoke a new power or faculty like Reason or Pure Intuition. Positively and concretely, it means that a reasonable account shall be given of the ways in which it is possible for the traits that differentiate deliberate inquiry to develop out of biological activities not marked by those traits. It is possible, of course, to deal with what was called proximate logical subject-matter without raising this question. But it is cause for surprise that writers who energetically reject the intervention of the supernatural or the non-natural in every other scientific field feel no hesitancy in invoking Reason and *a priori* Intuition in the domain of logical theory. It would seem to be more incumbent

upon logicians than upon others to make their position in logic coherent with their beliefs about other matters.

If one denies the supernatural, then one has the intellectual responsibility of indicating how the logical may be connected with the biological in a process of continuous development. This point deserves emphasis, for if the following discussion fails to fulfil the task of pointing out satisfactorily the continuous path, then that failure becomes, for those who accept the naturalistic postulate, but a challenge to perform the task better.

Whatever else organic life is or is not, it is a process of activity that involves an environment. It is a transaction extending beyond the spatial limits of the organism. An organism does not live *in* an environment; it lives by means of an environment. Breathing, the ingestion of food, the ejection of waste products, are cases of *direct* integration; the circulation of the blood and the energizing of the nervous system are relatively *indirect.* But every organic function is an interaction of intra-organic and extra-organic energies, either directly or indirectly. For life involves expenditure of energy and the energy expended can be replenished only as the activities performed succeed in making return drafts upon the environment—the only source of restoration of energy. Not even a hibernating animal can live indefinitely upon itself. The energy that is drawn is not forced in from without; it is a consequence of energy expended. If there is a surplus balance, growth occurs. If there is a deficit balance, degeneration commences. There are things in the world that are indifferent to the life-activities of an organism. But they are not parts of *its* environment, save potentially. The processes of living are enacted by the environment as truly as by the organism; for they *are* an integration.

It follows that with every differentiation of structure the environment expands. For a new organ provides a new way of interacting in which things in the world that were previously indifferent enter into life-functions. The environment of an animal that is locomotor differs from that of a sessile plant; that of a jelly fish differs from that of a trout, and the environment of any fish differs from that of a bird. So, to repeat what was just said, the difference is not just that a fish lives *in* the water and a bird *in*

the air, but that the characteristic functions of these animals are what they are because of the special way in which water and air enter into their respective activities.

With differentiation of interactions comes the need of maintaining a balance among them; or, in objective terms, a unified environment. The balance has to be maintained by a mechanism that responds both to variations that occur within the organism and in surroundings. For example, such an apparently self-contained function as that of respiration is kept constant by means of active exchanges between the alkaline and carbon dioxide contents of changing pressures exerted by the blood and the carbon dioxide in the lungs. The lungs in turn are dependent upon interactions effected by kidneys and liver, which effect the interactions of the circulating blood with materials of the digestive tract. This whole system of accurately timed interchanges is regulated by changes in the nervous system.

The effect of this delicate and complex system of internal changes is the maintenance of a fairly uniform integration with the environment, or—what amounts to the same thing—a fairly unified environment. The interactions of inanimate things with their surroundings are not such as to maintain a stable relation between the things involved. The blow of a hammer, for example, breaks a stone into bits. But as long as life normally continues, the interactions to which organic and environmental energies enter are such as to maintain the conditions in both of them needed for later interactions. The processes, in other words, are self-maintaining, in a sense in which they are not in the case of the interactions of non-living things.

Capacity for maintenance of a constant form of interaction between organism and environment is not confined to the individual organism. It is manifested also, in the reproduction of similar organisms. The stone is presumably indifferent as to how it reacts mechanically and chemically (within the limits of its potentialities) to other things. The stone may lose its individuality but basic mechanical and chemical processes go on uninterruptedly. As long as life continues, its processes are such as continuously to maintain and restore the enduring relationship which is characteristic of the life-activities of a given organism.

Each particular activity prepares the way for the activity that follows. These form not a mere succession but a series. This seriated quality of life activities is effected through the delicate balance of the complex factors in each particular activity. When the balance within a given activity is disturbed—when there is a proportionate excess or deficit in some factor—then there is exhibited need, search and fulfilment (or satisfaction) in the objective meaning of those terms. The greater the differentiation of structures and their corresponding activities becomes, the more difficult it is to keep the balance. Indeed, living may be regarded as a continual rhythm of disequilibrations and recoveries of equilibrium. The "higher" the organism, the more serious become the disturbances and the more energetic (and often more prolonged) are the efforts necessary for its reestablishment. The state of disturbed equilibration constitutes *need*. The movement towards its restoration is search and exploration. The recovery is fulfilment or satisfaction.

Hunger, for example, is a manifestation of a state of imbalance between organic and environmental factors in that integration which is life. This disturbance is a consequence of lack of full responsive adaptation to one another of various organic functions. The function of digestion fails to meet the demands made upon it directly by the circulatory system which carries replenishing nutritive material to all the organs concerned in the performance of other functions, and the demands indirectly made by motor activities. A state of tension is set up which is an actual state (not mere feeling) of organic uneasiness and restlessness. This state of tension (which defines need) passes into search for material that will restore the condition of balance. In the lower organisms it is expressed in the bulgings and retractions of parts of the organism's periphery so that nutritive material is ingested. The matter ingested initiates activities throughout the rest of the animal that lead to a restoration of balance, which, as the outcome of the state of previous tension, is fulfilment.

Rignano, in an instructive discussion of the biological basis of thinking, says that every organism strives to stay in a stationary state. He gives evidence from the activity of lower organisms which shows that activities occurring when their state is disturbed

are such as tend to restore the former stationary condition.[1] He also states that "a prior physiological state cannot be perfectly re-established and made to persist in normal activity until an animal by its movements has succeeded in getting again into an environment identical with its old one." His position may be interpreted so that what is said in this text is in agreement with it. But as his treatment stands, it emphasizes *restoration* of the previous *state* of the *organism* rather than the institution of an integrated *relation.* The establishment of the latter relation is compatible with definite changes in both the organism and the environment; it does not require that old and new states of either the organism or the environments be identical with one another. Hence the difference in the two views is of considerable theoretical importance.

If we take as an example the search for food found in connection with the higher organisms, it appears clear that the very search often leads the organism into an environment that differs from the old one, and that the appropriation of food under new conditions involves a modified state of the organism. The *form* of the relationship, of the interaction, is reinstated, not the identical conditions. Unless this fact is recognized, development becomes abnormal or at least unusual matter rather than a normal feature of life activities. Need remains a constant factor but it changes its quality. With change in need comes a change in exploratory and searching activities; and that change is followed by a changed fulfilment or satisfaction. The conservative tendency is doubtless strong; there is a tendency to get *back.* But in at least the more complex organisms, the activity of search involves modification of the old environment, if only by a change in the connection of the organism with it. Ability to make and retain a changed mode of adaptation in response to new conditions is the source of that more extensive development called organic evolution. Of human organisms it is especially true that activities carried on for satisfying needs so change the environment that new needs arise which demand still further change in the activities of the organism by which they are satisfied; and so on in a potentially endless chain.

In the lower organisms, interaction between organic and en-

[1] *The Psychology of Reasoning,* English translation, p. 6, p. 11 and p. 31.

viron-energies takes place for the most part through direct contact. The tension in the organism is that between its surface and its interior. In the organisms that have distance receptors and special organs of locomotion, the serial nature of life behavior demands that earlier acts in the series be such as to prepare the way for the later. The time between the occurrence of need and the occurrence of its satisfaction inevitably becomes longer when the interaction is not one of direct contact. For the attainment of an integral relation is then dependent upon establishing connections with the things at a distance which arouse exploratory activity through stimulation of eye and ear. A definite order of initial, of intermediate, and of final or closing activities, is thus instituted. The terminus *ab quo* is fixed by such a condition of imbalance in the organism that integration of organic factors cannot be attained by any material with which the organism is in direct contact. Certain of its activities tend in one direction; others move in a different direction. More particularly, its existing contact-activities and those aroused by its distance-receptors, are at odds with each other, and the outcome of this tension is that the latter activities dominate. A satiated animal is not stirred by the sight or smell of the prey that moves him when he is hungry. In the hungry creature activities of search become a definite intervening or intermediate series. At each intermediate stage there is still tension between contact activities and those responsive to stimuli through distance-receptors. Movement continues until integration is established between contact and visual and motor activities, as in the consummatory act of devouring food.

What has been said describes a difference between modes of environing-organical interactions to which the names excitation-reaction and stimulus-response may be applied. An animal at rest is moved to sniff, say, by a sensory excitation. If this special relation is isolated and complete in itself, or is taken to be such, there is simply excitation-reaction, as when a person jumps but does nothing else when he hears a sudden noise. The excitation is specific and so is the reaction. Now suppose an excitation comes from a remote object through a distance-receptor, as, the eye. There is also excitation-reaction. But if the animal is aroused to an act of pursuit the situation is quite different. The particular

sensory excitation occurs, but it is coordinated with a larger number of other organic processes—those of its digestive and circulatory organs and its neuro-muscular system, autonomic, proprioceptor and central. This coordination, which is a state of the total organism, constitutes a *stimulus*. The difference between this condition (whatever name it be called by) and a specific sensory excitation, is enormous. The pursuit of prey is a response to the total state of the organism, not to a particular sensory excitation. Indeed, the distinction between what has been called stimulus and response is made only by analytic reflection. The so-called stimulus, being the total state of the organism, moves of itself, because of the tensions contained, into those activities of pursuit which are called the response. The stimulus is simply the earlier part of the total coordinated serial behavior and the response the later part.

The principle involved in the distinction just drawn is more important than it may seem to be at first sight. If it is ignored, the sequential character of behavior is lost from view. Behavior then becomes simply a succession of isolated and independent units of excitation-reaction, which would be comparable, say, to a succession of muscular twitches due to a disordered nervous mechanism. When the stimulus is recognized to be the tension in the total organic activity (ultimately reducible to that between contact activities and those occasioned through distance-receptors), it is seen that the stimulus in its *relationship* to special activities persists throughout the entire pursuit, although it changes its actual content at each stage of the chase. As the animal runs, specific sensory excitations, those of contact and those that are olfactory and visual, alter with every change of position; with every change in the character of the ground; with changing objects (like bushes and rocks) that progressively intervene; and they also change in intensity with every change in distance from the hunted object.

The changing excitations are, however, integrated into a single stimulus by the total state of the organism. The theory that identifies stimuli with a succession of specific sensory excitations, cannot possibly account for such unified and continuous responses as hunting and stalking prey. On that theory the animal would have to make at each stage a new and isolated "response" (reaction) to everything that came across his path. He would be re-

acting to stones, bushes and to changes in the levels and character of the ground in so many independent acts that there would be no continuity of behavior. He would forget, as we say, what he was after in the multitude of separate reactions he would have to make to independent excitations. Because behavior is in fact a function of the total state of the organism in relation to environment, stimuli are functionally constant in spite of changes in specific content. Because of this fact, behavior is sequential, one act growing out of another and leading cumulatively to a further act until the consummatory fully integrated activity occurs.

Because organic behavior is what it is, and not a succession and compounding of independent discrete reflex-arc units, it has direction and cumulative force. There are special acts, like winking or the knee-jerk, that exemplify the isolated reflex-arc that is sometimes supposed to be the unit which, through compounding, constitutes behavior. But there is no evidence that such acts have played any role in development. On the contrary, the available evidence shows that they are end-points of highly specialized lines of development, or else are coincident by-products of the behavior of structures that have arisen developmentally.

What exists in normal behavior-development is thus a circuit of which the earlier or "open" phase is the tension of various elements of organic energy, while the final and "closed" phase is the institution of integrated interaction of organism and environment. This integration is represented upon the organic side by equilibration of organic energies, and upon the environmental side by the existence of satisfying conditions. In the behavior of higher organisms, the close of the circuit is not identical with the state out of which disequilibration and tension emerged. A certain modification of environment has also occurred, though it may be only a change in the conditions which future behavior must meet. On the other hand, there is change in the organic structures that conditions further behavior. This modification constitutes what is termed habit.

Habits are the basis of organic learning. According to the theory of independent successive units of excitation-reaction, habit-formation can mean only the increasing fixation of certain ways

of behavior through repetition, and an attendant weakening of other behavioral activities.[2]

Developmental behavior shows, on the other hand, that in the higher organisms excitations are so diffusely linked with reactions that the sequel is affected by the state of the organism in relation to environment. In habit and learning the linkage is tightened up not by sheer repetition but by the institution of effective integrated interaction of organic-environing energies—the consummatory close of activities of exploration and search. In organisms of the higher order, the special and more definite pattern of recurrent behavior thus formed does not become completely rigid. It enters as a factorial agency, along with other patterns, in a total adaptive response, and hence retains a certain amount of flexible capacity to undergo further modifications as the organism meets new environing conditions.

There is, for example, reciprocal excitation between hand and eye activity; a movement of the hand is aroused by visual activity, then the movement of the hand is followed by a change in visual activity, and so on. Here is a definite recurring pattern of action. If the hand never did but one thing, say reach, then this habit-pattern might become rigidly set. But the hand also grabs, pushes, draws and manipulates. Visual behavior has to be responsive to the performance of a great variety of manual activities. It thus maintains flexibility and readaptability; the connection between hand and eye does not become a rigid bond.

The view that habits are formed by sheer repetition puts the cart before the horse. Ability to repeat is a result of a formation of a habit through the organic redispositions effected by attainment of a consummatory close. This modification is equivalent to giving some definite direction of future actions. As far as environing conditions remain much the same, the resulting act will look like a repetition of a previously performed act. But even then repetition will not be exact as far as conditions differ. Sheer repetition

[2] The effect of terminal success or consummatory satisfaction in determining habit has always been a stumbling-block to those who hold that there are elementary excitation-reaction "bonds." But this effect is just what should be expected on the ground of the view expounded in the text, since it is an expression of the fact that the stimulus-response relation is a function of the state of the organism as a whole.

is, in the case of the human organism, the product of conditions that are uniform because they have been made so mechanically—as in much school and factory "work." Such habits are limited in their manifestation to the rather artificial conditions in which they operate. They certainly do not provide the model upon which a theory of habit formation and operation should be framed.

From the foregoing considerations certain general conclusions follow as to the nature of the pattern of inquiry as a development out of certain aspects of the pattern of life-activities.[3]

1. Environmental conditions and energies are inherent in inquiry as a special mode of organic behavior. Any account of inquiry that supposes the factors involved in it, say, doubt, belief, observed qualities and ideas, to be referable to an isolated organism (subject, self, mind) is bound to destroy all ties between inquiry as reflective thought and as scientific method. Such isolation logically entails a view of inquiry which renders absurd the idea that there is a necessary connection between inquiry and logical theory. But the absurdity rests upon the acceptance of an unexamined premise which is the product of a local "subjectivistic" phase of European philosophy. If what is designated by such terms as doubt, belief, idea, conception, is to have any objective meaning, to say nothing of public verifiability, it must be located and described as behavior in which organism and environment act together, or *inter*-act.

The earlier discussion set out with the familiar common sense distinction of organism and environment, and went on to speak of their interaction. Unfortunately, however, a special philosophical interpretation may be unconsciously read into the common sense distinction. It will then be supposed that organism and environment are "given" as independent things and interaction is a third independent thing which finally intervenes. In fact, the distinction is a practical and temporal one, arising out of the state of tension in which the organism at a given time, in a given phase of life-activity, is set over against the environment as it then and there exists. There is, of course, a natural world that exists independently of the organism, but this world is *environment* only as it enters directly and indirectly into life-functions. The organism is

[3] The more specific points of connection are taken up in Ch. VI.

itself a part of the larger natural world and exists as organism only in active connections with its environment.

Integration is more fundamental than is the distinction designated by interaction of organism *and* environment. The latter is indicative of a partial disintegration of a prior integration, but one which is of such a dynamic nature that it moves (as long as life continues) toward redintegration.

2. The structure and course of life-behavior has a definite pattern, spatial and temporal. This pattern definitely foreshadows the general pattern of inquiry. For inquiry grows out of an earlier state of settled adjustment, which, because of disturbance, is indeterminate or problematic (corresponding to the first phase of tensional activity), and then passes into inquiry proper, (corresponding to the searching and exploring activities of an organism); when the search is successful, belief or assertion is the counterpart, upon this level, of redintegration upon the organic level.

A detailed account of the pattern of inquiry is given in Chapter VI. But the following considerations flow so directly from the pattern of life-behavior that they should be noted here:

a. There is no inquiry that does not involve the making of *some* change in environing conditions. This fact is exemplified in the indispensable place of experiment in inquiry, since experimentation is deliberate modification of prior conditions. Even in the prescientific stage, an individual moves head, eyes, often the entire body, in order to determine the conditions to be taken account of in forming a judgment; such movements effect a change in environmental relations. Active pressure by touch, the acts of pushing, pulling, pounding and manipulating to find out what things "are like" is an even more overt approach to scientific experimentation.

b. The pattern is serial or sequential. It has already been noted that this trait of life-behavior becomes more marked with the emergence of distance-receptors and of the neural apparatus necessary for coordinating their excitation with contact-receptors and with the muscular, circulatory and respiratory mechanisms which are involved in behavior. In the human organism, organic retention (or habit-patterns) give rise to recollection. Goals or consequences that are even more remote in time and space are then set

up and the intervening process of search becomes more seriated in temporal span and in connecting links than in the case of the simple presence of distance-stimuli. Formation of an end-in-view, or consequence to be brought about, is conditioned by recollection; it requires making plans in conjunction with selection and ordering of the consecutive means by which the plan may become an actuality.

c. The serially connected processes and operations by means of which a consummatory close is brought into being are, by description, intermediate and instrumental. This distinctive characteristic prefigures, on the biological level, the interpretation that must be given, upon the level of inquiry, to operations of inference and discourse in their relation to final judgment as the consummation of inquiry.

d. The basic importance of the serial relation in logic is rooted in the conditions of life itself. Modification of both organic and environmental energies is involved in life-activity. This organic fact foreshadows learning and discovery, with the consequent outgrowth of new needs and new problematic situations. Inquiry, in settling the disturbed relation of organism-environment (which defines doubt) does not merely remove doubt by recurrence to a prior adaptive integration. It institutes new environing conditions that occasion new problems. What the organism learns during this process produces new powers that make new demands upon the environment. In short, as special problems are resolved, new ones tend to emerge. There is no such thing as a final settlement, because every settlement introduces the conditions of some degree of a new unsettling. In the stage of development marked by the emergence of science, deliberate institution of problems becomes an objective of inquiry. Philosophy, in case it has not lost touch with science, may play an important role in determining formulation of these problems and in suggesting hypothetical solutions. But the moment philosophy supposes it can find a final and comprehensive solution, it ceases to be inquiry and becomes either apologetics or propaganda.

e. From the postulate of naturalistic continuity, with its prime corollary that inquiry is a development out of organic-environmental integration and interaction, something follows regarding

the relation of psychology and logic. The negative side of this conclusion has already been suggested. The assumptions of "mentalistic" psychology have no place in logical theory. The divorce between logic and scientific methodology, discussed in the previous chapter, has its basis largely in the belief that since inquiry involves doubt, suggestion, observation, conjecture, sagacious discernment, etc., and since it is assumed that all these things are "mentalistic," there is a gulf between inquiry (or reflective thinking) and logic. Given the assumption, the conclusion is just. But the recognition of the natural continuity of inquiry with organic behavior—the fact that it is a developed mode of such behavior—destroys the assumption. The student of intellectual history is aware of how the new scientific standpoint of the sixteenth and seventeenth centuries succeeded in setting up a gulf between the mental and the physical. The former was supposed to constitute a domain of existence of psychical "stuff" marked by processes totally unlike those of the external world which confronted "mind." The older Greek conception that the difference was one in the type of *organization* of common materials and processes, was lost from view. Psychology and epistemology accepted complete dualism, the "bifurcation" of nature, and the theory of thought and ideas was wrought into conformity with the dualistic assumption.

On the positive side, psychology is itself a special branch of inquiry. In general, it bears the same relation to the theory of logical inquiry that is sustained by physics or chemistry. But as it is more directly concerned with the focal center of initiation and execution of inquiry than are these other sciences, it may, if employed as servant and not as master of logic, make a contribution to logical theory which they cannot make. Personally, as has just been said, I doubt the existence of anything "mental" in the doctrinal sense alleged. But it is not necessary to go into that question, for, as was stated, if there is anything of this kind it is irrelevant to the theory of inquiry. Moreover, any investigation into it must itself be an inquiry that satisfies the logical conditions of all inquiry. Nevertheless, whatever throws any light upon the organic conditions and processes that are involved in the occurrence and conduct of inquiry (as a sound biological psychology cannot fail to do) can

hardly fail to make valuable contributions to the results of inquiry into inquiry.

The points that have been made may be gathered together by consideration of the current meaning of "experience," especially in connection with the intensified ambiguity, due to historical changes, that is attached to "empirical." Experience has a favorable or honorific use, as when it is said that a certain conclusion or theory is experientially verified, and is thereby marked off from a wild fancy, a happy guess and from a *merely* theoretical construction. On the other hand, because of the influence of psychological epistemology of a subjective, private type, "experience" has been limited to conscious states and processes. The contrast of the two meanings is radical. When it is said that certain conclusions are experientially or empirically confirmed, a scientist means anything but that they rest upon mental and personal states of mind. Again, the word "empirical" is often set in opposition to the *rational*, and this opposition adds to the confusion. The early meaning of "empirical" limited the application of the word to conclusions that rest upon an accumulation of past experiences to exclusion of insight into principles.

Thus a medical practitioner may have skill in recognizing the symptoms of disease and skill in their treatment because of repeated past observations and customary modes of treatment, without understanding the etiology of disease and the reasons for the kind of treatment employed. The same thing holds of the skills of many mechanics and artisans. "Empirical" in this sense describes an actual fact and is justly distinguished from "rational" activity, meaning, by that word, conduct grounded in understanding of principles. But it is evident that when a scientific conclusion is said to be empirically established, no such exclusion of rationality or reasoning is intended or involved. On the contrary, every conclusion scientifically reached as to matters of fact involves reasoning with and from principles, usually mathematically expressed. To say, then, that it is empirically established is to say the opposite of what is said when "empirical" means only observations and habitual response to what is observed. The conversion of a justifiable distinction between empirical as defined in terms of the knowledge and action of artisans and rational as defined in terms

of scientific understanding, into something absolute which sets every mode of experience in opposition to reason and the rational, depends accordingly, upon an arbitrary preconception as to what experience and its limits *must* be. Unfortunately, this arbitrary limitation still operates, as in many interpretations of the distinction between, say, temporal and eternal objects, perception and conception, and, more generally, matter and form.

It may be added that the honorific use of "experience" when it first appeared was undoubtedly overweighted upon the side of observation, as in the case of Bacon and Locke. This overweight is readily accounted for as a historic occurrence. For the classic tradition had degenerated into a form in which it was supposed that beliefs about matters of fact could and should be reached by reasoning alone; save as they were established by authority. Opposition to this extreme view evoked an equally one-sided notion that mere sense-perception could satisfactorily determine beliefs about matters of fact. It led in Bacon, as later in Mill, to a neglect of the role of mathematics in scientific inquiry, and in Locke to a pretty sharp division between knowledge of matters of fact and of relations between ideas. The latter, moreover, rested finally according to him upon sheer observation, "internal" or "external." The final outcome was a doctrine that reduced "experience" to "sensations" as the constituents of all observation, and "thought" to external associations among these elements, both sensations and associations being supposed to be merely mental or psychical.

The problem of the relation between material that is observed and subject-matter that is conceived or thought of is a real one, especially in respect to its logical equivalents. But the solution of the problem should not be compromised at the outset by a statement of it in terms of a fixed and absolute distinction between the experiential and the rational. Such a statement implies that there is no logical problem, but a separation absolutely and immediately given. Justification cannot be given at this stage of the discussion for the belief that, in a proper conception of experience, inference, reasoning and conceptual structures are as experiential as is observation, and that the fixed separation between the former and the latter has no warrant beyond an episode in the history of culture. Upon the basis of the naturalistic position here taken, there is a

problem, which takes the following form: How does it come about that the development of organic behavior into controlled inquiry brings about the differentiation and cooperation of observational and conceptual operations?

The discussion of language and linguistic symbols in the following chapter lays the basis for an answer. But it must be repeated that adherence to a tradition that was formed before modern scientific inquiry (including the biological) had arisen or been subjected to independent analysis, should not be permitted to convert a problem that holds for all schools alike, into an alleged ready-made solution. For such a solution prevents the problem from being seen as a problem. Finally, while the position here taken implies that logic is empirical in that its subject-matter consists of inquiries that are publicly accessible and open to observation, it is not empirical in the sense in which Mill, for example, developed the ideas of Locke and Hume. It is experiential in the same way in which the subject-matter and conclusions of any natural science are empirical: experiential in the way any natural science is experiential, that is, as distinct from the merely speculative and from the *a priori* and intuitional.

I close with a reference to a predicament in which both organic behavior and deliberate inquiry are caught. There always exists a discrepancy between means that are employed and consequences that ensue; sometimes this discrepancy is so serious that its result is what we call mistake and error. The discrepancy exists because the means used, the organs and habits of biological behavior and the organs and conceptions employed in deliberate inquiry, must be present and actual, while consequences to be attained are future. Present actual means are the result of past conditions and past activities. They operate successfully, or "rightly," in (1) the degree in which existing environing conditions are very similar to those which contributed in the past to formation of the habits, and (2) in the degree in which habits retain enough flexibility to readapt themselves easily to new conditions. The latter condition is not readily fulfilled by lower organisms; when it is fulfilled a case of "evolution" occurs. The potential conditions for its fulfilment are present in the activities of human beings in much larger measure. But the inertial phase of habit is strong, and,

so far as it is yielded to, human beings continue to live upon a relatively animal plane. Even the history of science has been marked by epochs in which observation and reflection have operated only within a predetermined conceptual framework—an example of the inertia-phase of habit. That the only way to avoid and avert the mistakes of this fixation is by recognition of the provisional and conditional nature (as respects any inquiry in process) of the facts that enter into it, and the hypothetical nature of the conceptions and theories employed, is a relatively late discovery. The meaning of the discovery has hardly penetrated yet into inquiry about the subjects of the greatest practical importance to man, religion, politics and morals.

The recognition of what Peirce called "fallibilism" in distinction from "infallibilism" is something more than a prudential maxim. It results of necessity from the possibility and probability of a discrepancy between means available for use and consequences that follow: between past and future conditions, not from mere weakness of mortal powers. Because we live in a world in process, the future, although continuous with the past, is not its bare repetition. The principle applies with peculiar force to inquiry about inquiry, including, needless to say, the inquiry presented in this treatise. The very words which must be used are words that have had their meanings fixed in the past to express ideas that are unlike those which they must now convey if they are to express what is intended. To those who are naturalistically inclined, the attendant "fallibility" will be but a spur to do better the work which this volume attempts to do. The present volume is an approach not a closed treatise. The aim it hopes to fulfil is that of being a sufficiently coherent and systematic approach to move others to undertake the long cooperative work (never-ending in any case as long as inquiry continues) needed to test and fill in the framework which is outlined in this book.

The important matter is that those who reject the doctrine of the intervention of some supernatural agency should not be led, by the fact that it is not customary to introduce biological considerations into the discussion of logical theory, to dismiss the chapter as irrelevant. Those who believe in such intervention have ground for belief in an *a priori* Reason upon which logical forms and prin-

ciples depend; they are precommitted to belief in the irrelevancy of all considerations of the order of those here presented. But any thoroughgoing naturalist is equally committed by the logic of his position to belief in continuity of development, with its corrollary of community of factors in the respective patterns of logical and biological forms and procedures.

CHAPTER III

THE EXISTENTIAL MATRIX OF INQUIRY: CULTURAL

THE ENVIRONMENT in which human beings live, act and inquire, is not simply physical. It is cultural as well. Problems which induce inquiry grow out of the relations of fellow beings to one another, and the organs for dealing with these relations are not only the eye and ear, but the meanings which have developed in the course of living, together with the ways of forming and transmitting culture with all its constituents of tools, arts, institutions, traditions and customary beliefs.

I. To a very large extent the ways in which human beings respond even to physical conditions are influenced by their cultural environment. Light and fire are physical facts. But the occasions in which a human being responds to things as merely physical in purely physical ways are comparatively rare. Such occasions are the act of jumping when a sudden noise is heard, withdrawing the hand when something hot is touched, blinking in the presence of a sudden increase of light, animal-like basking in sunshine, etc. Such reactions are on the biological plane. But the typical cases of human behavior are not represented by such examples. The *use* of sound in speech and listening to speech, making and enjoying music; the kindling and tending of fire to cook and to keep warm; the production of light to carry on and regulate occupations and social enjoyments:—these things are representative of distinctively human activity.

To indicate the full scope of cultural determination of the conduct of living one would have to follow the behavior of an individual throughout at least a day; whether that of a day laborer, of a professional man, artist or scientist, and whether the individual be a growing child or a parent. For the result would show how thoroughly saturated behavior is with conditions and factors that

are of cultural origin and import. Of distinctively human behavior it may be said that the strictly physical environment is so incorporated in a cultural environment that our interactions with the former, the problems that arise with reference to it, and our ways of dealing with these problems, are profoundly affected by incorporation of the physical environment in the cultural.

Man, as Aristotle remarked, is a *social* animal. This fact introduces him into situations and originates problems and ways of solving them that have no precedent upon the organic biological level. For man is social in another sense than the bee and ant, since his activities are encompassed in an environment that is culturally transmitted, so that what man does and how he acts, is determined not by organic structure and physical heredity alone but by the influence of cultural heredity, embedded in traditions, institutions, customs and the purposes and beliefs they both carry and inspire. Even the neuro-muscular structures of individuals are modified through the influence of the cultural environment upon the activities performed. The acquisition and understanding of language with proficiency in the arts (that are foreign to other animals than men) represent an incorporation within the physical structure of human beings of the effects of cultural conditions, an interpenetration so profound that resulting activities are as direct and seemingly "natural" as are the first reactions of an infant. To speak, to read, to exercise any art, industrial, fine or political, are instances of modifications wrought *within* the biological organism by the cultural environment.

This modification of organic behavior in and by the cultural environment accounts for, or rather is, the transformation of purely organic behavior into behavior marked by intellectual properties with which the present discussion is concerned. Intellectual operations are foreshadowed in behavior of the biological kind, and the latter prepares the way for the former. But to foreshadow is not to exemplify and to prepare is not to fulfil. Any theory that rests upon a naturalistic postulate must face the problem of the extraordinary differences that mark off the activities and achievements of human beings from those of other biological forms. It is these differences that have led to the idea that man is completely separated from other animals by properties that come from a non-

natural source. The conception to be developed in the present chapter is that the development of language (in its widest sense) out of prior biological activities is, in its connection with wider cultural forces, the key to this transformation. The problem, so viewed, is not the problem of the transition of organic behavior into something wholly discontinuous with it—as is the case when, for example, Reason, Intuition and the *A priori* are appealed to for explanation of the difference. It is a special form of the general problem of continuity of change and the emergence of new modes of activity—the problem of development at any level.

Viewing the problem from this angle, its constituents may be reduced to certain heads, three of which will be noted. Organic behavior is centered in *particular* organisms. This statement applies to inferring and reasoning as existential activities. But if inferences made and conclusions reached are to be valid, the subject-matter dealt with and the operations employed must be such as to yield identical results for all who infer and reason. If the same evidence leads different persons to different conclusions, then either the evidence is only speciously the same, or one conclusion (or both) is wrong. The *special* constitution of an individual organism which plays such a role in biological behavior is so irrelevant in controlled inquiry that it has to be discounted and mastered.

Another phase of the problem is brought out by the part played in human judgments by emotion and desire. These *personal* traits cook the evidence and determine the result that is reached. That is, upon the level of organic factors (which are the actively determining forces in the type of cases just mentioned), the individual with his individual peculiarities, whether native or acquired, is an active participant in producing ideas and beliefs, and yet the latter are logically grounded only when such peculiarities are deliberately precluded from taking effect. This point restates what was said in connection with the first point, but it indicates another phase of the matter. If, using accepted terminology, we say that the first difference is that between the singular and the general, the present point may be formulated as the difference between the subjective and the objective. To be intellectually "objective" is to discount and eliminate merely personal factors in the operations by which a conclusion is reached.

Organic behavior is a strictly temporal affair. But when behavior is *intellectually* formulated, in respect both to general ways of behavior and the special environing conditions in which they operate, propositions result and the terms of a proposition do not sustain a temporal relation to one another. It was a temporal event when someone landed on Robinson Crusoe's island. It was a temporal event when Crusoe found the footprint on the sands. It was a temporal event when Crusoe inferred the presence of a possibly dangerous stranger. But while the proposition was *about* something temporal, the *relation* of the observed fact as evidential to the inference drawn from it is non-temporal. The same holds of every logical relation in and of propositions.

In the following discussion it is maintained that the solution of the problem just stated in some of its phases, is intimately and directly connected with cultural subject-matter. Transformation from organic behavior to intellectual behavior, marked by logical properties, is a product of the fact that individuals live in a cultural environment. Such living compels them to assume in their behavior the standpoint of customs, beliefs, institutions, meanings and beliefs which are at least relatively general and objective.[1]

II. Language occupies a peculiarly significant place and exercises a peculiarly significant function in the complex that forms the cultural environment. It is itself a cultural institution, and, from one point of view, is but one among many such institutions. But it is (1) the agency by which other institutions and acquired habits are *transmitted*, and (2) it *permeates* both the forms and the contents of all other cultural activities. Moreover, (3) it has its own distinctive structure which is capable of abstraction as a *form*. This structure, when abstracted as a form, had a decisive influence historically upon the formulation of logical theory; the symbols which are appropriate to the form of language as an agency of inquiry (as distinct from its original function as a medium of communication) are still peculiarly relevant to logical theory. Consequently, further discussion will take the wider cultural environment for granted and confine itself to the especial function of language in effecting the transformation of the biological into the intellectual and the potentially logical.

[1] The non-temporal phase of propositions receives attention later.

In this further discussion, language is taken in its widest sense, a sense wider than oral and written speech. It includes the latter. But it includes also not only gestures but rites, ceremonies, monuments and the products of industrial and fine arts. A tool or machine, for example, is not simply a simple or complex physical object having its own physical properties and effects, but is also a mode of language. For it *says* something, to those who understand it, about operations of use and their consequences. To the members of a primitive community a loom operated by steam or electricity says nothing. It is composed in a foreign language, and so with most of the mechanical devices of modern civilization. In the present cultural setting, these objects are so intimately bound up with interests, occupations and purposes that they have an eloquent voice.

The importance of language as the necessary, and, in the end, sufficient condition of the existence and transmission of non-purely organic activities and their consequences lies in the fact that, on one side, it is a strictly biological mode of behavior, emerging in natural continuity from earlier organic activities, while, on the other hand, it compels one individual to take the standpoint of other individuals and to see and inquire from a standpoint that is not strictly personal but is common to them as participants or "parties" in a conjoint undertaking. It may be directed by and towards some physical existence. But it first has reference to some other person or persons with whom it institutes *communication*—the making of something common. Hence, to that extent its reference becomes general and "objective."

Language is made up of physical existences; sounds, or marks on paper, or a temple, statue, or loom. But these do not *operate* or function as mere physical things when they are media of communication. They operate in virtue of their *representative* capacity or *meaning*. The particular physical existence which has meaning is, in the case of speech, a conventional matter. But the convention or common consent which sets it apart as a means of recording and communicating meaning is that of agreement in *action;* of shared modes of responsive behavior and participation in their consequences. The physical sound or mark gets its meaning in and by conjoint community of functional use, not by any

explicit convening in a "convention" or by passing resolutions that a certain sound or mark shall have a specified meaning. Even when the meaning of certain legal words is determined by a court, it is not the agreement of the judges which is finally decisive. For such assent does not finish the matter. It occurs for the sake of determining future agreements in associated *behavior*, and it is this subsequent behavior which finally settles the actual meaning of the words in question. Agreement in the proposition arrived at is significant only through this function in promoting agreement in action.

The reason for mentioning these considerations is that they prove that the meaning which a conventional symbol has is not itself conventional. For the meaning is established by agreements of different persons in existential activities having reference to existential consequences. The particular existential sound or mark that stands for *dog* or *justice* in different cultures is arbitrary or conventional in the sense that although it has *causes* there are no *reasons* for it. But *in so far* as it is a medium of communication, its meaning is common, because it is constituted by existential conditions. If a word varies in meaning in intercommunication between different cultural groups, then to that degree communication is blocked and misunderstanding results. Indeed, there ceases to be communication until variations of understanding can be translated, through the meaning of words, into a meaning that is the same to both parties. Whenever communication is blocked and yet is supposed to exist misunderstanding, not merely absence of understanding, is the result. It is an error to suppose that the misunderstanding is about the meaning of the *word* in isolation, just as it is fallacious to suppose that because two persons accept the same dictionary meaning of a word they have therefore come to agreement and understanding. For agreement and disagreement are determined by the consequences of conjoint activities. Harmony or the opposite exists in the effects produced by the several activities that are occasioned by the words used.

III. Reference to concord of consequences as the determinant of the meaning of any sound used as a medium of communication shows that there is no such thing as a *mere* word or *mere* symbol. The physical existence that is the vehicle of meaning may as a

particular be called *mere;* the recitation of a number of such sounds or the stringing together of such marks may be called *mere* language. But in fact there is no word in the first case and no language in the second. The activities that occur and the consequences that result which are not determined by meaning, are, by description, only physical. A sound or mark of any physical existence is a part of *language* only in virtue of its *operational* force; that is, as it functions as a means of evoking different activities performed by different persons so as to produce consequences that are shared by all the participants in the conjoint undertaking. This fact is evident and direct in oral communication. It is indirect and disguised in written communication. Where written literature and literacy abound, the conception of language is likely to be framed upon their model. The intrinsic connection of language with community of action is then forgotten. Language is then supposed to be simply a means of expressing or communicating "thoughts"—a means of conveying ideas or meanings that are complete in themselves apart from communal operational force.

Much literature is read, moreover, simply for enjoyment, for esthetic purposes. In this case, language is a means of action only as it leads the reader to build up pictures and scenes to be enjoyed by himself. There ceases to be immediate inherent reference to conjoint activity and to consequences mutually participated in. Such is not the case, however, in reading to get at the meaning of the author; that is, in reading that is emphatically intellectual in distinction from esthetic. In the mere reading of a scientific treatise there is, indeed, no direct overt participation in action with another to produce consequences that are *common* in the sense of being immediately and personally shared. But there must be imaginative construction of the materials and operations which led the author to certain conclusions, and there must be agreement or disagreement with his conclusions as a consequence of following through conditions and operations that are imaginatively reinstated.

Connection with overt activities is in such a case indirect or mediated. But so far as definite grounded agreement or disagreement is reached, an attitude is formed which is a preparatory readiness to act in a responsive way when the conditions in question

or others similar to them actually present themselves. The connection with action in question is, in other words, with *possible* ways of operation rather than with those found to be *actually* and immediately required.[2] But preparation for *possible* action in situations not as yet existent in actuality is an essential condition of, and factor in, all intelligent behavior. When persons meet together in conference to plan in advance of actual occasions and emergencies what shall later be done, or when an individual deliberates in advance regarding his possible behavior in a possible future contingency, something occurs, but more directly, the same sort as happens in understanding intellectually the meaning of a scientific treatise.

I turn now to the positive implication of the fact that no sound, mark, product of art, is a word or part of language in isolation. Any word or phrase has the meaning which it has only as a member of a constellation of related meanings. Words as representatives are part of an inclusive code. The code may be public or private. A public code is illustrated in any language that is current in a given cultural group. A private code is one agreed upon by members of special groups so as to be unintelligible to those who have not been initiated. Between these two come argots of special groups in a community, and the technical codes invented for a restricted special purpose, like the one used by ships at sea. But in every case, a particular word has its meaning only in relation to the code of which it is one constituent. The distinction just drawn between meanings that are determined respectively in fairly direct connection with action in situations that are present or near at hand, and meanings determined for possible use in remote and contingent situations, provides the basis upon which language codes as systems may be differentiated into two main kinds.

While all language or symbol-meanings are what they are as parts of a system, it does not follow that they have been determined on the basis of their fitness to be such members of a system; much less on the basis of their membership in a comprehensive

[2] Literature and literary habits are a strong force in building up that conception of separation of ideas and theories from practical activity which is discussed in ensuing chapters.

system. The system may be simply the language in common use. Its meanings hang together not in virtue of their examined relationship to one another, but because they are current in the same set of group habits and expectations. They hang together because of group activities, group interests, customs and institutions. Scientific language, on the other hand, is subject to a test over and above this criterion. Each meaning that enters into the language is expressly determined in its relation to other members of the language system. In all reasoning or ordered discourse this criterion takes precedence over that instituted by connection with cultural habits.

The resulting difference in the two types of language-meanings fundamentally fixes the difference between what is called common sense and what is called science. In the former cases, the customs, the *ethos* and spirit of a group is the decisive factor in determining the system of meanings in use. The system is one in a practical and institutional sense rather than in an intellectual sense. Meanings that are formed on this basis are sure to contain much that is irrelevant and to exclude much that is required for intelligent control of activity. The meanings are coarse, and many of them are inconsistent with each other from a logical point of view. One meaning is appropriate to action under certain institutional group conditions; another, in some other situation, and there is no attempt to relate the different situations to one another in a coherent scheme. In an intellectual sense, there are many languages, though in a social sense there is but one. This multiplicity of language-meaning constellations is also a mark of our existing culture. A word means one thing in relation to a religious institution, still another thing in business, a third thing in law, and so on. This fact is the real Babel of communication. There is an attempt now making to propagate the idea that education which indoctrinates individuals into some special tradition provides the way out of this confusion. Aside from the fact that there are in fact a considerable number of traditions and that selection of some one of them, even though that one be internally consistent and extensively accepted, is arbitrary, the attempt reverses the *theoretical* state of the case. Genuine community of language or symbols can be achieved only through efforts that

bring about community of activities under existing conditions. The ideal of scientific-language is construction of a system in which meanings are related to one another in inference and discourse and where the symbols are such as to indicate the relation.

I shall now introduce the word "symbol" giving it its signification as a synonym for a word *as* a word, that is, as a meaning carried by language in a system, whether the system be of the loose or the intellectual rigorous kind.[3] The especial point in the introduction of the word "symbol" is to institute the means by which discrimination between what is designated by it and what is now often designated by *sign* may be instituted. What I have called symbols are often called "artificial signs" in distinction from what are called *natural signs*.

IV. It is by agreement in conjoint action of the kind already described, that the *word* "smoke" stands in the English language for an object of certain qualities. In some other language the same vocable and mark may stand for something different, and an entirely different sound stand for "smoke." To such cases of representation the word "*artificial signs*" applies. When it is said that smoke as an actual existence points to, is evidence of, an existential fire, smoke is said to be a *natural* sign of fire. Similarly, heavy clouds of given qualities are a natural sign of probable rain, and so on. The representative capacity in question is attributed to *things in their connection with one another*, not to marks whose meaning depends upon agreement in social use. There is no doubt of the existence and the importance of the distinction designated by the words "natural" and "artificial" signs. But the fundamentally important difference is not brought out by these words. For reasons now to be given, I prefer to mark the difference by confining the application of *sign* to so-called "natural signs"—employing *symbol* to designate "artificial signs."

The difference just stated is actual. But it fails to note the distinctive intellectual property of what I call symbols. It is, so to

[3] This signification is narrower than the popular usage, according to which anything is a symbol that has representative *emotional* force even if that force be independent of its intellectual representational force. In this wider sense, a national flag, a crucifix, a mourning garb, etc., are symbols. The definition of the text is in so far arbitrary. But there is nothing arbitrary about the *subject-matters* to which the limited signification applies.

speak, an incidental and external fact, logically speaking, that certain things are given representative function by social agreement. The fact becomes logically relevant only because of the possibility of free and independent development of meanings in discourse which arises when once symbols are instituted. A "natural sign," by description, is something that exists in an acutal spatial-temporal context. Smoke, as a thing having certain observed qualities, is a sign of fire only when the thing exists and is observed. Its representative capacity, taken by itself, is highly restricted, for it exists only under limited conditions. The situation is very different when the *meaning* "smoke" is embodied in an existence, like a sound or a mark on paper. The actual quality found in existence is then subordinate to a representative office. Not only can the sound be produced practically at will, so that we do not have to wait for the occurrence of the object; but, what is more important, the meaning when embodied in an indifferent or neutral existence is *liberated* with respect to its representative function. It is no longer tied down. It can be related to other meanings in the language-system; not only to that of fire but to such apparently unrelated meanings as friction, changes of temperature, oxygen, molecular constitution, and, by intervening meaning-symbols, to the laws of thermodynamics.

I shall, accordingly, in what follows, connect *sign* and *significance, symbol* and *meaning,* respectively, with each other, in order to have terms to designate two different kinds of representative capacity. Linguistically, the choice of terms is more or less arbitrary, although sign and significance have a common verbal root. This consideration is of no importance, however, compared with the necessity of having some words by which to designate the two kinds of representative function. For purposes of theory the important consideration is that existent things, as signs, are *evidence* of the existence of something else, this something being at the time *inferred* rather than observed.

But words, or symbols, provide no *evidence* of any existence. Yet what they lack in this capacity they make up for in creation of another dimension. They make possible ordered discourse or reasoning. For this may be carried on without any of the existences to which symbols apply being actually present: without, in-

deed, assurance that objects to which they apply anywhere actually exist, and, as in the case of mathematical discourse, without direct reference to existence at all.

Ideas as ideas, hypotheses as hypotheses, would not exist were it not for symbols and meanings as distinct from signs and significances. The greater capacity of symbols for manipulation is of practical importance. But it pales in comparison with the fact that symbols introduce into inquiry a dimension different from that of existence. Clouds of certain shapes, size and color may signify to us the probability of rain; they portend rain. But the *word* cloud when it is brought into connection with other words of a symbol-constellation enable us to relate the meaning of being a cloud with such different matters as differences of temperature and pressures, the rotation of the earth, the laws of motion, and so on.

The difference between sign-significance and symbol-meaning (in the sense defined) is brought out in the following incident.[4] A visitor in a savage tribe wanted on one occasion "the word for Table. There were five or six boys standing around, and tapping the table with my forefinger I asked 'What is this?' One boy said it was *dodela*, another that it was an *etanda*, a third stated that it was *bokali*, a fourth that it was *elamba*, and the fifth said it was *meza*." After congratulating himself on the richness of the vocabulary of the language the visitor found later "that one boy had thought he wanted the word for tapping; another understood we were seeking the word for the material of which the table was made; another had the idea that we required the word for hardness; another thought we wished the name for that which covered the table; and the last . . . gave us the word *meza*, table."

This story might have been quoted earlier as an illustration of the fact that there is not possible any such thing as a direct one-to-one correspondence of names with existential objects; that words mean what they mean in connection with conjoint activities that effect a common, or mutually participated in, consequence. The word sought for was involved in conjoint activities looking to a common end. The act of tapping in the illustration was isolated from any such situation. It was, in consequence,

[4] Quoted by and from Ogden and Richards, *The Meaning of Meaning*, p. 174.

wholly indeterminate in reference; it was no part of *communication*, by which alone acts get significance and accompanying words acquire meaning.[5] For the point in hand, the anecdote illustrates the lack of any evidential status in relation to existence of the symbols or representative values that have been given the name "meanings." Without the intervention of a specific kind of existential operation they cannot indicate or discriminate the *objects* to which they refer. Reasoning or ordered discourse, which is defined by development of symbol-meanings in relation to one another, may (and should) provide a basis for performing these operations, but of itself it determines no existence. This statement holds no matter how comprehensive the meaning-system and no matter how rigorous and cogent the relations of meanings to one another. On the other hand, the story illustrates how, in case the right word had been discovered, the meaning symbolized would have been capable of entering into relations with any number of other meanings independently of the actual presence at any given time of the object *table*. Just as the sign-significance relation defines *inference*, so the relation of meanings that constitutes propositions defines *implication* in discourse, if it satisfies the intellectual conditions for which it is instituted. Unless there are words which mark off the two kinds of relations in their distinctive capacities and offices, with reference to existence, there is danger that two things as logically unlike as inference and implication will be confused. As a matter of fact, the confusion, when inference is treated as identical with implication, has been a powerful agency in creating the doctrinal conception that logic is purely formal—for, as has been said, the relation of meanings (carried by symbols) to one another is, *as such*, independent of existential reference.[6]

V. So far the word "relation" has been rather indiscriminately employed. The discussion has now reached a point where it is necessary to deal with the ambiguity of the word as it is used not

[5] Another aspect of the same general principle, not directly connected with language, is brought out later in consideration of the meaning of any demonstrated object in relation to "*this*."

[6] A farther important logical aspect of this matter is dealt with below in the necessity of distinguishing *judgment* from propositions, and *involvement* from *implication*.

merely in ordinary speech but in logical texts. The word "relation" is used to cover three very different matters which in the interest of a coherent logical doctrine must be discriminated. (1) Symbols are "related" directly to one another; (2) they are "related" to existence by the mediating intervention of existential operations; (3) existences are "related" to one another in the evidential sign-signified function. That these three modes of "relation" are different from one another and that the use of one and the same word tends to cover up the difference and thereby create doctrinal confusion, is evident.

In order to avoid, negatively, the disastrous doctrinal confusion that arises from the ambiguity of the word *relation*, and in order to possess, positively, linguistic means of making clear the logical nature of the different subject-matters under discussion, I shall reserve the word *relation* to designate the kind of "relation" which symbol-meanings bear to one another *as* symbol-meanings. I shall use the term *reference* to designate the kind of relation they sustain to existence; and the words *connection* (and *involvement*) to designate that kind of relation sustained by *things* to one another in virtue of which *inference* is possible.

The differences, when once pointed out, should be so obvious as hardly to require illustration. Consider, however, propositions of mathematical physics. (1) As propositions they form a system of *related* symbol-meanings that may be considered and developed as such. (2) But as propositions of *physics*, not of mere mathematics, they have *reference* to existence; a reference which is realized in operations of *application*. (3) The final test of *valid* reference or applicability resides in the *connections* that exist among things. Existential involvement of things with one another alone warrants inference so as to enable further connections among things themselves to be discovered.

The question may be raised whether meaning-relations in discourse arise before or after significance-connections in existence. Did we first infer and then use the results to engage in discourse? Or did relations of meanings, instituted in discourse, enable us to detect the connections in things in virtue of which some things are evidential of other things? The question is rhetorical in that the question of historical priority cannot be settled. The question

is asked, however, in order to indicate that in any case ability to treat things as signs would not go far did not symbols enable us to mark and retain just the qualities of things which are the ground of inference. Without, for example, words or symbols that discriminate and hold on to the experienced qualities of sight and smell that constitute a thing "smoke," thereby enabling it to serve as a sign of fire, we might react to the qualities in question in animal-like fashion and perform activities appropriate to them. But no inference could be made that was not blind and blundering. Moreover, since *what* is inferred, namely fire, is not present in observation, any anticipation that could be formed of it would be vague and indefinite, even supposing an anticipation could occur at all. If we compare and contrast the range and the depth of the signifying capacity of existential objects and events in a savage and a civilized group and the corresponding power of inference, we find a close correlation between it and the scope and the intimacy of the relations that obtain between symbol-meanings in discourse. Upon the whole, then, it is language, originating as a medium of communication in order to bring about deliberate co-operation and competition in conjoint activities, that has conferred upon existential things their signifying or evidential power.

VI. We are thus brought back to the original problem: namely, transformation of animal activities into intelligent behavior having the properties which, when formulated, are *logical* in nature. Associated behavior is characteristic not only of plants and animals, but of electrons, atoms and molecules; as far as we know of everything that exists in nature. Language did not originate association, but when it supervened, as a natural emergence from previous forms of animal activity, it reacted to transform prior forms and modes of associated behavior in such a way as to give experience a new dimension.

1. "Culture" and all that culture involves, as distinguished from "nature," is both a condition and a product of language. Since language is the only means of retaining and transmitting to subsequent generations *acquired* skills, acquired information and acquired habits, it is the latter. Since, however, meanings and the significance of events differ in different cultural groups, it is also the former.

2. Animal activities, such as eating and drinking, searching for food, copulation, etc., acquire new properties. Eating food becomes a group festival and celebration; procuring food, the art of agriculture and exchange; copulation passes into the institution of the family.

3. Apart from the existence of symbol-meanings the results of prior experience are retained only through strictly organic modifications. Moreover, these modifications once made, tend to become so fixed as to retard, if not to prevent, the occurrence of further modifications. The existence of symbols makes possible deliberate recollection and expectation, and thereby the institution of new combinations of selected elements of experiences having an intellectual dimension.

4. Organic biological activities end in overt actions, whose consequences are irretrievable. When an activity and its consequences can be rehearsed by representation in symbolic terms, there is no such final commitment. If the representation of the final consequence is of unwelcome quality, overt activity may be foregone, or the way of acting be replanned in such a way as to avoid the undesired outcome.[7]

These transformations and others which they suggest, are not of themselves equivalent to accrual of logical properties to behavior. But they provide requisite conditions for it. The use of meaning-symbols for institution of purposes or ends-in-view, for deliberation, as a rehearsal through such symbols of the activities by which the ends may be brought into being, is at least a rudimentary form of reasoning in connection with solution of problems. The habit of reasoning once instituted is capable of indefinite development on its own account. The ordered development of meanings in their relations to one another may become an engrossing interest. When this happens, implicit logical conditions are made explicit and then logical theory of some sort is born. It may be imperfect; it will be imperfect from the standpoint of the inquiries and symbol-meanings that later develop. But the first step, the one that costs and counts, was taken when some one began to

[7] Generalizing beyond the strict requirements of the position outlined, I would say that I am not aware of any so-called merely "mental" activity or result that cannot be described in the objective terms of an organic activity modified and directed by symbols-meaning, or language, in its broad sense.

reflect upon language, upon *logos,* in its syntactical structure and its wealth of meaning contents. Hypostization of *Logos* was the first result, and it held back for centuries the development of inquiries of a kind that are competent to deal with the problems of the existent world. But the hypostization was, nevertheless, a tribute to the power of language to generate reasoning and, through application of the meanings contained in it, to confer fuller and more ordered significance upon existence.

In later chapters we shall consider in some detail how a logic of ordered discourse, a logic that gathered in a system the relations which hold meanings consistently together in discourse, was taken to be the final model of logic and thereby obstructed the development of effective modes of inquiry into existence, preventing the necessary reconstruction and expansion of the very meanings that were used in discourse. For when these meanings in their ordered relations to one another were taken to be final in and of themselves, they were directly superimposed upon nature. The necessity of existential operations for application of meanings to natural existence was ignored. This failure reacted into the system of meanings as meanings. The result was the belief that the requirements of rational discourse constitute the measure of natural existence, the criterion of complete Being. It is true that logic emerged as the Greeks became aware of language as Logos with the attendant implication that a system of ordered meanings is involved.

This perception marked an enormous advance. But it suffered from two serious defects. Because of the superior status assigned to forms of rational discourse, they were isolated from the operations by means of which meanings originate, function and are tested. This isolation was equivalent to the hypostization of Reason. In the second place, the meanings that were recognized were ordered in a gradation derived from and controlled by a class-structure of Greek society. The means, procedures and kinds of organization that arose from active or "practical" participation in natural processes were given a low rank in the hierarchy of Being and Knowing. The scheme of knowledge and of Nature became, without conscious intent, a mirror of a social order in which craftsmen, mechanics, artisans generally,

held a low position in comparison with a leisure class. Citizens as citizens were also occupied with doing, a doing instigated by need or lack. While possessed of a freedom denied to the artisan class, they were also taken to fail in completely self-contained and self-sufficient activity. The latter was exemplified only in the exercise of Pure Reason untainted by need for anything outside itself and hence independent of all operations of doing and making. The historic result was to give philosophic, even supposedly ontological, sanction to the cultural conditions which prevented the utilization of the immense potentialities for attainment of knowledge that were resident in the activities of the arts—resident in them because they involve operations of active modification of existing conditions which contain the procedures constituting the experimental method when once they are employed for the sake of obtaining knowledge, instead of being subordinated to a scheme of uses and enjoyments controlled by given socio-cultural conditions.