THE PSYCHOLOGY OF RATIONAL THOUGHT

A Critical Estimate of Current Views
and
An Hypothesis Concerning the Role of Language
in the Structure of Human Reason

by

Albert Seymour Towell

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Chapter 1

INTRODUCTION

The late William James said of psychology in a passage that has often been quoted: "This is no science, it is only the hope of a science."  

It is probably true, of course, that no single department of human knowledge can be said to be based upon foundations that are absolutely unassailable. It is also true with respect to advances in any field that the solving of one problem at once brings fresh problems to light. We learn new facts; we modify our formulations of scientific laws and hypotheses so that they become better statements of the relations that are observed to hold between phenomena; we study things that have hitherto puzzled us and one by one we bring these things into harmony with the rest of our knowledge -- we 'explain' them, that is. But as often as not, each such advance brings into view further discrepancies which must be studied and in turn explained. None the less the gains that have been made in the physical sciences are very real; these sciences are now well based on self-consistent systems of principles.

The case is very different with regard to psychology. Spearman points out that while in physics and chemistry the divergences of opinion "always remain confined to points of

1Psychology, Briefer Course; p.468.
detail; in psychology they reach out to the very foundations, even to the whole terminology itself."

The same writer is also very sceptical as to whether certain changes that orthodox psychologists have made in the statements of their doctrines constitute any real advance. He says that "we find the doctrine of 'faculties' everywhere mentioned in terms of the keenest reprobation. Such hostility, however, shows itself on closer examination to be curiously concentrated against the name. Just the same actual doctrine is still freely accepted under very numerous synonyms, as 'powers', 'capacities', 'abilities', 'properties', and so forth." Certainly, he admits, attempts are being made to formulate more acceptable theories; but the sole "serious rival to the doctrine of separate faculties is that which.... ....has tried to resolve all knowing ultimately into sensation and all thinking into nothing more than associative reproduction;" a theory which "breaks down by reason of its flagrant conflict with the actual facts."

He is no better satisfied with attempts to connect psychology with evolutionary theory and teleological biology, for these lead to the shirking of genuinely psychological explanations and the substitution of "glib references to 'situations', 'environment', 'responses', and so forth."

We do not, however, often see it explicitly recognized that there is very good reason for this state of affairs,

\footnote{The Nature of Intelligence; pp. 24 ff.}
since no matter how complex and difficult are the problems of physics, astronomy, or chemistry, those presented by the study of the human mind are incomparably more baffling. As Osborn remarks, "Of all incomprehensible things in the universe Man stands in the front rank, and of all incomprehensible things in Man the supreme difficulty centers in human intelligence, human memory, human aspirations, human powers of discovery, research, and conquest of obstacles." When the data of a science have been reduced to a form in which they are susceptible to mathematical treatment we can get to grips with its problems; but in psychology there is little or nothing that we can lay hold of in that way -- everything is elusive, nebulous, baffling; its very terms, 'mind', 'image', 'attention', 'instinct', 'volition', and so on, are vague and are defined in as many different ways as there are psychologists.

We must not omit to point out, on the other hand, that in certain fields experimenters are obtaining results which are relatively definite and precise. Psycho-physics is accumulating information on the quantitative aspects of the sensations resulting from certain stimuli, the 'two-point limen', and the like. Many workers are applying statistical methods to the measurement of intelligence and of learning. The neurologists are gradually working out the physiological

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1 In his foreword to "The Brain from Ape to Man", by F. Tilney.
basis of psychological phenomena. Valuable results are being secured by the 'objective' study of behavior.

In spite of all this work, we find when we come to consider what are known as the higher forms of mental activity -- reasoning, judgment, inference, and so on -- that the results obtained by the experimental psychologists seem not to contribute greatly towards genuinely psychological explanations of the processes involved. As Brown says, "If we turn to almost any standard textbook of psychology we find that more than half the book is concerned with the study of lower forms of the mental processes, and that only a few concluding chapters are devoted to the consideration of the highest forms of mental activity, such as deliberation, choice, volition and character-formation."

A moment's thought will convince one that this statement of Brown's is true of the usual textbook in psychology. We find long and detailed chapters on Sensation, Perception, Memory, Habit, Instinct, Association, Emotion, and so forth; and in the main the treatment of these topics is careful and scientific, it embodies the results of much experimentation and painstaking observation. But the conventional handling of the higher mental processes is much less satisfactory, and ordinarily receives rather summary treatment in three or four chapters. Yet these same higher mental processes constitute precisely the human part of psychology;

1 Mind and Personality; p.1.
much of what is said of sensation, habit, and the rest applies almost as much to animals as it does to human beings.

We are now in a position to state what is to be the subject-matter of this thesis. It will attempt to examine the present state of the science of psychology with respect to these distinctively human mental functions, collectively characterized as the thought processes. We shall give some account of obstacles and misconceptions that appear to us to have hindered the development of an adequate psychology of the higher mental processes; and we shall attempt to show that within the last few years some new view-points have been stated which give considerable promise of putting us on the right track at last.

More specifically, the thesis will deal with the relation of language to thought (the word language being taken in its widest sense to include the symbolic activities in general, and all the means of social intercommunication -- written and spoken words, gestures, etc.)

In order to prevent misconception at the outset, it will be well to supplement this general statement by making clear what we shall not try to prove: namely, that fundamentally thinking is linguistic behavior, that to have ideas means to speak aloud or silently, that thought consists in vestigeal laryngeal movements. Nor on the other hand shall we try to prove that the structure of thought can be discovered in the social, conventional, syntactical, or logical
organization of language or other symbolic processes. Both these doctrines have been held, and are held today; but this thesis will take the ground that neither of these two approaches to the problem has proved fruitful, and the more closely they are examined the less likely it seems that they will lead to a solution.

What we shall maintain is that thought is prior to linguistic activity; that its appearance and gradual rise may be traced in evolving mental activity as it becomes more and more differentiated in successively higher forms of living organisms. But we shall also maintain that it is through the agency of the linguistic processes that thought is reconstituted into human reason.

Throughout we shall hold fast to a functional and a genetic viewpoint.
Chapter 2

DOCTRINES PAST AND PRESENT

The title of this chapter is not to be taken as indicating that we are about to embark on a detailed survey or criticism of the very numerous accounts which have been given of the phenomena of the higher forms of mental activity. Obviously no such survey can be attempted in one brief chapter. It is our purpose to view the field in only a very general way, so as to establish a background for what is later to be said.

It was remarked above that the ordinary textbook in psychology devotes only a few brief concluding chapters to the subject of reasoning. Is it to be taken that this branch of the whole subject has been neglected in comparison with the attention that has been devoted to the lower mental processes such as sensation? By no means; on the contrary it has received more attention, and from the ablest thinkers, than has any other branch of the science; but the result has been that today disagreements are perhaps deeper and more fundamental than they have ever been in the past. This state of affairs is sufficient evidence of the complexity and difficulty of the subject.

Twenty-five hundred years ago the Greeks were deeply interested in the problems presented by the study of the mental life of man. Their enquiries, however, were more of a philosophical than a psychological nature; and having accepted the concept of an entity called 'mind' which was conceived as
discontinuous and separate from the world of matter, they con-
ained their investigations largely to formulating a descrip-
tion of the modes of activity of this entity. Out of this
investigation there naturally arose the science of Logic as a
separate discipline. From the Greeks we derive, too, an idea
which has persisted ever since and which has played an import-
ant part in the history of speculative thought; the idea,
namely, that a true philosophy can be achieved through an ex-
amination and manipulation of words.

It is vital to understanding of the relationship
between contemporary schools of psychology that we should
realize how persistently this doctrine of a separate mental,
 psychic, or spiritual entity works itself into our phraseology
and descriptions. We are compelled to omit any attempt to
trace the past workings of this conception, and to confine
ourselves instead to the present state of affairs in the field
of psychology; but we must comment very briefly on the effects
that various schools of philosophy, metaphysics, and epistem-
ology have had on the development of psychology.

We shall consider first that type of philosophical
type known as Idealism. This theory has been worked on,
examined, and expounded for many centuries; some of the pro-
foundest systems of thought are based upon it. It is exceed-
ingly difficult to find any self-inconsistency in the greatest
of these systems -- yet we find them leading often finally to
conclusions that can only be called preposterous, as, for
example, solipsism. Or again, as Broad remarks, "No one in his senses can in practice regard........his arm-chair or his poker as being literally societies of spirits or thoughts in the mind of God." In other words, some of these systems fall to the ground by a sort of reductio ad absurdum.

We need not, of course, take the stand that a Naive Realism is the only philosophical theory that is worthy of serious consideration; on the contrary we have ample evidence from modern physics and chemistry that things are very far from being what they seem from the naive standpoint. But we shall maintain that where a theory leads to conclusions which are preposterous from the point of view of science and of common sense, even though the theory may be supported by a dialectic structure which seems as unshakeable as the pyramids, then we do have a real case of reduction to absurdity; the theory may be as self-consistent as one pleases but unless it is also consistent with empirical observation it must be rejected. In other words the philosophical basis of this thesis is an Empirical Realism.

We are aware that in saying these things we are making assertions of the most dogmatic kind. This cannot be helped, for any real attempt to justify the position we have taken would require a whole book of itself. We may, however, give some slight hint as to the reasons for this position.

1 The Mind and its Place in Nature; p.5.
For several years now there has been a growing suspicion that a vast deal of what has been called 'philosophy' has been little more than a sort of beating the air. It is also becoming apparent that the discipline known as epistemology is an artificial and insoluble problem that has been 'set up' and that has no basis whatsoever in reality.

One important piece of evidence leading to this conclusion is that these systems of thought so frequently lead to dilemmas which are absolutely insoluble. We often hear such arguments as this: Either Reality already has the form which logical thought strives to give it, or it has not; in the former case thought is futilely reiterative, and in the latter case it is falsificatory. One would imagine that such a result as this would lead the thinker to examine most carefully both his premises and the whole body of his inferential reasoning. This he may proceed to do -- but with the result that both premises and inference appear to be incontrovertible. Thus it would seem that a set of premises whose truth is unquestionable may lead by an unimpeachable process of reasoning to a dilemma which cannot be resolved, such as the controversy between Mechanism and Vitalism. Such a paradox is too flagrant to be accepted for a moment; there must be a fallacy somewhere, but where is it?

An instance or two will probably make clear what we are trying to show. Let us take the epistemological problem of the relation of truth to reality, the question of how far
the most perfect mental structure can claim to be an adequate account of that which we seem compelled to assume as the object and occasion of our ideas. From the naive point of view this problem does not exist; we think perfectly freely of money, sunsets, God, beauty, beef-steak, anything in the universe whether it be 'real' or only a mental construct such as the idea of a relation; and in practice we accept the empirical tests as the measures of the validity of our thinking. Dewey, in dealing with this whole question, points out that it appears to the traditional epistemologist as though everyday man is "rashly assuming the right to glide over a cleft in the very structure of reality." Our point is that this fact at once puts the traditional view under suspicion; that it becomes extremely probable that the 'cleft' does not exist at all.

On closer examination of the traditional account we find, says Dewey, that there actually is no such cleft; it is a purely imaginary one that has appeared because of a fallacy in the argument. What the epistemologist has done is to take "the material which thought selects as its problematic data as identical with the significant content which results from successful pursuit of enquiry......He identifies the final deposit of the thought-function with its own generating antecedent, and then disposes of the resulting surd by reference to some metaphysical consideration."  

1 Essays in Experimental Logic; p.87.
Here, then, is a typical dilemma of the kind mentioned above; and in this case it seems to have arisen from a flaw in the argument, but a flaw that was sufficiently subtle to have evaded discovery. In other words, the paradox of which we spoke is sometimes to be accounted for by the fact that the premises or the inferences, no matter how unimpeachable they appear, do actually contain some flaw. This is of course no new discovery; on the contrary a favorite diversion of philosophers is finding flaws in one another's systems. But we may here assert our conviction that because of the results of modern speculation and investigation we are now able to point out fallacies in various traditional systems that could not possibly have been detected in the light of the knowledge of a century ago.

As Dewey further points out, we are continually finding "that problems in their previous form of statement are insoluble because put in terms of unreal conditions; because the real conditions have been mixed up with mental artifacts or misconstructions. Every science is continually learning that its supposed solutions are only apparent because the solution solves, not the actual problem, but one that has been made up." ¹

If we may be permitted a short digression we may note at this point how often metaphysics serves as a haven of refuge for the psychologist or philosopher who has been driven

by his own arguments into an impossible position. Weiss, in presenting a Behavioristic that seems somewhat more worthy of serious consideration than that of J. B. Watson, states that a good deal of the futility of traditional psychology is due to the fact that "as soon as a discussion approaches the fundamental assumptions upon which the controversy rests, the real issue is avoided by a hopeless, -- 'but this is approaching the field of metaphysics with which psychology has no concern'."

For the behaviorist, he continues, metaphysics is that form of behavior known as guessing, and "consists in developing a verbal description of what would probably be observed if more refined experimentation or observation were possible." All metaphysical discussions, he says, are in the last analysis nothing but language responses. For example, 'reality' is "merely a word stimulus......to designate the fact that the responses occurring at any one moment might be more complex and varied than they actually are if the bodily response mechanism were more complex than it really is."  

We may perhaps hesitate to agree that metaphysics is nothing more than guessing, but we do believe that many metaphysical discussions and problems are purely verbal.

This brings us to our next point: that many of the unresolvable dilemmas which we mentioned are due, not to flaws in premises or reasoning, but to the fact that the whole argument is a purely verbal construction having no relation what-

1 A Theoretical Basis of Human Behavior; pp. 39 ff.
soever to objective reality. Verbal symbols can be exceedingly treacherous, and the realization of this has been growing now for a good many years; so that of late it has become very common to find that writers of works in all sorts of fields of enquiry feel that they must introduce their respective contributions by a preliminary enquiry into the misleading influence of words in their particular field. It has even been said that this treachery of symbols is the source of almost all the difficulties which thought encounters.

We cannot at this point proceed further with a general discussion of the question of verbalism, but in a later chapter we shall find ourselves returning to it. All sciences, as has been hinted, are troubled by it; physics, for example, cannot free itself from the misleading connotations which are well known to cling to such terms as 'force', 'momentum', and the like; and even though the danger is so generally realized the error is so insidious that it creeps unobserved into even the most careful discussions of physical theory, and we find these terms treated as attributes (or even hypostatized into separate existences) instead of as mere names for relationships. Psychology is of all sciences the one most subject to this danger, for none of the others is so much infected with metaphysical difficulties.

From the point of view of this thesis the important thing is that this general uneasiness seems now to be crystallizing into a definite realization of the seriousness and the
magnitude of the problem, and exhaustive enquiry into the whole question has begun. Headway is being made towards overcoming some of the difficulties, although as yet there is little sign of the results of such enquiries being made use of in other fields.

At this point we shall give an example to show more directly what is the bearing of this discussion on contemporary psychological theory, using as our illustration Bertrand Russell's well-known work, "The Analysis of Mind".

Russell is far more of a philosopher than he is a psychologist; consequently we find that when his enquiries bring him to the point where he has to examine his fundamental conceptions he does not evade the issue by referring his difficulties to metaphysics and abandoning them there, after the manner of too many of our writers. Nor can he agree, with what may be called the 'naive' school of psychologists, to take mental phenomena for granted; he insists instead that we must examine very closely such concepts as 'mind', 'ideas', 'consciousness', and the like, and that if possible we must determine their true nature.

He finds himself led to the view that the world of experience is composed neither of mind nor of matter, but rather of a 'neutral stuff' more primitive than either. This primary stuff he tentatively calls 'pure experience', and supposes that some arrangements of it can be called 'mind'.

\[1\] For a detailed discussion of the whole matter see "The Meaning of Meaning", C.K.Ogden and I.A.Richards.
and others 'matter'.

Since it is not our purpose to give an exposition of Russell's views we shall not attempt to follow his enquiries any farther. What we desire to do is to state the position of this thesis with regard to his treatment of the subject.

That position is this: We willingly admit that "The Analysis of Mind" is a noteworthy piece of speculation or dialectic, worked out by one of the acutest minds of our day; but we maintain (and there are plenty of critics to support our stand) that as a contribution to psychology Russell's volume is of very slight value.

This sweeping statement is based on a conviction that his work is largely vitiated by exactly such fallacies as were briefly dealt with earlier in this chapter. For instance, his treatment of the problem of the existence of an external world is open to attack on the ground that the problem is stated in terms which necessarily assume the existence of the very thing that is called in question, namely, an external world. His argument involves the consideration of such terms as sense data, visual colors, etc., and it seems that he takes these to be primitive and irreducible. But these are synthetic propositions and not terms; they amount to statements that there are data which are sensed and colors which are seen; and this at once presupposes existences beyond the sensing or the seeing.

Incidentally the previous paragraph is a splendid
example of the sort of discussion which, however interesting it may be from certain points of view, is futile and profitless as far as psychology is concerned, since it only confuses the real issues.

Lastly, we shall turn to the task of outlining very briefly our notion of the relation that formal logic bears to psychology proper.

Angell says: "We do not ordinarily think in syllogisms......As a device for exhibiting the source of our confidence in the truth of the conclusion, the syllogism undoubtedly possesses a value; for it makes explicit and clear in the fewest possible words the fundamentally important relations among the ideas involved. It is, however, as a method of exposition, demonstration, and proof, rather than as a type of actual constructive thinking, that it gets its chief significance."

We present this quotation as illustrative of the fact that in almost all recent works on psychology the writers take pains to point out that the forms, categories, and principles of formal logic have little bearing in psychology. In fact, as Miller points out, the older accounts of thinking were cast too much in logical terms; "descriptive psychology has paid too much attention to the relations existing between the ideas in that series which represents the solution of a problem, and too little attention to the mental processes

1 Psychology (4th ed., revised); p.283.
which led up to the attainment of those ideas and their organization and incorporation into a movement of thought which attained the solution.\textsuperscript{1}

We believe that formal logic has been a major hindrance to the development of psychology. It is largely responsible for a fallacious notion which insists on creeping into our accounts of the higher mental processes despite our efforts to keep clear of it -- namely, the notion that there is a 'thought power' which is an abstract and general power of the mind, and which can be applied equally well in all sorts of situations. To it also can be traced current attempts (known as 'structural' psychology) to analyse mental life into its elements -- sensations, images, etc., -- and to describe rational thought in terms of a re-synthesis of such elements.

An especially insidious error is introduced by the adoption of the terms of logic as names for psychological phenomena. Such words as 'judgment', 'analysis', 'deduction', have clinging to them a cluster of logical implications which are apt to escape our notice, and which all too frequently land us unwittingly in some hopeless dilemma. Ogden and Richards give us an example of what happens when we unknowingly use a word in an ambiguous way: "By using the same term 'meaning' both for the 'Goings on' inside their heads (the images, associations, etc., which enabled them to interpret signs) and for the Referents (the things to which the signs

\textsuperscript{1} The Psychology of Thinking; p.144.
refer) philosophers have been forced to locate Grantchester, Influenza, the Russians, Queen Anne, and indeed the whole Universe equally inside their heads -- or, if alarmed by the prospect of cerebral congestion, at least 'in their minds' in such wise that all these objects become conveniently 'mental'\textsuperscript{1}.

Perhaps we can make our point clearer by looking at the matter from quite another angle. It is precisely because formal logic always has been (and in the main still is) thoroughly unpsychological that it has constituted a hindrance to the progress of psychology. Logic is always getting mixed up with metaphysical abstractions, and these are carried over into psychology, to the great hurt of the latter. Dewey gives an example of the sort of difficulty that arises; he says, "The relation of brain-change to consciousness is thought to be an essential part of the problem of knowledge. But if the brain is involved in knowing simply as a part of the mechanism of acting, as the mechanism for coordinating partial and competing stimuli into a single scheme of response........there is no miracle about the participation of the brain in knowing. One might as well make a problem out of the fact that it takes a hammer to drive a nail."\textsuperscript{2}

Yet logic cannot be separated from psychology, which attempts among other things to discriminate those acts and

\textsuperscript{1} The Meaning of Meaning; p.29, footnote.

\textsuperscript{2} Essays in Experimental Logic; p.408.
attitudes of the organism that determine how knowledge actually comes to be acquired. What is needed, and what is happening, is that logic is turning to psychology in order to correct its own fundamental notions.

It may be pertinent to recall what has long been recognized, that traditional logic is based on language, and especially on grammar, rather than on psychology. Sayce points out that Aristotle fell into the error of assuming the same laws for both thought and language; he assumed that the subject-copula-predicate organization which is characteristic of the Greek along with other Aryan languages reflected a subject-copula-predicate organization of objective reality. There are said to be languages in which there is no element which corresponds to our subject or predicate. Had Aristotle spoken such a language his system of logic would have been totally different,"and his system cannot be corrected or replaced until comparative philology has taught us to distinguish between the universal and the particular in the grammar of the Greek and Aryan."

We may now briefly sum up this chapter; but before doing so let us again apologise for the sketchy and at times dogmatic nature of our treatment of the subject-matter. Our attempt to give in the course of a few pages a comprehensive over-view of the relations between psychology and the 1

1 Introduction to the Science of Languages; pp. 11 ff.
more speculative fields of enquiry, philosophy, metaphysics, and so on, could have led, however, to no other treatment. The subject would require volumes if the positions taken were to be fully expounded and adequately justified.

We shall say, then, that if psychology is to progress it had better steer as clear as possible of philosophy, metaphysics, logic, and epistemology. These disciplines are still infected through and through, from any scientific point of view, with errors, fallacies, false assumptions, and false conceptions. That this is no exaggerated statement is very simply demonstrated by the fact that within any one of these disciplines there are divergences of opinion that are as the poles asunder; and when two schools of thought are diametrically opposed both cannot be true, at least one (and possibly both) must be fundamentally in error.

Psychology, therefore, must somehow free its concepts and its methods from the metaphysical and logical implications that cling so stubbornly to them. It must hold fast to what can be empirically verified. It has accumulated many experimentally determined data, especially with reference to the 'lower' mental functions. It must now apply this knowledge to the study of the higher activities of mind; and (here is the rub) it must approach the study of these higher activities without philosophical preconceptions of the kind which we have been criticizing.

Within the last few years psychology has begun to
do this; it has begun to follow the example of the other sciences and to look at its problems objectively and in a more unprejudiced way. There is now ample evidence that the functional and genetic approaches offer the greatest promise; the labors of the Structuralists have uncovered (and we hope will continue to uncover) data of immense value, but their results are only ancillary to the solution of our problems and the structuralist approach will of itself lead to no real increase in our understanding of the higher mental life.
Chapter 3

SOME APPROACHES TO THE PROBLEMS OF PSYCHOLOGY

One of the purposes of this thesis is to examine and briefly to estimate the present status of psychology as a science, more especially with reference to the study of the higher mental activities. In this chapter we shall attempt a very general survey of the field, and shall comment on some of the ways in which the problems are being attacked.

Let us consider first the Introspectionist school, since in the work of this group we find by far the most elaborate and detailed accounts of the operation of human reason. Perhaps as typical an example as we could choose is Dewey's "How We Think", for its title indicates exactly the nature of its content; and while the volume leans slightly towards a popular and untechnical treatment of the subject, it is the work of one of our greatest present-day thinkers.

We may say of this book that it does give simply a description of how we think. It just tells what happens in our minds when our higher mental 'faculties' are acting -- or perhaps better, it tells what seems to happen as far as can be seen from introspecting the process. It is as if a chemist were to confine his report of an experiment merely to describing what was observed to occur -- an effervescence or a precipitation -- without going into the question of what was precipitated or why the results were what they were. In other words there is no explanation or reference to general principles.
This is true not only of this particular book but of the work of most other psychologists of this school, William James, for instance, in so far as he is treating of the thought-process.

In making these comments we have not the least thought of trying to slight or discredit the achievements of these men. On the contrary it is an indispensable preliminary to explanation that we have an accurate account of what does happen. One of the main reasons why James made the remark with which this thesis begins is precisely that we are still very far from clear as to what really happens; and while there remains considerable disagreement as to the facts themselves it is surely hopeless to expect any great advance in the interpretation of those facts. For instance, psychologists are still arguing over what ideas are, and even as to whether they exist at all. Until we arrive at some definite conclusions in such matters we cannot begin to deal with them in any really scientific sense.

There are two main reasons for this unsatisfactory state of affairs. The first is that the vocabulary of psychology is absolutely unstandardized. When a chemist refers to ionization or a physicist refers to the composition of forces we are all agreed as to what they speak of; but if two psychologists speak of 'volition', the chances are that each means something quite different from the other. Attempts to arrive at a rigid definition of such terms have so far led to almost no result. As Maudsley puts it, "It is not possible to write
a sentence concerning our highest mental functions without implying, if the word have any meaning at all, entities which are merely objectified abstractions. Moreover, this must also be borne in mind, for it aggravates our difficulties -- that a word is not merely a definite symbol of something, but a centre also of various associations which affect essentially its meaning; use it then carefully as we may in its psychological sense, we cannot detach these associations from its meaning, and in spite of ourselves we are driven to raise a metaphysical haze."

The second reason is, of course, the complexity, obscurity, and elusiveness of that which we are trying to study. There seems to be no other way of getting at it except through introspection, and whole volumes have been written to show that introspection is as little reliable as any source of information that we have. None the less there is no other way; and, as has frequently been pointed out, the most radical Behaviorist in making his reports on what he observes is really introspecting while he does so.

Those of the Introspectionist school, then, are making an important contribution. Although they are handicapped by the fact that the vocabulary of psychology is such that they cannot speak except in parables, they are gradually working out a more accurate account of mental events from a descriptive point of view.

1 The Physiology of Mind; p.44.
The Behaviorists have been mentioned; let us turn next to them. They have been made the objects of a tremendous amount of criticism; in fact many psychologists refuse even to take them seriously, but make them the butt of 'clever' remarks such as: "Psychology has lost its mind", or "The Polynesians regard thinking as 'speaking in the stomach', thereby anticipating the conclusions of modern Behaviorism".

Along with this there has been much misunderstanding and misrepresentation of the Behaviorist viewpoint, partly because one Behaviorist is commonly taken as expressing the views of all the others -- which is by no means the case since some of them find themselves in fundamental disagreement with J.B. Watson, who seems to be the accepted spokesman. For instance some members of the school arbitrarily rule out all phenomena of consciousness and all data of introspection from psychology, on the ground that these things are not open to scientific study. But others accept introspection and regard it as a perfectly legitimate means of obtaining reports on obscure internal reactions which are so subtle that they can be detected only by the one within whose body they are occurring; and their quarrel with consciousness is merely that they claim "to render a more complete and a more scientific account of human achievement without the conception of consciousness, than traditional psychology is able to render with it. The factors which traditional psychology vaguely classifies as conscious or mental elements merely vanish without a remainder
into the biological and social components of the behavioristic analysis." The writer just quoted (Weiss) further explains that "behaviorism in psychology is merely the name for that type of investigation and theory which assumes that man's educational, vocational, and social activities can be completely described and explained as the result of the same (and no other) forces used in the natural sciences."

To the Behaviorists it seems that traditional psychology is hopelessly tangled up beyond all possibility of extricating itself, with metaphysical abstractions; and no matter how carefully its expounders insist that such terms as reason, emotion, desire, are merely classificatory names given to the results of analysis of mental states (which 'states' seem to the Behaviorists to be themselves very dubious entities), it seems that these terms cannot be prevented from surreptitiously turning into causes. Behaviorism is fundamentally an attempt to extricate psychology from this metaphysical quagmire; and, as is often the case with movements which are basically protests, it has swung to an extreme that seems unreasonable to many students of the subject. It is also, however, an attempt to divert psychology from a preoccupation with analysis and classification to a functional and dynamic viewpoint.

We shall sum up this brief estimate by saying that the value of Behaviorism is not so much, we believe, in any

great contribution that it has directly made, as in its very
cogent and well-founded criticisms of the traditional view-
point. It has drawn attention very pointedly to certain
marked weaknesses in orthodox psychology, but the danger is
that orthodox psychology will be so preoccupied in demonstrat-
ing that Behaviorism is not to be taken seriously that it will
fail to profit as it should from these very pertinent critic-
isms.

Dewey propounds as an hypothesis that "thinking
starts neither from an implicit force of rationality desiring
to realize itself in and through and against the limitations
which are imposed upon it by the conditions of our human ex-
perience (as all idealisms have taught), nor from the fact
that in each human being is a 'mind' whose business is just
to 'know' -- to theorize in the Aristotelian sense; but rather
that it starts from an effort to get out of some trouble,
actual or menacing." The Behaviorist points out that ortho-
dox psychology now claims to agree with this hypothesis, but
that while it states in a Preface or Foreword its acceptance
of this view it proceeds later to contradict itself by giving
what is fundamentally an idealistic account of rational
thought.

We have several times mentioned that traditional
psychology consists for the most part of description, analy-
sis, and classification. These three things are decidedly

1 Essays in Experimental Logic; p.23.
involved in the scientific study of any group of phenomena; but there is another thing that is also involved, namely the detection of basic principles to which all particular phenomena can be referred, this reference constituting 'explanation'; and it is precisely here that psychology has made the least progress. We shall deal briefly with the few attempts that actually have been made in this direction.

First, certain Behaviorists (and others) maintain that these ultimate general principles can only be those of chemistry and physics; that there are no vital phenomena which are unique, unparalleled, and inexplicable on strictly physical principles; that there is no life force which is different from so-called material forces; and that mental life must ultimately be described in terms of movements, and of attractions and repulsions between electrons and protons in a space-time continuum.

With regard to this view we have these comments to make; that in the light of the evidence at present available we are not justified in accepting this dictum, for there are mental phenomena which, as far as we can now see, cannot be forced into any such schema; and that whether or not mental life can be explained in terms of electrons and protons, there seems little prospect for a long time to come of any such explanation being forthcoming. Nevertheless the movement of psychology is now definitely towards a materialistic explanation.

See beginning of chapter 4, below.
tion; purely psychic causation is being less and less ap­pealed to.

Secondly we shall mention Spearman's recent volume, "The Nature of Intelligence and the Principles of Cognition". This interesting book is an attempt to state the basic principles (analogous to Newton's Laws of Motion or Principle of Universal Gravitation in physics) in terms of which all mental phenomena are to be explained; and it includes also a restatement of the subject-matter of psychology in terms of the basic principles laid down.

We cannot give here even the briefest summary of Spearman's book, for to be adequate such a summary would require more space than we can afford. We shall only say that thus far his cognitive principles have not been generally accepted by psychologists; and further, that they seem to imply the existence of unique mental powers of a transcendental nature, and are thus not in line with the current tendency of psychology.

Thirdly we must mention that theory, exemplified mainly in the work of E.L. Thorndike and adopted by the Behaviorists, which explains all mental phenomena in terms of the formation or reinforcement of neural 'bonds', and traces all learning to a process of 'conditioning'.

This theory has met with a fairly general acceptance because its proponents have advanced a great deal of experimental evidence in support of it; but there is a growing
realization that at best it contains no more than certain elements of truth. The functional and genetic schools of psychologists (and especially those interested in what is known as the 'Gestalt' theory) have succeeded in showing fairly definitely that Thorndike and the others arrived at their hypothesis through having misinterpreted their experimental results, and that a mass of other results can be adduced which absolutely conflict with the 'bond' theory.

We turn next to a brief discussion of the 'Structural' viewpoint, which aims to analyse consciousness into its elements. Of course there is no literal separation; these elements are discriminated within more complex processes which are thus reduced to conglomerations of sensations, images, etc.

This analytic approach has proved very fruitful in other branches of science, and it seems to meet something that we feel as a sort of logical necessity to reduce to its ingredients anything that we may be studying. But in psychology the case seems, in the light of our present knowledge, to be otherwise. If we analyse a feeling, all we find are certain qualities of sensation; the affective tone of the whole experience eludes us, it cannot be explained in terms of the individual sense qualities. We find the same sort of thing if we attempt to analyse perception. According to R.M. Ogden, experiments on clang-analysis have shown that if a component of a clang is reproduced with the exact pitch, intensity, and quality that

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1 See, for example, criticism of Thorndike's results in Koffka's "The Growth of the Mind", chapter 4.
it had within the clang, it nevertheless sounds quite different in isolation from its sound as a part of the clang. "If the clang were a mere combination of partial tones, its ingredients taken separately ought to have been heard as identical with their separately reproduced counterparts. But this was not the case. This shows that membership in a clang alters the phenomenal character of the partial tones. A phenomenal configuration, such as a clang, is both something more than and something different from the sum of its ingredients; for these ingredients are no longer separable entities, but members of a 'whole'."

When we have analysed an experience into all its elements we find that the elements, like Humpty-Dumpty, cannot be put together again — that we cannot reconstitute the experience out of its ingredients. One reason for this may be that what is apparently the simplest sort of mental experience may really be of a complexity that we can never hope to analyse. (For instance, Wheeler wrote a thousand words of introspective analysis of his experience during a moment of indecision when he was choosing whether to add or subtract two numbers). If this be true, it is probable that any analysis we do make is extremely faulty and omits essential elements that we can never hope to discriminate.

But even if this were not so — even if we could discriminate and state every element that enters into a con-

1 Psychology and Education; pp. 149 and 150.
scious experience -- the fact remains that the experience as a unitary whole is more than the sum of its parts, that as a whole it possesses a unique quality or 'flavor' which somehow vanishes or is destroyed during the analysis. We shall return later to this consideration; meanwhile we shall say that while the Structuralist analysis can increase our fund of information, it can never of itself lead to an explanation. Those who believe the contrary have fallen into the error of regarding sensations of vision, contact, movement, etc., and also images, as the primitive data of experience out of which more and more complex phenomena are compounded; whereas the exact reverse is the real state of affairs -- the primitive data of experience are exceedingly vague and confused, and it is only later that we learn gradually to discriminate the elements we have mentioned.

Since the situation can be conceived in terms of discrete stimuli it has been supposed that behavior can likewise be conceived in terms of unitary responses, chained reflexes, and the like; but this falsifies the data by leaving out the pattern quality which is precisely what is unanalyzable. The physical situation and the biological response are not two things as far as psychology is concerned; they interact so as to form one complex. L.W. Cole says that the formula 'stimulus-reaction' is too simple to account for human behavior, that the formula is rather 'stimulus-sensation-meaning-reaction to meaning'. Certainly we shall agree with his
first statement, if perhaps not entirely with his second. Of Psychophysics we need say little in this thesis; like Structural psychology it is a useful, even an indispensable supplement to the work of the functional and genetic schools, to which, together with what is called Comparative psychology, we shall turn in the next chapter.

1 Factors of Human Psychology; p.19.
We have already referred to the tremendously complicated nature of the field of psychology and to the fragmentary nature of the facts at our command. The consequences of these things are, first, that it is impossible to give a compact and highly systematized form to this science, and second, that it is inevitable that there be wide differences of opinion between schools of thought.

Before proceeding to discuss the line of approach which seems to us to give most promise of being fruitful, we shall touch on certain considerations which we think must be kept in mind.

First, we must consider certain characteristics of the total reactions of organisms which, according to many observers, cannot be reconciled with any mechanical scheme. Some of these are: (a) Spontaneity; (b) the action persists after the stimulus has ceased; (c) the activity comes to an end after a certain purpose has been achieved; (d) behavior is modified by previous experience. These may perhaps be summed up by saying that the organism acts as a whole, and not in its various parts.

Mechanical explanations such as tropisms and conditioned reflexes have been advanced to account for these phenomena. But it is worth noting that, as McDougall has recent-
ly pointed out, decerebrate animals show reflex activity but do not show conditioned reflexes; they show a meachanical regularity of behavior but all spontaneity has disappeared.

Other observers, therefore, find it necessary to postulate some unique vital force to account for the facts; and we find advanced such theories as Psycho-physical Parallelism, Emergent Vitalism, etc. The view taken in this thesis is that while these theories are of considerable interest from the philosophical point of view, psychology has at present no concern with them; they are premature, and psychology has a long way to go before it gets its data in such shape that hypotheses of this kind can be profitably examined.

Nevertheless psychology must accept as one of its data the fact that the behavior of living organisms is teleological in its nature. What has to be done is to free the dangerous term 'teleological' from its metaphysical implications, and to study the facts without theoretical presuppositions.

Secondly, we shall take the ground that the fact of consciousness cannot be successfully ignored; to ignore it would be deliberately to discard many of our data. We cannot enter upon a detailed argument in support of this position; we must simply repeat what was stated earlier, that there are facts which can be ascertained in no other way than by introspective report of conscious experiences. For instance, Cole

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1 An Outline of Psychology; pp. 55 and 56.
says: "A dose of hasheesh is said to produce not only vivid hallucinations but a terrible fear of impending death. The former effect is general but is the latter due only to an idiosyncracy of certain nervous systems? Only further introspective reports can decide."

Thirdly, we wish to suggest that in psychology there have been historically two tendencies: For a very long time it was usual to emphasize the tremendous difference between human and animal mentality, or even to suppose that the former is qualitatively *sui generis* so that it had to be studied in isolation as having little or no relation to the latter. Then more recently the tendency has been to emphasize the genetic relationship between the two and to stress similarities much more than differences, with the result that deliberation and thought have been reduced to 'chained reflexes' or to a mechanical matter of associations fixed through the operation of trial and error or through the so-called Laws of Learning.

We believe that psychology must take the middle ground as between these two views; or rather that it must keep in mind the continuity that can be traced in behavior at all levels from the lowest to the highest, and at the same time it must not lose sight of the fact that as far as we can now see there is a great gulf between human and animal behavior. There is nothing to be gained by ignoring the tremendous

1 Factors of Human Psychology; p.23.
difference between reflex and deliberate action; and we think that at present the continuity between human and animal behavior is being too strongly emphasized (perhaps in the interests of a passion for logical simplicity). It must not be forgotten that language and a time-sense (especially of the future) seem to be exclusively human, and that these to things are what make possible thoughtful, deliberate, conscious action.

It may be objected that what we have just said involves a contradiction; that there cannot be at the same time a continuity and a gulf between human and animal behavior. This may be so from a logical standpoint, but we are dealing with psychology rather than with logic, (or rather with what some writers are beginning to call 'bio-logic').

It would be interesting to deal with this point at length, but all we can do here is to explain that what resolves the apparent contradiction is this: Recent studies have gone far to show that development is often saltatory in character, that in the field of mental phenomena there occur transformations which involve the sudden emergence of something new and different. A fuller recognition of this feature in the evolution of mind is one of the things that differentiate the 'Gestalt' from the other schools of psychology. (It may not be amiss to point out parenthetically that this notion of saltatory development shows a parallelism with (a) mutations in genetics, and (b) the Quantum theory in physics).

Fourthly, we maintain that as far as human psycho-
logy is concerned, social antecedents and social context are among the basic determiners of behavior. Warren and Carmichael say that a complete psychological description involves: (a) the physics of the stimulus; (b) the physiology of the receptor-neuro-muscular systems; (c) introspectively known events of mental life. But we cannot agree that these three collectively constitute a complete psychological description; we insist that all behavior occurs in a context (which context includes patterns of mental, physical, and social events, contiguous and remote in time and space), and that this context is an essential determiner of behavior. Further we insist that a context is a configuration which possesses a unitary character that defies analysis.

Some of the most important ways in which the social context affects human behavior are: (a) We learn to react discriminatively to an enormous number of aspects of our environment which are ignored by animals. (b) The great majority of the stimuli which affect us acquire the character of signs of something not immediately present; and it is to this sign-character rather than to the crude physical stimulus that we react. And incidentally we can ordinarily find in the mere physical characteristics of a stimulus not the slightest clue to its symbolic 'meaning'. Animals as well as humans react to the meanings of stimuli, but only among humans do we find a tremendous use of conventionally determined meanings. (c) A

1 Elements of Human Psychology; chapter 4.
point which is often overlooked is the extent to which human actions or responses (taken in the widest sense) serve as stimuli to other human beings. The degree to which this is the case with animals is negligible in comparison with ourselves, and there are those who say that we have here one of the most important factors differentiating human from animal behavior; upon it depend, as a moment's thought will make clear, all human cooperation, human education, and almost all human achievement in general.

We shall point out finally that in spite of the pronouncement of Warren and Carmichael quoted above, psychologists cannot in practice ignore the contextual determiners of behavior. Now these contextual features are, even for relatively simple items of human behavior, so hopelessly intricate that we cannot imagine the possibility of ever tracing them out in their completeness; and not only so, but for no two individuals are they alike. This is one of the main reasons why psychology is such a tremendously complicated study, and why we still have the tremendous divergences of opinion that we mentioned at the beginning of this chapter. None the less progress is being made; and, as in the cases of the other sciences, we are progressing to the degree in which we can discern uniformities and general principles in the mass of particular and seemingly accidental data.

Let us now indicate what appear to us to be some of the more promising lines of further investigation.
We believe that the growth of mind must be conceived genetically as successive differentiations of function which arise (sometimes, as has been said, in saltatory fashion) out of an original amorphous, undifferentiated, 'all-or-none' type of behavior; and that these can best be conceived as patterns of behavior that articulate themselves into more and more coherent wholes, which are not susceptible of analysis into elements because analysis destroys the integrated pattern-character the unitariness of which is essential to its meaning.

We think, further, that the stimulus-situation must also be conceived as patterned. Psychological experimentalists have commonly analysed such stimulus-patterns into discrete stimuli and have proceeded to study separately the experiential correlates of each, the assumption being that the mental phenomenon is the sum of its parts. Such studies have had their value, but in future there will have to be taken into account the results of other work which has clearly demonstrated that the pattern itself plays an important part in determining the mental phenomena. As Koffka says, "the assumption which is commonly made that sensation is determined once and for all by its stimulus, will simply have to be abandoned."

It is becoming clear, also, that successive differ-

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1 See chapter 5 below.
3 The Growth of Mind; p. 137.
entiations of mental activity are functionally correlated with successively discriminated aspects of the environment, and that it is in some such sense as this that we must interpret such terms as 'adaptation' and 'teleology'. It follows that the organism is receptive to the integrated pattern of the environment precisely because the organism is possessed of a counterpart in function. It may be that we can find here the basis of the philosophical doctrine of Psycho-physical Parallelism.

Another recent advance (or rather a laying bare of previous misconceptions, which will make progress possible) is that certain mental elements, formerly thought to be 'primitive' and original, are now found to be secondary and derivative. For instance, C.J. Herrick and G.E. Coghill have found in their investigations of a salamander known as Amblystoma that in the larval stage the animal reacts as a whole, and not until a later stage of development do we find that this total-reaction is replaced by reflexes. They state that "the typical two neurone, short-circuit connection between dorsal and ventral root-fibers......appears late in development and is not to be regarded as a primitive form." Herrick says further in another connection: "The concept of the reflex is not a general master-key competent to unlock all the secrets of brain and mind......Attention should be especially directed.

1 The Development of Reflex Mechanisms in Amblystoma. Journal of Comparative Neurology, Vol. 25, 1915; p. 84.
to the futility of attempting to derive intelligence and the higher mental faculties in general from reflexes, habits, or any other forms of fixed or determinate behavior. \footnote{Neurological Foundations of Animal Behavior; p.234.} The nervous system is more than an aggregate of reflex-arcs."

A similar instance is the recognition that such an apparently complex perception as that of the 'friendliness' of a certain facial expression is far more primitive than is the well-known 'visual sensation of a red patch' of current theory. The initial simplicity of a baby's perceptions is not that of the so-called \underline{simple} sensations, which are instead the product of a higher development of the power of discrimination.

It is on such considerations as these that were based our earlier remarks concerning the Structural viewpoint in psychology. Such facts make it imperative to reverse that viewpoint; it appears that complex perceptions are not built up out of 'simple' sensations, nor complex behavior out of reflexes. The genetically primitive sensations are vague undifferentiated wholes, reacted to as wholes, out of which are later discriminated (in some cases) the so-called simple sensations.

Earlier in this thesis we mentioned errors into which psychologists have fallen in their desire for logical simplicity. We shall now show our idea of how the notion of the relation between sensation-stimulus and movement-response should be recast.
This has been thought to be of the nature of a cause-and-effect reaction; the stimulus acted on the sensory system and resulted in various movements of a responsive nature in the motor-affective-glandular system, the central nervous system playing in the whole process the part of a coordinating and integrating agent.

It now appears that the sensory and the motor systems interact so much more intimately than was formerly realized that we can best conceive of them as forming one self-adjusting system. Take for example the case of a lumberman wielding an axe. The ordinary account would say that the sight of the tree, the feel of the handle of the axe, the lumberman's mental 'set', etc., together constitute the stimulus situation; while the contraction of the necessary muscles constitutes the response. But the case is not so simple. While the muscle-fibres are in the very act of contracting, kinaesthetic sensations from them keep the lumberman informed as to the position of the various parts of his body; and in the light of these sensations the precise pattern of innervation of the muscles is continuously kept adjusted. Meanwhile other sense organs are also adjusted to suit the needs of the momentary situation, while in turn they supply sensations which again help to adjust the muscular action.

It is mathematically certain that the lumberman never in his whole lifetime struck two axe-blows in which the minutest details of muscular innervation were exactly the
same. In other words, every time he wields his axe he does something that to an extent is new and unprecedented. He may nevertheless have learned to use an axe with extraordinary skill; but in the light of our statement that each stroke contains new elements, the 'chained reflex', 'bond', and 'association' theories are seen to be quite inadequate to explain learning. These theories are also found deficient on other grounds which we shall pass over. We desire here only to make the point that the sensori-motor 'mechanism' is one integrated, self-adjusting, reciprocally coordinated whole; the stimulus does not simply release the response through a system of connections.

No sensory learning is without motor components, and no motor learning is without sensory components. This is well illustrated in the disease called locomotor ataxia. In this disease, a purely nervous disorder, the power of walking is impaired or destroyed; yet it is not the motor centres of the nervous system that are diseased, it is the sensory centres. The victim may partly re-learn to walk, but only by substituting other senses for the ones normally used; usually he re-learns to walk by carefully watching his feet.

We shall turn next to the contribution that animal and child psychology can make towards the study of the mental phenomena of civilized adults. Without an adequate of the two former, that of the latter can never be quite satisfactory.

The serious error that has been made is that hypothe-
ses and concepts derived from the study of adult psychology have been applied in interpreting the mental life of children. In genetic psychology old hypotheses have been applied to the new facts. The differences that have been found in the mental processes of children have been ascribed to a lack of sensations, images, associations, etc. The result has been, according to Koffka, that "the psychology of the human adult has not infrequently been unable to define its problems correctly, to say nothing of arriving at serviceable hypotheses." He remarks further that "there is no principle of mental development which we owe directly to child psychology", yet there must be a genetic psychology, and through it we can best understand the human adult. It is necessary to study the child as he is, and not to view him always as an immature adult; and we must especially avoid interpreting observed facts by means of ready-made hypotheses.

E. Claparède makes a similar statement; he remarks that heretofore studies of the child mind have been mainly analytic, lists of children's words, phrases, and errors. But, he says, "this labor does not seem to have taught the psychologist exactly what he wanted to know, viz., why the child thinks and expresses himself in a certain manner; why his curiosity is so easily satisfied with any answer one may give or which he may give himself......; why he affirms and believes things so manifestly contrary to fact; whence comes

1 The Growth of the Mind; pp. 5 and 6.
his peculiar verbalism; and how and by what steps this incoherence is gradually superseded by the logic of adult thought. In a word, contemporary research has stated the problem clearly but has failed to give us the key for its solution." The problem, he says, turns out to be one of quality and not one of quantity. "Formerly, any progress made in the child's intelligence was regarded as the result of a certain number of additions and subtractions, such as an increase of new experience and elimination of certain errors -- all of them phenomena which it was the business of science to explain. Now, this problem is seen to depend, first and foremost upon the fact that this intelligence undergoes a gradual change of character." Child thought appears obscure to adults not because it lacks certain elements but because it is a different kind of thought.

A similar statement to the above can obviously be made of animal psychology. It is as erroneous, somebody has said, to regard a dog as a very stupid man as it is to regard a man as an exceedingly clever dog.

1 E. Claparède, in his preface to J. Piaget's "The Language and Thought of the Child".
Chapter 5

THOUGHT PRIOR TO LANGUAGE

This chapter is a continuation of the previous one in that it will give a further statement of our conception of the functional and genetic approach to the problems of psychology. Before entering on this discussion, however, we should explain that in our view human intelligence is best understood as being constituted of two components which are intricately interrelated but which are discriminable for purposes of study. These are: (a) what may be called organic intelligence, which is relatively independent of social factors and whose rise may be traced through the evolving forms of life from lowest to highest; and (b) the symbolic processes, social in origin. What we shall say is to be understood, of course, in the light of the viewpoint stated, unfortunately in only the sketchiest and most general terms, in the preceding chapters of this thesis.

We may, without doing too much violence to the genetic continuity of its evolution, differentiate three functional stages of differentiation in the development of organic intelligence. These are: (1) The pattern of transmission of excitations is transmitted by the organism as a whole. (2) In multi-cellular organisms there appears a nervous system which has the specific function of transmitting and correlating excitations. (3) Intentions and distinct perceptual patterns are differentiated within the processes of neural correl-
ation. We shall discuss each of these in turn, and we shall hope that the discussion will make sufficiently clear what we mean by organic intelligence without our being put to the necessity of undertaking a formal definition.

Our first stage is well illustrated by the behavior of an amoeba as seen under the microscope. The protrusion and retraction of the pseudopodia are not random, but are integrated and coordinated into patterns which are conformable with the characteristics of the environmental situation; the behavior is adaptive, "there is the establishment of a new equilibrium in an individual organism in relation to some condition which is itself an operating factor in initiating the changes involved in the adjustment." 1 Jennings, after long and detailed study, has stated that if the amoeba were a large and conspicuous animal we should attribute to it states of pleasure, pain, hunger, desire, etc., just as we do to a dog. 2

It is noteworthy that the reaction of the amoeba is not fixed in a mechanical sort of way; it is more or less modified by the organic disposition or 'set' of the animal at the time, and by immediately preceding experience. It is in this fact that we find the genetic origin of learning and habit formation.

An example of a simple form of the second stage is

2 Quoted by R.M. Ogden in "Psychology and Education"; p.34.
the primitive 'nerve net' in the medusae or jelly-fish. The study of the function of such a nerve net in facilitating adaptive behavior brings out another most important point: that neural structures originate in, and function in integral relation with, the whole organismic system. "The tendency to isolate the treatment of neurological behavior from other types of behavior has been a cause of very serious misconceptions of intellectual functions."

With the appearance of specialized conducting cells we have (a) sensitiveness to a greater variety of stimuli; (b) possibility of more complex responses; (c) the mechanism for the establishment of specific response patterns on a basis of mutual reinforcement between certain conduction units and mutual inhibition between others.

At this stage there appears much more noticeably the phenomenon to the importance of which we drew attention just now: namely, the modification of the response in accordance with the physiological state of the organism at the time. For instance Herrick says that "the identical stimulus applied to an earthworm may at one time be followed by a forward crawling and at another time by an avoiding reaction in the form of a quick jerk which brings into play an entirely different set of nervous elements."

The condition which is produced within an organism

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1 Lorimer; op. cit., p.14.
when physiological equilibrium is disturbed by stimulating conditions (with resulting changes in metabolic rates, etc.) is usually called a 'tensional' state. Another most significant point is to be noted with regard to such tensional situations, especially when they are sustained (i.e., not immediately resolved back into equilibrium by some quasi-mechanical reaction). This is that distinctly non-neural factors seem then to play a decisive part in the integration of the total response -- such factors as glandular activity, respiration changes, changes of muscular tonus, etc. It seems probable that it is in relation to such factors that the phenomena of consciousness appear.

Again, these non-neural processes are relatively obscure; they are "capable of only partial introspective report, of little direct instrumental experimentation, and are primarily affairs of inferential discovery (like the atoms of the physicists)". Now these minute and obscure processes have exercised a peculiar role in philosophical theory; they have been conceived of as 'spiritual' and as discontinuous with 'objective reality', thus generating the problem of finding how the two can be brought into relation with each other. "The emancipation of the human mind from this dilemma may fairly be said to be the greatest achievement of modern philosophy".

In the third stage we find the appearance of intentional patterns and of perceptual patterns, and we shall dis-
cuss these two separately.

The relatively obscure and implicit processes of which we have just been speaking constitute the basis of the intentional patterns. When there is a sustained tensional state these processes are maintained in a state of sustained excitation, and therefore exercise a dominating influence over the articulation of the successive reaction patterns which are initiated (as in the case of a hungry animal which sees food that it cannot reach). Such sustained excitation patterns we call intentions, and when they are symbolized we may call them purposes. It follows that the reaction-patterns will be adapted to the stimulus situation -- they are suggestions; and it is characteristic of the higher forms of intelligence that these suggestions are experimented with implicitly rather than overtly. With lower forms of intelligence the reaction patterns tend to be overt, and to be poorly adapted to the situation unless the pattern of that situation is one to which the organism is functionally adapted. In so far as this overt behavior is ill-adapted to the situation we call it 'random' or 'trial and error' behavior.

The appearance of perceptual patterns is extremely important in relation to the first beginnings of what may be called thought (implicit experimentation). When a situation is perceived as an articulated configuration, the pattern of neural activity must correspond in some sense (tending towards a point-to-point correlation) with the pattern of the situation.
The definiteness of such neural patterns will range in a gradient all the way from extremely vague to relatively precise and distinct. As distinctness increases, a point will be reached where it is possible for the neural pattern to be reinstated in the absence of the corresponding stimulus situation; and we then have an implicit reconstruction of an absent situation. This we may consider to be the genetic origin of memory, as distinct from the mere affective tone of familiarity attaching to a situation. There will appear, too, the possibility of such an implicit reconstruction functioning in a sustained tensional situation; and this is a sort of 'thought' -- it is the organic intelligence of which we spoke earlier in this chapter.

To gain a clear conception of this organic intelligence as it appears in action, it is indispensable to read Köhler's "The Mentality of Apes"; and we believe that the observations there described can be usefully interpreted in terms of the above account. From this book we can well see the peculiar limitations of this kind of intelligence as it appears in its highest manifestations in the behavior of a group of notably intelligent animals.

Köhler himself says that the thought of his apes, while incorporating elements of absent situations, cannot operate detached from the immediate situation (usually a keenly desired bunch of fruit). We have read elsewhere of another

\footnote{The Mentality of Apes; p.282.}
illustration: a savage trying to put on and lace up a pair of boots, the hypothesis being that he has no words for the boots or laces; necessarily his thought would be mostly unverbalized but he would probably be thinking quite actively. His thought, however, would be preoccupied with the tensional situation and would be concerned with manipulations, touch perceptions, etc. It would be a kind of perceptual thought.

The distinctive feature of the 'free' intelligence which is characteristic only of human beings is that it can hold in mind a problem which is not enforced by the immediate perceptual situation, and can consider and freely experiment with suggestions and inferences. Moreover, it is our belief that the symbolic processes are what liberate thought. (We shall amplify this statement in the following chapter).

Dewey says that in what we have called 'organic' intelligence, reaction to a suggested thing is much the same as if the suggested thing were actual; e.g., an animal may react to the scent of a man exactly as it would to an actual man; the tendency is towards uncritical acceptance. A thing, he says, means another thing, it does not mean a meaning. What is needed is some device for seeing such things as they are, viz., as inferred objects; then we can get into free, flexible, and effective relations with the thing indicated. "Words are the great instrument of translating a relation of inference existing between two things into a new kind of thing
which can be operated with on its own account."\footnote{Essays in Experimental Logic; pp. 431 ff.}

In summarizing this chapter we may remark that we have had no intention of giving an account of pre-symbolic thought. What we have tried to do is to indicate briefly yet definitely the genetic origins of the higher mental processes; and also to indicate ways in which Genetic psychology can illuminate our understanding of the processes.
In passing from the consideration of organic intelligence to that of the free intelligence made possible by the device known as the symbolic processes, we shall have to note that there is no clear-cut dichotomy between the two, for the one shades into the other. Yet the indeterminate region between them is a great deal narrower than in the case of most of the other distinctions that psychologists make for convenience of study, (between sensation and affection, for example). The distinction is relatively a sharp one, and may be said to consist in whether thought can or cannot operate detached from the immediate perceptual situation.

But this distinction which we can so easily make in theory is very hard to make in practice, for the reason that commonly the two kinds of intelligence interact in a very intricate fashion. An example is the process of solving a geometrical exercise; in this case the thought fluctuates back and forth between quite abstract inferences and the actual figure. (Yet this case is complicated by the fact that the geometrical figure with which we work is not only a sort of perceptual situation, it is also to an extent a symbolic device, like language itself.)

When a man is untangling a snarled length of string, he is using almost exclusively his perceptual, organic intelligence. We have already mentioned its use among animals
on a high plane in the case of Köhler's apes; some very inter-
esting illustrations of its operation on a lower plane may be
found in the Peckhams' "Wasps, Social and Solitary", and the
descriptions in this book will also make abundantly clear how
flexible can be that behavior commonly called strictly instinct-
ive.

We know of no specific study that has been made of
the development of the symbolic thought processes from birth
to maturity. Existing accounts of child psychology have usu-
ally been given from another angle, as was pointed out by
Claparède in the passage which we quoted above; and the work
of the Sterns is a good example of this.

Piaget's two recent books, "The Language and Thought
of the Child" and "Judgment and Reasoning in the Child", come
nearer being the sort of study which we have in mind; but they
deal with the development of childish intelligence from age 6
up to near the beginning of adolescence, and at age 6 symbolic
intelligence is already well established. These books, however,
bring out some very interesting points that have hitherto been
neglected, and on that account should be read by all students
of the subject.

Even less has been done on the study of the evolution
of symbolic thought from the ontogenetic (as distinguished from
the phylogenetic) point of view. Such studies have usually
stressed the ethnological and anthropological aspects rather
than the psychological; and even where they have been truly psychological, the tendency has been to apply to savage races the concepts derived from traditional accounts of the mental activity of civilized adults, a method which has led inevitably to misunderstandings and false interpretations.

On the other hand we have many splendid descriptive accounts of how rational thought functions in its developed form. As good examples as any are two works which we have already mentioned: parts of Dewey's "Essays on Experimental Logic", and for a more popular treatment, the same author's "How We Think". In no such work, however, have we found an explicit distinction made between our two forms of intelligence. There is an implicit acceptance of the two aspects and casual references are made to them; but the two forms are not explicitly recognized and separately treated. Rational thought is described as it actually operates -- as an intricate interplay of symbolic intelligence with what we have called 'organic' intelligence. We believe that the full recognition of the distinction which we are urging would clarify some current issues in psychology, as, for example, the difficult question of imageless thought.

It should be explained that we owe the idea of treating the subject of thought in this way to F. Lorimer's "The Growth of Reason", and also that in the previous chapter, we followed to a certain extent his treatment of pre-linguistic mental activity.
We shall now discuss some fundamental considerations that should be taken into account in the further study of symbolic thought.

I. We must recognize that symbolic thought is by no means restricted to verbal symbols, although these latter play a predominating part in all except the very lowest forms of it. Dewey, in the works that we have just mentioned, lays very great stress on the fact that, except in infancy, virtually everything that we perceive acts as an indicator of something else -- it is a sign. It is exceedingly difficult to conceive of a perception devoid of all 'meaning'. Cole gives the illustration of a class of psychology students being frightened at a sudden noise over their heads, until they recognized it as snow sliding off the roof; but we would point out that even in this case the noise was not perceived merely as a noise, without signifying anything at all; it signified 'something to be afraid of'. Another often quoted illustration is the experience that most of us occasionally have of perceiving a printed word in a very peculiar way, as if it were stripped of all associations; the word takes on a strange and unfamiliar appearance.

This universal perceiving of things as signs lies, of course, at the basis of all inference; and much work has been done on the topic. All that we wish to emphasize here is our belief that some of this work has got itself 'side-tracked' by theoretical presuppositions derived from metaphysics and
formal logic.

Several writers make the following distinction between the terms 'symbol' and 'sign'. Symbols include language (spoken, written, and gestural) together with any other existences that are conventionally set aside, as it were, to serve as indicators of other things. The term sign is broader; it refers to anything at all which is taken as indicating something else; for example a farmer will take the sudden scurrying of hens into the chicken-house as a sign of the presence of a hawk, and will immediately look into the sky. In this thesis we are concerned more particularly with language symbols, and our purpose in this part of the chapter is to indicate, without going into any detail, certain aspects of language as considered from the psychological standpoint.

II. It may be worth while to point out that there has long existed a doctrine with regard to the function of language, namely that language is primarily the expression of thought. This notion still seems to persist sufficiently at least to color current accounts; but it is being generally superseded by the theory (held by Malinowsky and many others) that primarily language is an accompaniment of action; that it is used secondarily to influence the action of others through the expression of desire, emotion, etc.; that its tertiary function is to enable us to enter into more intimate social relations with others; (the so-called 'phatic' communion); and that only after all these is it the expression of thought.
III. Another misconception, more of a metaphysical nature, is that language is a duplicate or a sort of shadow-soul of reality, a concept which dates back to the Greeks; and it is possibly a partial consequence of this concept that philosophers (Descartes, for example) have thought that they could arrive at 'Truth' through a study and manipulation of words. We do not propose to comment on this idea, but it leads to one or two considerations with regard to the general theory of symbolism which we shall briefly mention even though they are really a digression from our main topic.

We have stated (in chapter 2 above) that the whole question of symbolism is now beginning to receive a good deal of attention. It would be possible to write an interesting thesis on the subject of language as a potent agent of misconception -- as an actual hindrance to thought and communication. Basically the trouble with language is that words are used without definite reference. Ten men use the same word, but they mean ten different things by it; or again, one man uses a word and another hears and interprets it, but the thing to which the interpreter believes it to refer is not the same as the thing which the speaker had in mind. Yet we proceed on the general assumption that a given word 'means' the same thing to all who say or hear it; and to this naive assumption is due much current controversy of the kind which we have characterized above as verbal.

An ideally perfect language would provide one defin-
ite symbol for each discriminable entity in the universe. Language in the ordinary sense can of course never even remotely approach this ideal; but we may note that the symbolic device known as mathematics is theoretically capable of becoming in this sense a perfect language, and it is partly for this reason that language is becoming more and more a matter of mathematics as far as science is concerned -- in fact mathematics is tending to become the language of science.

IV. There is another source of error to which we wish to draw explicit attention. This is the notion that the structure of thought is mirrored in the form of language, so that the former can be detected by a study of the latter. This, of course, is not to be interpreted as a statement that language can give us no clue to thought.

We must also guard, as Jesperson says, against the assumption that the word is the unit of thought; genetically the sentence is primary and the word derivative.

V. As to the psychological function of words in enabling us to 'fix' concepts by substituting for them a symbol with which the mind can easily deal, we need say nothing here, for the subject is dealt with in detail in most works on psychology; yet we must not lose sight of the fact that this function of words is a basic factor in the establishment of symbolic as contrasted with organic intelligence. It will for 1

1 The Philosophy of Grammar; pp.305 ff.
the same reason be unnecessary for us to deal with the way in which the meaning of a word becomes at once richer and more precise; although we may remark that we do not entirely agree with the usual explanation of this phenomenon in terms of a sort of accretion of associations.

Having thus advanced in somewhat random fashion the above general considerations, we shall conclude this thesis with a brief discussion of the lines along which the study of symbolic thought is proceeding.

I. We mentioned just now (p. 60) that language originated in relation to social behavior. We shall now supplement this remark by pointing out that, although there is as yet no satisfactory theory of the genesis of language, it seems probable that before there was developed any grammar, syntactical structure, or naming function, social behavior was integrated with the assistance of vocal sounds of the nature of interjections and imperatives. Thus a beginning was made whereby certain specific sounds became the instruments of specific social adjustments. From this beginning was gradually built up a condition in which elaborate and intricate ways of social behavior became organized about words. Today the child is born into an environment where this organization already exists; consequently the civilized ways of life and the correlative linguistic structure are learned together by the child.

It is now fairly generally realized that the ling-
uistic processes overshadow all others as a medium of inter-
action between the individual and his social environment; and
that reciprocally they furnish the great means whereby society
humanizes its members. This social context of the language
function has been much studied of late. Again, the language
processes occur in a psychological context, and as we have
already pointed out, most textbooks in psychology deal at some
length with the subject of language in this latter connection.

What seems to be needed now is a study of the
interaction of these two sets of processes. We must unravel
"the main lines of interaction between the structure of organic
intelligence and the structure of social organization, and we
must recognize adequately "the role of vocal processes in this
interaction."

Jean Piaget, in the two works which we have prev-
iously mentioned, has made a start in this direction; and his
investigations lead him to attribute mainly to social factors
the genesis of the notion of relations between things -- es-
pecially the relation of causality. More specifically, he
finds that everything is taken for granted by very young child-
ren, and that it is not until the child really converses with
other people that he finds it necessary to adapt himself to
the viewpoint of others, to question his own beliefs, to just-
ify his notions, and therefore to modify and clarify his ideas
of relations.

F. Lorimer; op. cit., p. 73.
II. It is not possible for us to give here even an outlined account of the development of symbolic intelligence from infancy onward, for the reason that this development still awaits investigation; and one way of investigating the problem would be for the immense mass of material that has already been accumulated by child psychologists to be worked over and re-examined in the light of the theory which we have outlined. This theory is that human reason is of a two-fold structure, its components being what we have called respectively 'organic' and 'symbolic' intelligence; that the development of the former can be traced up through the rising scale of animal life; but that it is through the latter that thought is reconstituted into human reason.

We should like, however, to give an example to show how our hypothesis may be applied to the study of problems which have proved troublesome. The concept of 'general ideas' has been one of these troublesome problems, and we shall try to formulate, in the light of the view that we have expressed, a statement which seems to give promise of a better understanding of this concept.

Functionally, all ideas are general, for they may be thought of as behavior patterns that function in relation to various situations. The difficulty, then, is with the conscious recognition of ideas as being general, and this, we think, is a product of analysis. But this analysis depends on symbolic thought processes, as we shall now try to show.
Prior to verbal thought there is an organic intelligence which is intuitive in its nature, and whose operation can best be described in terms of the Gestalt psychology. We shall say, then, that in this sort of thought the organization of an experience consists in the discrimination and more precise definition of a configuration upon a ground, and that this process involves the inclusion of certain members and the exclusion of certain other elements. Now these two processes of inclusion and exclusion are the genetic basis of synthesis and analysis, but as yet there is nothing in them that can properly be called synthesis or analysis. It is all one process. When we are speaking of a figure becoming defined to say that certain elements are included is the same thing as to say that certain elements are excluded; the act of including involves an act of excluding.

But when an experience is organized on the verbal plane, the configuration which has become defined is named, i.e., a verbal symbol is tacked on to it whereby it is made available for social reference as well as becoming 'fixed' as an available unit of thought. If other verbal symbols are also available, elements that are included in the configuration can be discriminated and named, which constitutes a veritable analysis. Conversely the elements of the configuration (attributes, relations, and what not) can be recognized as constituting the configuration -- a veritable synthesis. Configurations which are organized on this plane we call 'concepts';
they are fixed, and are in a state where they can either be analysed or can be used in such symbolic structures as "This rain is good for the lawns"; they are the instruments of free intelligence. Configurations which have been organized on the organic plane we call 'intuitions'; they are not susceptible of this free mental manipulation. The difference between them and the more highly (verbally) organized configurations can be well summarized by saying that they are percepts rather than concepts (and hence our previous use of the phrase 'perceptual intelligence' as a synonym for 'organic intelligence'; see page 54 above).

Now the recognition of ideas as being general involves the recognition of identities and differences; and this, it appears, is not possible with 'intuitions', the ideas must have been organized on the verbal plane before there can be the necessary analysis.

The above account, as we have given it, is perhaps not very satisfactory; it is too 'skeletal', it needs to be expanded in detail and supported by evidence. But our purpose was not to prove anything; it was to give an example of how our notion of the two-fold nature of human thought may be useful in attacking certain problems that in the past have proved difficult.

III. We suggest further that if our hypothesis be investigated and developed, it may well bring results that will be of interest in the field of mental testing.
Our present intelligence tests are admittedly designed to operate in a sort of 'blunderbuss' fashion; we aim a variety of tests at 'intelligence' in the large, and the relative consistency of results indicates that we do succeed in hitting something definite. Numerous attempts have been made, by statistical study of correlations and by other means, to discriminate constitutive elements within 'general' intelligence. If we could isolate these elements our tests could be made much more satisfactory, and incidentally we should have a much better idea of what it is that we are measuring. Thus far, however, efforts in this direction have met with little success.

It is not to be thought that we are postulating the symbolic processes as the determining factor in the degree of intelligence shown by an individual (his I.Q.); although if our hypothesis be correct it appears that they must be a major contributing factor. In our present tests the assumption is apparently that an individual's social environment (and consequently his symbolic intelligence) remains uniform, and can therefore be treated, mathematically speaking, as a constant; so that the I.Q. becomes a function of some physiological factor such as innate complexity of neural structure or available amount of 'nervous energy'.

Whether or not organic and symbolic intelligence

1 See for example R.M. Ogden, "Psychology and Education"; chapter 17.
can be isolated and separately measured remains to be seen. The difficulty is, as we said previously (p.56), that the two interact so intricately. Many tests have been invented that were thought to be purely perceptual and non-verbal, but work has recently been done that shows fairly clearly that verbal schemata function to a considerable extent even in tests of this kind.

In this thesis we have tried to do three things: (a) to estimate the present status of psychological theory in so far as it is concerned with rational thought and to suggest certain criticisms of traditional views; (b) to outline some of the more promising lines for further study; and (c) to advance an hypothesis concerning the structure of human reason.

This hypothesis is not to be confused with the Behaviorist theory of thought. Bertrand Russell, referring to this theory, says: "True, we talk a great deal, and imagine that in so doing we are showing that we can think; but behaviorists say that the talk they have to listen to can be explained without supposing that people think. Where you might expect a chapter on 'thought processes' you come instead to a chapter on 'The Language Habit'. It is humiliating to find how terribly adequate this hypothesis turns out to be." ²


² The Analysis of Mind; p.27.
We agree with Russell that this theory seems very 'adequate', so much so that there is probably a good deal of truth in it. But we believe that rational thought cannot be reduced to merely language habits; such an hypothesis is too simple to account for the facts, and in this respect it is analogous to the 'stimulus-response' formula which we also criticized on the same ground of over-simplicity.

Lastly, we hope that our estimate of traditional psychological doctrines is not too pessimistic. We cannot convince ourselves that current theories of rational thought are satisfactory, nor can we blind ourselves to the tremendous difficulty and complexity of the problems involved; but we have tried to show that much profitable work has been done, and that promising new theories are being advanced in the light of which there can be reinterpreted the mass of valuable data that have been accumulated by investigators in the past.
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