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## ASSOCIATION AS A FUNDAMENTAL PROCESS OF OBJECTIVE PSYCHOLOGY

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From the early dawn of psychological history when thinkers first began to reflect upon the mysteries of human behavior, they were attracted to the processes of association especially as they are manifest in memorial and kindred activities. Strikingly enough, too, from our present point of vantage, the early Greek thinkers, standing upon a common-sense basis of reflection, merely described in the manner of an unadorned narrative what appeared to happen when one stimulus-object called out a reaction to another stimulus,<sup>1</sup> or when they essayed an account of the incidents involved in the act of remembering or recollecting.<sup>2</sup>

But with the rise of the modern spiritualistic psychology the problem of association became extended and the associational process was no longer looked upon as merely a fact of memory, but became regarded as a property of psychic elements or was considered as an explanatory principle to account for the succession and cohesion between states of mind. Thus, in either case the associational process became a universal condition for all psychological phenomena, even to the existence of a stable mind, and was subject, of course, to all the criticisms of which a thoroughgoing mentalistic psychology becomes the target.

Associationism, however, suffered less from this criticism, as the records of psychological history show, than from a

<sup>1</sup> As the classic passage in Plato's *Phaedo*, 73-6, bears witness.

<sup>2</sup> For example, Aristotle, *De Memoria*, II., 6-11.

general tendency toward innocuousness and superfluity induced by the displacing activity of biological theories. When in the middle decades of the nineteenth century psychological phenomena became looked upon as the activities of biological organisms a basis was found for mental phenomena (which were themselves now considered as processes within the structures of the organism). This basis it is needless to say was the neural apparatus. Now while the data of psychology still remained mental for the biological psychologist, the machinery of association as a general principle of psychic unity he could dispense with, though he retained it to account for the orderly connections between the elements of what he called the purely mental reactions, namely, imagination and thought.<sup>1</sup>

Comes now a time when psychologists are modifying their conception of their science, a time in which psychological phenomena are more and more frequently considered as total unitary adjustments to stimuli, and not either exclusively mental or physiological facts or parallels of the two.<sup>2</sup> As a normal consequence of this new attitude association becomes again a general process involved in all psychological behavior. Increasingly accepted becomes the view that association constitutes the connections between responses and their stimuli.<sup>3</sup> We submit that no psychologist, whatever be his theoretical views, would deny that conditioned reflex phenomena are associational facts.<sup>4</sup> Moreover, the workers in comparative psychology find it most expedient to treat the animal's

<sup>1</sup> For a statement that undoubtedly will remain for a long time to come the classic exposition in English of the history of Association, cf. Warren, 'A History of the Association Psychology,' 1921.

<sup>2</sup> In this connection, we believe that, although Hunter ('A Reformulation of the Laws of Association,' *PSYCHOL. REV.*, 24, 188) appears to be arguing for a reformulation of the law of mentalistic association, proposing that it be not confined to ideas but also be made to include sensations, he is really suggesting that we should make association cover response acts as well as merely mental states. It is interesting to note that Hunter's quotations suggest the fact that while psychologists have always observed the connections between reactions it still appears that their failure to exploit the fact is owing entirely to their mentalistic presupposition.

<sup>3</sup> Hunter (*loc. cit.*) makes this point when he subscribes to the view that the principle of association is the principle of habit formation.

<sup>4</sup> Cf. Warren, *loc. cit.*, p. 257.

organization of stimuli and responses as definite facts of association precisely as in the case of the human organism.<sup>1</sup> Psychological history repeats itself then in the matter of the pervasiveness and importance of associational processes, but with how striking a difference in the two periods. Instead of a mentalistic property or a statement of mental connections, associational processes are now looked upon as definite objective facts of psychological behavior. The purpose of the following paper is to attempt to bring together some of the conspicuous points involved in an objective investigation of psychological association.

I. *The Problem and Nature of Association.*—In its largest aspects the problem of association is the determination of the nature of the orientation of the psychological organism in its surroundings and the means whereby this orientation is achieved. In other words, the problem of association is the discovery of the conditions for the various interrelationships between the organism and its environmental complexities.

In detail, psychological association refers to the effects which specific objects and particular grouping of objects have upon persons in eliciting from them responses of various sorts, and furthermore, the association problem involves the discovery of the effects upon the organism of the various changes in the relationship between objects. Now consider what this means when we add that psychological association carries over to the interrelationships of persons in social situations. Here we must take account not only of the intricate orientation of persons in exceedingly complex surroundings, but moreover, we must observe that the various individuals are mutually influencing each other in the course of such adaptations; so that while changing behavior to adapt themselves to each other they at the same time provide new stimuli for the further modification of the other person's behavior, which in turn creates for the individual in question newer necessities for adaptation and orientation.

<sup>1</sup> Cf. the work of Carr, for example 'Length of Time Interval in Successive Association,' *PSYCHOL. REV.*, 1919, 26, 335.

Precisely how important a psychological phenomenon association really is may be readily gathered from the fact that if we include its elementary forms it is indubitably a *sine qua non* of psychological activity. For the essential point about psychological phenomena is the intimate association of a specific response with a particular stimulus. When the organism has acquired responses sufficient to connect him with a large number of surrounding objects then we consider it as oriented in those surroundings, since the organism will then be able to perform behavior serviceable to itself in the given situation. In more complex situations, that is to say, when responses must be prepared for before their actual operation, and when the response must be delayed and in consequence aroused by substitution stimuli,<sup>1</sup> then we must also have our surrounding objects and events themselves so related as to form interconnected stimuli.

We repeat, that only on the condition that the objects or events of the person's surroundings are orderly and systematically connected can he develop intelligent and rational behavior. For intelligent behavior implies a final directness, certainty, and efficiency of responses which are impossible without a definite interrelationship of the various stimuli with other stimuli and with the person.<sup>2</sup> Let us therefore at the outset observe that we mean to depart from the older tradition of modern psychology and look upon psychological association not as a condition of happenings entirely within the individual himself, as the historical term association of ideas implies, but rather as a series of phenomena involving always the reactions of the person in specific relationships to surrounding stimuli, both things and persons. Not in the slightest does this mean that we entertain the idea of excluding from associational phenomena the connections between the individual's reactions. To do this would mean to pass over an extremely important series of psychological happenings. How far we are from committing such an error may be

<sup>1</sup> As in meaning reactions.

<sup>2</sup> This emphasis of the stimuli factors, in view of the spreading prevalence of the behavioristic conception of association, is probably the main point of our discussion.

judged from the fact that we do not even exclude from the forms of psychological association the connections between stimuli-objects themselves. When we accept the hypothesis that association means the reactional orientation of the individual we thereby make room for all forms of associational connection.

But we hear the strident voice of objection saying, "All this you have written represents association almost entirely as a condition of psychological behavior, an essential condition perhaps, but still a condition merely, whereas by common consent psychological phenomena are constituted of responses to stimuli." Especially pointed appears this protest when directed toward our inclusion among associational data of the relationship between objects, for it practically amounts to a destructive criticism of our theory. And yet an examination of the facts in the case renders this objection innoxious. To this examination we shall now proceed.

And first, we propose to suggest that although psychological association must always involve a prominent element of purely physical relationship between objects, relationships which indeed greatly influence psychological behavior, still such physical conditions do not become psychological data except through the influence they have upon reacting organisms. It is only because an object and its connection with other objects are coördinated with the responses of the persons that they become of interest to the psychologist. This means to say that from a psychological standpoint it is because the proximity of and similarity between reactions are induced in the person by the proximity and similarity between objects, that the latter are admitted into the psychological domain. Now let us see what is the net result that we have reached.

Briefly, we have arrived at this conclusion, that although we cannot exclude physical connections between objects from the domain of psychological association it is to be observed that their inclusion among the data of psychology is only justified because such objects and their association are the stimuli for specific forms of reactions. It remains merely to

add that when we generalize the question whether a physical object is or is not a psychological datum we must declare that the question depends entirely upon the functional condition of such physical objects, or in plainer words, depends upon whether they are or are not operating to arouse an organism to action. When a physical object induces a reaction in the organism, that object obviously becomes a datum for psychology and we call that object a stimulus.<sup>1</sup>

Nor is the situation any different in the case of connections between reactions even when the reactions are ideas, in spite of the frequency with which they have historically been considered the sole elements of association. Let us be absolutely clear in our contention at this point. Since nothing other than a response to a stimulus may be considered as a psychological fact, we cannot admit the mere connections between reactions as psychological data any more than the mere connections between physical objects. No, reactional connections are not psychological facts unless they are responses to stimuli. Be it observed, however, that this does not mean that each unit of response or reaction system must necessarily be the response to a stimulus. On the contrary, the response member of a stimulus-response couple may consist of a group of reactions not one of which is a stimulus to another but all taken together constitute the response to whatever object or action of an object or person happens to be the stimulus.

We doubt much whether we need to protest, after our foregoing discussion, that our standpoint is whole-heartedly naturalistic, and that as scientific data we make no distinction between physical and psychological facts, tremendous as are, of course, the differences between the materials of the two domains of study. But it may not be superfluous to repeat that not because responses are organic activities are they data of psychology but rather because they are specific responses to particular stimuli. It is for this reason that we pointed out the similarity between responses and stimulating objects, a similarity which we may best state by observing

<sup>1</sup> A datum of psychology, we assume to include a stimulus as well as a response.

that each is a reciprocal phase of a single psychological fact. Furthermore, if we agree that no more special psychological quality inheres in the response than in the stimulus we cannot possibly make the mistake that the reaction in an associational situation is anything but an actual adjustment of the organism. Frankly, what we have especially to guard against is the idea that an associational member must be some kind of inner process, the traditional mental state for example.

Was it not the overemphasis of the person's responses in the associational process which was responsible for the traditional view that made association refer exclusively to ideas, whether considered as thought processes or as general terms for all psychological activities (awareness)? Very true it is that, at least in human behavior, exceedingly prominent associational activities will involve primarily the implicit forms of action that usually go by the names of ideational and memorial behavior. All of the delayed reactions which constitute the foundation for all complex intellectual operations are made possible through the connections established between the reacting person and things by means of similar and chains of dissimilar ideational reactions. We must not overlook the fact, however, that ideational connections consist of only one phase or form of association, a fact which we have already indicated by saying that association comprises a foundation both for the general orientation of the organism in its surroundings and for learning the most complex intelligent and rational responses.

One point more before concluding this section. We believe our discussion has shown that, while association may well be considered as involving conditions of behavior, association always turns out in the final analysis to be itself a definite form of behavior. This condition refers as we have seen both to connections between stimuli-objects and between reactions. Now we want to point out that psychological association may be considered as a reactional condition in another sense, namely, whenever we build up specific sorts of responses to particular stimuli, or in other words when we

form associations, we invariably create a condition for the later operation of those associations when appropriate occasions arise. Obviously this condition of association which we are now discussing is unlimited in its comprehensiveness, involving indeed practically every one of our psychological reactions. We can no better state our point here than by saying that the fact of having formed associational connections means that we have prepared a condition for behavior which is nothing less than a latent associational reaction and which under appropriate circumstances becomes active. Accordingly, we might add that associational processes involve three phases of connections. The first phase is active, namely, the formation of the connections, phase two is latent and may be most appropriately called an associational condition, while the third phase is again active consisting of the actual operation of the formed associational connections.

II. *The Basic Roots of Associational Processes.*—Complex psychological association may be considered as rooted in and developed from at least two of the elementary properties of all psychological phenomena, namely, integration and differentiation of responses.<sup>1</sup> By differentiation of responses we mean to refer to the organism's apparent discrimination of objects and their qualities and of the auspices under which the organism is in contact with its stimuli. How is this discrimination manifested? We answer, by the differential behavior which the organism performs when stimulated by different stimulating objects and situations. Now we assume that this elementary and universal behavior quality lies at the basis of the organism's development of its elaborate stimulus and response connections.

Likewise, we postulate a similar foundation for associational processes in the psychological property of integration, by which we understand the intrinsic morphological organization of the responses of the individual. Such integrations of reactions are well exemplified in the development of acts of skill, such as the organization of strokes in writing, of

<sup>1</sup> In addition to integration and differentiation of responses we may consider psychological phenomena to have these characteristics, variability, modifiability, delay, and inhibition of reaction.



movements in dancing, and manual operations in handling complex machinery. Excellently also are the integrative processes observed in the acquisition of speech behavior in infants. Beginning with words the infant integrates these into phrases and sentences. Language in infancy is all the better an illustration of the integrative processes because it shows the line at which integration develops into and merges with the larger and more complex process of association. For the infant (and for the adult also) language is only to a limited extent integrational, while for the most part it is definitely associational. The line of distinction between integration and association we place at the point where a series of reaction systems merge into a larger reaction system. When acts are integrated into larger acts they lose their identity as separate acts, as in the case of the separate t-h and e strokes when they become the "the" reaction system. Per contra the association of reactions in a pattern of response<sup>1</sup> does not involve at all any loss of identity on the part of the associated members.<sup>2</sup>

Upon these two functional foundations and possibly some others are built up all the multifarious combinations of associational connections. Needless it is to say again that it is hardly possible to place a limit upon the number and intricacy of associations which a complex organism develops in its multitudinous contacts with the surroundings; but always the character of the associations, which in all ultimate analysis must of course be brought down to concrete, memorial, manual, or other sort of actual behavior, is determined

<sup>1</sup> Note that the term reaction system and reaction pattern themselves indicate the differences between integration and association. For the former refers to a single unit of behavior of no matter what degree of complexity, while the latter refers to an organization of reaction systems. On the side of the stimulus be it noted also that the reaction system would most probably be stimulated by a single and simple stimulus, while the reaction pattern may be associated with a single complex or a group of stimuli.

<sup>2</sup> Is it necessary to point out that associational and integrational processes may be temporally relative? That is to say, while we have considered integration as prior and more simple than association, this really depends upon the particular stage of development, since the reactions now being integrated may have previously been associationally connected.

by stimulus and response situations. Now since it is a fact that associations are intimately involved in every type and level of our behavior, it follows that there must be an enormous variety of association forms. In the following section we plan, therefore, to enumerate some of the outstanding types of associational connection.

III. *What are Associated?*—If psychological association means the connection and operation of responses to stimuli, then we are in immediate possession of a serviceable method for isolating the association data, namely, to specify the connections between responses, stimuli, and the settings of the stimuli.

For convenience, we plan to adopt the plan of calling simple any association of two or more behavior factors of not more than two varieties, while a connection involving more than two varieties of factors we will call complex. To illustrate, the connection of a stimulus and response, two stimuli, or two responses are simple associations, but when a stimulus, a response of one type, say an implicit reaction, and another type of response are joined together we will call the association complex. While it is certain that most of our reactions include the complex forms of association, we shall still find it very useful to make a list of the simple associations, even if they are finally found to be for the most part abstracted from the complex associations.

Following our proposed plan we may arrange the simple associations into the following classes.

*A. The Simple Associates.*

1. Associations of stimuli and responses.
2. Associations of stimuli and stimuli.
3. Associations of settings and stimuli.
4. Associations of settings and reactions.
5. Associations of settings and settings.
6. Associations of reactions and reactions analyzable into the following forms:
  - a. Association of two or more overt responses.
  - b. Association of two or more implicit responses.
  - c. Association of two or more partially implicit responses.

- d. Association of two or more partially overt responses.
- e. Association of overt with implicit responses.
- f. Association of implicit with partially overt responses.

Before arranging the complex responses we may first discuss the simpler associations.

1. *The Association of Stimuli and Responses.*—One of the primary forms of association is the connection between stimuli and responses, since without doubt the fundamental psychological fact is the operation of a specific reaction system through stimulation by a particular stimulus. Such a segment of behavior is the basic fact in all orientation and learning adjustments of the psychological individual. Now it is possible to distinguish at least two classes of such associations on the basis of whether the association is primary or secondary. By a primary association we do not necessarily mean an association not acquired in the life of the individual, but one which although acquired by the individual has its basis in the structural character of the person and in the adaptational history of the species of which the individual is a member. As examples of primary and secondary association we may take for the former the reflex behavior segments and for the latter conditioned reflexes and acquired reactions of all sorts. The association in the latter cases consists of the development of response systems for adaptation to specific objects and events.

Another distinction in the domain of stimulus-response association is that between (1) the connection of stimuli with overt responses; this is illustrated by the reflex act, (2) between stimuli and implicit reactions, such as between ideas and their arousing objects, and (3) between stimuli and partially overt and partially implicit reactions; this last situation is exemplified by the connection between a stimulus object and a perceptual response. Needless is it to add that the two kinds of distinction are not mutually exclusive, and moreover even in a single complex action may we find all of the kinds of associates mentioned.

2. *The Association of Stimuli.*—Here we have merely to point out the fact that through the connection of objects, events, and conditions, with other objects, the individual is forced to connect and correlate his reactions to the end of achieving a greater control over his surroundings and of becoming more efficient in his adaptations. The primary process of psychological orientation is the organization of particular behavior combinations because of the interrelationship between objects and events. The general integration of behavior we might say is due to the necessity to adapt to many related objects in a given time. As an illustration of this situation we may take the case of typewriting, in which the various strokes or movements must be integrated in a definite form because of the connections between the stimuli, namely, the combinations of words and letters.

In the association of stimuli we may again distinguish between *primary* and *secondary* connections. In the former case the association between objects may be original and merely discovered by the person in his first contact with the stimuli in question, while in the latter case the stimuli are rearranged and brought into some new relation, in each case of course modifying the behavior of the person. Another name for the primary form of association between stimuli is natural association, while the secondary connections may be called contrived association. Natural connections between stimuli may be illustrated by the relation of two or more houses, and let us observe that by natural we mean only that the connections between objects are formed without the knowledge, aid, and consent of the particular reacting individual. Contrived associations are (1) connection between a stream and a bridge, a person with another person (man and wife, parent and child) or a person and some object (occupational post or residence) and (2) all informational and physical objects connected by learning, creating or through acts of skill.

Most emphatically must we suggest again that while no connection between objects constitutes a fact for psychology

unless such a connection operates to effect some form of reaction in an organism, still that connection need not be known by the organism. Very frequently such associations of stimuli are so subtle that the reacting person or observer does not know how connected objects or persons stimulate an individual to respond, nor why the stimulating objects or persons come to assume that office. In many cases, however, the basis of the substitution function is clear; it is found in the similarity or other resemblance between two persons or objects, in the frequency of their relation, and in other cases, merely by virtue of the recent connections between two persons, objects, or events.

To the writer's mind it appears possible that the experimental problem of mediate association finds its solution in the fact that we have just discussed, namely, that we can be stimulated to action by objects or persons whose connections with other things we react to are unknown to us. Another form of stimuli association is the connection between objects serving as signs to call out responses to other things or persons which they signify. This type of association finds a large place in complex action of all sorts and especially in reasoning activities. As compared with the association of substituting stimuli the person reacting to a sign which signifies something else is always fully aware of the relationship between objects. The entire work of scientific and other forms of inferential behavior consists in great part in the development of an efficient capacity to respond to things and conditions when their representing signs appear. To illustrate this form of association let us assume that the high temperature of a patient may stimulate us to seek the means of discovering and controlling a toxic condition or an increased rate of a chemical reaction makes us think of the relative capacities of given catalyzers.

3. *The Association of Stimuli with their Settings.*—Very frequently specific forms of our actions become what they are because of an association existing between stimuli, whether objects, places or events, and objects, places or events serving as the backgrounds or settings of those stimuli. Let us

observe that the specificity of psychological reactions is due not only to the stimulus-object but also to that object in its setting or background, and observe further that it is because these factors are separated that the person is liable to perform an erroneous reaction to the misplaced stimulus. The dependence of a stimulus-object upon its setting is especially familiar in the case of contrasting colors or objects. Through the changes which are introduced in the medium of stimulation by colors placed in close proximity we are made to react to colors differently than when they have other backgrounds. Similarly we are prone to call a man tall or otherwise, because we respond differently to him when he is compared with a shorter person, than when he is likened to an individual taller than himself. Again, objects and events affect us differently when they have certain backgrounds than when they have others. How markedly divergent are our reactions to the same music when played by acknowledged musicians than when executed by unknown persons; again novels or other books of the greatest merit when written by women are by that very fact unreadable for some people.

As to the classification of the associations between stimulating objects and their settings we may, because of the similarity of these associations with the connections between stimuli-objects, call them by the same name. Thus we may speak of natural, original, conventional, or contrived connections between objects and their settings. Among such settings we may include the hygienic and other conditions of the person, as well as the person's relative size and weight as compared with stimuli objects.

4. *The Associations between Reactions and Settings.*—Not only are reactions connected with stimuli-objects, but they may be conjoined with the settings of such objects; so that the setting will serve as a secondary stimulus to elicit the response. We believe that the ordinary case of hallucination is a type of reaction induced in the person by the setting or a stimulus which in the normal course of events would have produced that response. We may readily grant that whenever the setting alone arouses a reaction we must look upon

the setting as the stimulus in that situation, but we must in that case call the setting an auxiliary and not the adjustment stimulus. This is true even when no actual object can be the adjustment stimulus, as is the case in "seeing a ghost."

5. *The Association of Settings and Settings.*—At least from a logical standpoint we ought to include here the connections between settings and settings as a form of association. For if we agree that a stimulus-object may be misplaced then of course the stimulus-object would be connected with two settings. As a consequence we must agree that the connection between the two settings has some influence in conditioning the behavior of the person. That different settings may be related, follows further from the consideration that our reaction to a particular stimulus may be similar to our response to a different object merely because of the influence of a related setting; a government official may respond just as politely to an agent of an unfriendly power as to the representative of a friendly one, provided that in both cases there are present similar conditions which may merely be the diplomatic background. For our purposes here it is well to note that the same physical, social, or political conditions may constitute different settings for stimuli.

6. *The Association of Responses.* (a) *Overt Responses.*—In many manual and skill acts we can determine the acquisition of them to consist primarily in the organization of interrelated overt reaction systems to form a definite pattern of response to some stimulating object or situation. Typewriting or swimming illustrate the connection between such overt reactions.

(b) *Association of Two or More Implicit Reactions.*—Likewise series of implicit responses may be related to form a pattern response to stimuli, precisely as is the case with overt reactions. Indeed the association of implicit reactions was the first type of association noticed and studied, under the heading, of course, of ideas. In this as in the last paragraph it is necessary to observe that we intend to refer here only to the conjoining of responses and not the connection of

responses with stimuli, for in many cases when we have series of responses operating the preceding reactions serve as stimuli to the following.

(c) *The Association of Two or More Partially Implicit Reactions.*—The best example of such an association is the conjoining of verbal responses. Verbal articulations are morphologically overt activities but in their operation they may be as elements in thought activities, implicit meaning reactions.

Possibly it is truer to say that they are both overt and implicit, but because their morphological and functional aspects can be distinguished we prefer to speak of them as partially overt and partially implicit. Articulate speech involves large series of conjoined, partially implicit reactions, forming in their various patterns effective specific adaptations to surrounding stimuli.

(d) *The Association of Overt with Partially Overt Reactions.*—Any perceptual behavior segment in which the specific perceptual reaction system is connected with some particular overt response following it, is an example of this type of association. Inseparable is this connection arising from the fact that the partially implicit reaction system is a vestige of some actual overt response which is in a sense replaced by the overt action which follows it in the behavior segment.

(e) *The Association of Overt and Implicit Action.*—Thought and memory activities exemplify the connections between overt and implicit acts whenever the segment of behavior involves a definite change in some stimulating object, and this, we might add, occurs more frequently than not. In thought processes the implicit behavior may be so intimately related with overt byplay responses that we may truthfully say that pacing the floor, scratching the head and other overt byplay responses are intrinsic factors in the thinking. Better illustrated is this type of association by the facts of planning as anticipatory responses for overt acts as bridge constructing, military campaigning or other types of overt responses.



(f) *The Association of Implicit and Partially Overt Reactions.*—In every act of thought the implicit reactions involved are put into operation immediately or mediately by some substitution or associated object. Now the contact with such an object constituting the immediately preliminary reaction to the thinking processes is very frequently a perceptual or partially overt action. Our implicit responses are in great measure conditioned and modified by such connection with perceptual responses. In fact, it is the closer association of implicit responses with perceptual reactions which makes our diurnal thoughts and problem solving different from day or night dreams.

*B. The Complex Associations.*—As we have previously indicated, possibly the most satisfactory description we can give of complex associations is to say that they constitute various organizations of the connections which we have already attempted to isolate. Thus every complex reaction consists of many interrelationships of stimuli, their settings, and all of the varieties of responses. The primary point here is that the particular modes of orientation and adaptation of the person to his surroundings are functions of numerous specific connections which the person makes during his development and growth, within the range of his surrounding stimuli. Thus for example, in every perceptual behavior segment the specific occurrence involves a connection between the partially implicit and overt responses, with the additional connection of all of these factors with implicit responses. In more complex acts such as planning, the situation is even more elaborate and complicated, and while these acts may involve many overt responses they are so named as to suggest primarily implicit activity because such responses play an unusually important part in the total behavior.

IV. *How Associations are Organized.*—Having enumerated various kinds of association, the problem arises as to what are the attendant circumstances under which these various connections are made. Not only is it clear that different conditions may be responsible for the formation of different

associations, but it seems evident that any individual connection may involve a number of specifically different kinds of conditions.

Concerning all of the associations involved in our behavior taken *en masse* we may assert that two general methods of bringing the associated terms together may be isolated, (1) the casual connection of stimuli and responses, and (2) the deliberate connection of the associated terms. By casual association we mean any connection between stimuli and responses or other terms which are not planned or brought about in any purposive manner.<sup>1</sup> The various language responses illustrate both forms of association. We strive to make the child in its early infancy adopt definite, prescribed word responses as the names for objects and thus learn to communicate with others. For the most part, however, the child acquires specific language responses through the sheer casual stimulation by the sounds of other people.

Cutting across both of these modes of forming associations are the more specific conditions observed in the formation of connections. Thus a response may get connected with its stimulus because of frequently having been associated, or because of the great vividness of the conditions under which the associations are made. The conditions are operative whether it is a mannerism which is unwittingly acquired or whether the situation is the training of a child in school. Probably the different conditions can best be isolated by considering separately the six general kinds of association.

1. *Stimuli and Responses.*—To consider first the connections between responses and stimuli we find that such connections are due in some form or other to some or all of the following conditions. (a) The necessity of the situation may force us to make particular movements in order to prevent injury or to make any or an adequate adaptation to certain stimulating conditions. Older boys assume this principle when they throw the uninitiated youngster into deep water as a method of forcing him to learn how to swim. Such

<sup>1</sup> It is immaterial, of course, whether the deliberation is that of the acting person or someone else.

needs as we have suggested extend of course to social requirements and prohibitions as well as to physical necessities. (b) The frequency with which we perform a given response to a stimulus conditions the formation of a connection at all or the rapidity with which such an association is made. This condition applies more to routine and mechanical forms of responses. (c) In many cases an association is formed because of a recent contact with a stimulating object. This condition operates only in what we will later designate as the temporary associations. At this point it is well to suggest that in many cases the sole warrant for asserting the presence or existence of certain associations lies in the fact that we can observe them to operate. The application of this fact receives its importance here in the consideration that an association may be formed and operate once only and never again. In such a case the condition of recency has its most plausible application.

(d) Another very strikingly contributory condition for the formation of associations is the vividness of the circumstances under which the reaction is made to the stimulus. Illustrative of this condition are the first acquisitions in school, the facts occurring in the presence of persons loved, feared, or respected, and associations made in the presence of danger or distress or under conditions of great happiness or importance to the person. (e) Associations involving rewards and punishments of various sorts are facilitated or hindered by these conditions in whatever form they occur. (f) And in many cases associations are developed as definite or indefinite means to ends. A prospective engineer acquires mathematical training as a basis for future use in his profession. Clear it is that the conditions here overlap in many cases the motive for the formation of associations, but we allow in this separate division for many conditioning motives, as in the illustration of the engineering student. (g) Whether an act is pleasant or the opposite, determines in great measure whether and how soon given associations will be made. (h) And as a last condition in influencing the connection of

responses and stimuli we may name the motive of self-aggrandizement and self-satisfaction through the influence of which many associations are made and the acquisition of reactions facilitated.

2. *Stimuli and Stimuli*.—(a) Exceedingly prominent as a condition for the association of stimuli is the similarity or other resemblance between things or persons. The resemblance then, is a basis for the substitution of one object or person for another in a memory, thought, or imagination action. Possibly the resemblance may be owing to a partial identity of the stimuli such as the possession by each of a particular color or some similarly shaped common element. Illustrative of this type of connection is the case in which upon observing an unknown person on the street we call out the name of a friend only to find that a single more or less pronounced resemblance was responsible for arousing in us what we may call a misplaced reaction. This elementary fact of association we may consider to lie at the basis of all highly developed forms of classification such as we find in the earlier stages of all science. To be more succinct, the complex classificatory behavior of science and its development into the activities of organizing phenomena has its roots in the concrete fact that we make the same or similar reactions to similar stimuli.

(b) Another very important condition for the association of stimuli is the existence between them of some definite form of relationship. Objects may be related in series of various description so that the appearance of one may serve to arouse responses associated with all or some of the other members of the series. Besides membership in series, objects and events may be related as causes and effects, antecedents and consequences. Personal relationships as father and son, husband and wife, brother and sister, etc., may be the condition for the reaction of the person to an absent stimulus when the associated stimulus is present. What we mean by insight into and knowledge of things and processes is the development of expectancies and predictional capacities for events when their related phenomena are present.

(c) Meriting separate discussion is the connection of things or events because of the fact that stimuli-objects impress themselves upon us as signs for a thing or event signified. Through the connection of objects as possible symbolic representations of one by another we acquire our capacities to use objects needed as instruments of adaptation to conditions, but which are not now within actual reach. Here we find one of the prominent bases for all the higher forms of intelligent behavior, for in the symbolic relations of things we already have an elaborate interconnection of actions with combinations of stimuli-objects.

(d) Just as in the case of the association of stimuli and responses so here we find also that the frequency of connection between two objects or persons is conducive to the operation of one as a substitution stimulus for the other, and in consequence enlarges the scope and increases the effectiveness of our action.

(e) Recency serves likewise in this situation to connect objects and events, although the condition is limited in its potency to bring about serviceable connection.

(f) And finally as a contributing condition to the organization of connections of stimuli we might add contiguity or the sheer and accidental connection between objects, events or persons.

3. *Responses and Responses.*—(a) In the association of responses the frequency of connection is a very effective condition for the establishment of a relationship. This fact is illustrated by the rule of much practice for the acquisition of informational and skill responses. (b) Similarly recency operates as a condition for bringing together in more or less permanent form the members of a series of responses. When manual or verbal responses are in question then (c) rhythm is a patent factor in the formation of connections. (d) In the connection of verbal responses sound similarity is very important in many cases for the establishment of a connection which may resolve itself into actual rhythm. When we consider such associations as language responses we cannot over-

look the great importance of (e) custom and usage in the formation of response connections as well as in their dissociation.

4. *Stimuli and Settings*.—Significant as conditions for the establishment and continuation of these associations are (a) the sheer location of a stimulus object in its particular surroundings, and (b) the constancy of the location and connections between the stimulating factors.

5. *Responses and Settings*.—This type of association would clearly be conditioned by the same factors as (1).

6. *Settings and Settings*.—Whatever seems effective for (2) would appear to operate in this case also, although the connections here are not ever so clear cut or so permanent as in the case of the connections between stimuli and stimuli.

As a summary of this section we might suggest that our extensive, though certainly not exhaustive enumeration of the conditions surrounding the establishment of the various forms of association connections serves energetically to emphasize the individual direction of such connections. We mean to stress the fact that each associative connection, whether fortuitous or designed, casual or deliberate, is a unique fact and in consequence is a member among innumerable classes of events. Definitely, we mean to deny that there is a law or series of laws which can be considered either as a general statement of what brings about association or as a limited series of particular conditions exclusively contributing to the formation of associational connections. As we view the matter there are as many laws of association, if we insist upon the use of the phrase, as there are actual connections of psychological facts. This way of looking at the data of association constitutes merely a suggestion of the original character of all psychological phenomena and especially of human reactions.

V. *The Operation of Association Processes*.—Strictly speaking, the mechanism of association includes both (1) the processes of organizing connections between stimuli and acts, and (2) the operation of those reactions when formed. In

fact, these two processes are simply reciprocal phases of a single mode of behavior, although for practical purposes they may be treated apart. In many cases, however, as we have already seen, the two processes are not readily observable, since the fact of having formed certain connections is evidenced only by the fact of using them as in recalling a name or in the performance of skilled acts as repairing a piece of apparatus.

While the simplest associational operations consist merely of the functioning of a reaction system or a pattern of such reaction systems when the connected stimulus appears, the most striking and effective are those mechanisms in which the reactions of the person are brought into play by indirect stimulation, that is to say, through the mediation of a substitution stimulus. The importance of the substitution of one stimulus for another may readily be inferred from the fact that all complex delayed reaction consists of the operation of some response to an object or person other than the object or person which stimulated the individual to act. By the term complex delayed behavior we mean to distinguish the so-called ideational and memorial reactions from the simpler reactions which for only very brief periods are delayed from operating through their temporary replacement by orientation postures and attitudes, such as the crouching movements of the cat in anticipation of the appearance of its prey, or other similar forms of behavior. As compared with these simpler reactions the complex delayed reactions may in general be considered as the basis for all higher forms of intelligent conduct.

Typical functioning of the complex associational processes may be observed in memorial behavior, since our memory activities consist practically in the operation of reaction systems excited to action by means of substitution stimuli originally connected in some way with the object substituted for. Possibly this associational reaction may be even better observed in the study of language and reading reactions. In these forms of behavior sounds or printed symbols serve as substitution stimuli to arouse overt or implicit reactions

to whatever objects or persons are symbolized. Essentially, we repeat, the machinery of complex behavior is the interconnection between a given reaction of the person and two stimuli, one the original object to which the reaction is developed, called the adjustment stimulus, the other, any related object which can call out the reaction in question.

But here we may well pause and ask whether we are not unintentionally overdoing our argument concerning the prevalence and importance of association. Specifically, we may ask whether, in fact, an implicit action or idea can be associated either with an adjustment or a substitution stimulus. Our answer to the question is unequivocally affirmative and this answer we give because we believe ideational association is in essence a process of living over some past situation.<sup>1</sup> It is a process of repeating in an implicit manner some previous action. Possibly this point is most effectively illustrated in the observation that the process of recall which may be either an overt or an implicit act is merely the operation of a postponed reaction. My recalling an engagement may involve the overt act of immediately walking toward a certain point stimulated by the visual perception of my memorandum book, or it may be merely an act of determining and planning to go there induced by the same stimulus. Possibly it is not inadvisable to interpret the postponed act at the time of its actual operation as a substituted act, especially if we keep in mind the difference between it and the replacement acts mentioned above. Whether the postponed act is overt or implicit the event consists of a delayed response made possible by the connection of reactions with stimuli.

No better can we observe the operation of association than in the study of learning, for as a psychological process learning consists of the active connection of responses both overt and implicit, with specific stimuli. The overt responses may be manual or verbal, while the implicit reactions may involve any kind of indirect response to stimuli. When the responses are entirely indirect some actual contact between

<sup>1</sup> Cf. Kantor, 'An Objective Interpretation of Meanings,' *Amer. J. of Psychol.*, 1921, 32, 231-248.



the person and his surroundings is maintained, of course, through perceptual activities. We assume the learning to be accomplished when the associations are so firmly established that whatever reaction systems are acquired will operate whenever their appropriate stimuli are presented. Now when a person in his various contacts with his surroundings has made many associations between his responses and stimuli we may truthfully speak of his capacities to do various things, for not only is he equipped to respond definitely and directly to particular stimuli, but also by virtue of having made a large number of associations, he is equipped to meet new situations, situations exactly like which he has never faced before, provided always, however, that conditions common to older circumstances are present. Learning and the capacities to which the process gives rise consist of the postponed operation of a reaction to a stimulus with which it has previously been connected.

For the most part it holds true that our intellectual and manual capacities depend directly upon the development of associations through actual contact with particular objects and conditions. Inventive skill, the ability to discern relationships in things, as well as expertness of judgment in given situations can all be readily traced back to frequent and constant association with the objects and events in which the person excels. In many cases what appears as a mysterious intuitive faculty can be shown to have its direct origin in such preoccupation with particular facts. Was not the discovery of the table of periodic relationships between chemical elements based upon such associational facts and are not mathematical discoveries and the capacity to classify animals rooted in the same associational soil?

Digressing a moment we might point out that the study of association as a basic and universal form of behavior throws light upon the extremely important problem of psychological capacity. Note that by capacity we always refer to an action, although it may be a potential or possible action. Now a potential action in psychology is merely a postponed or delayed response, postponed we say because the action

was really started when the original association between stimulus and response was formed. My capacity to multiply, to play the piano and to draw, affirms the fact that I have acquired such associational connections between responses and stimuli; so that now the presentation of stimuli elicits their characteristic responses. By the same token the acquisition of many definite responses to particular stimuli leads also to the formation of more general and formal phases of action, and so we acquire general drawing, multiplying, and other capacities as well as the specific capacities to draw particular pictures or to multiply particular integers.

Observe then, that the general capacities refer to such phases of actual behavior as are common to all particular acts of a certain type. When we have multiplied enough pairs of integers and composed enough particular musical forms, we can thereafter multiply new combinations of integers and compose other pieces, but neither of these new activities will involve absolutely new factors; rather they will comprise individual and common behavior elements which have previously been associated. The less specific aspects of behavior give us then only relatively general capacities. That our so-called capacities are significantly rooted in previously acquired associations we note from the fact that it is extremely difficult to modify the capacities we already possess, such as dispensing with or changing our "styles" in handwriting, literary and musical composition and other ways of responding to stimuli. That all our capacities consist of associational connections is further indicated by the fact that we can change our styles only by training and in general finding new stimuli. Because the psychological data, at least of the human domain, involve so many and so wide a range of capacities and tendencies, we may consider our present discussion as offering additional evidence for the universality and foundational character of the association processes.

The associational processes, however, do not only constitute the main operational machinery for intelligent behavior, but the number and variety of associational reactions

acquired determine also the differing qualities of high grade acts. Thus, the difference between merely knowing and originating within the domain of intelligent behavior is determined by the different associational mechanisms involved. In informational and other knowing reactions the substituted stimuli are very similar to the original ones, while in originating acts the effectiveness of the behavior depends upon the quantity and differences of stimuli that make behavior substitutions possible.

Possibly not too redundant is it to repeat again that the operation of previously acquired associations not only constitutes the higher intelligent reactions but also the simpler intelligence acts and capacities as well as behavior not specifically designated as intelligent. Especially must we observe that our passions, diffuse feelings and other types of affective behavior operate as they do in specific instances and bring about conditions in the relations between persons and their surroundings precisely through the same sort of associational machinery as we find operating in the so-called motor and ideational reactions. Now since the operation of associations always involves some specific type of adjustmental response we propose to discuss the associational mechanisms in a few typical situations.

1. *The Mechanism of Association in Manual Skill.*—How well the expert designer can plan a bridge depends entirely upon the suggestions his original data offer for the specific development of suitable structures and the harmonization of cost, appearance, solidity, and usefulness in the total construction. The specific workings of these suggestions consist of the substitution of the present data such as kind and location of site, and the needs of the situation for types of structures already built, studied, or projected. At each point in the work stimuli in the form of unwritten or spoken instructions, drawings, maps, plans, and instruments serve as substitution stimuli for reactions to detailed features of the whole situation. To take a simpler case of skilled behavior, the particular difficulties in the mechanism of an automobile, for instance, suggest other difficulties in other situations, or

ways in which the difficulties were overcome. In both cases of suggestion the substitution stimuli operate by calling out in the person implicit responses. Indeed, unless the present difficulties call out such reactions in the person no act of skill is possible, and the amount of skill possessed, that is, the number of successful operations, is an index to the number of associations previously made, excluding of course the associations being made at the time.

A similar operation of interconnected stimuli and responses providing the organism with orienting behavior is illustrated by animal reactions. A young pigeon making its first flight from the cote can be easily caught because it has not associated its reactions with specific surrounding objects and places of possible safety.<sup>1</sup>

2. *The Mechanism of Association in Memory.*—In memorial behavior the associations operate in two main ways. (a) Through them projected reactions are possible in the sense that substitution stimuli are intentionally attached to acts for the purpose of postponing some work or other action. The substituted stimuli may be time, as when we agree to do something at a given point in the future. In this case we would mark our calendar as the effective means of stimulation, or we may promise to speak to someone when we meet him. In this case we project an action into the future by means of words. Probably it is well to point out that here we have an action in which an indirect or implicit response occurs before the direct one, although in every case, of course, the direct association must have been previously made.

(b) The recalling of forgotten events or the performance of forgotten actions is brought about by almost any kind of object or situation, provided it has previously been connected with the forgotten event or act. The appearance of a certain person may be the stimulus for the act of paying the arrears in dues to the club to which the person had introduced us. In this case the specific mechanism is not controlled by the person and the act is unintentionally delayed, perhaps to the chagrin of the reacting person.

<sup>1</sup> See Whitman, 'Orthogenetic Evolution in Pigeons,' 3; 'The Behavior of Pigeons,' 1919, 157, edited by Carr.

3. *The Mechanism of Association in Imagination.*—In imagination reactions the associations between things serve as stimuli to suggest to the person associations between other things; so that the latter can be recombined and rearranged in various ways besides dissociated and reconnected with other things, persons, or events. In this type of reaction the fact of association or other relation between things serves as the effective stimulus to new forms of implicit behavior. Here as in other cases the efficiency of the person depends upon the number of previous associations actually formed; in other words the imaginal capacity depends upon the amount and degree of practice.

4. *The Mechanism of Association in Thinking.*—Thinking acts, involving as they do intimate responses to problematic situations, exhibit a multiplicity of forms of associational operation. In the first place, the capacity of the thinker depends upon the number of solutional ideas suggested to him by any problematic situation. As in all the other cases this suggestion is a function of the number of previous associations the person has already made with similar objects and conditions. How many associations are necessary may be readily estimated when we consider that each thought activity constitutes a unique behavior situation.

Throughout the entire series of complex association mechanisms there runs a common principle, namely, that such mechanisms enable the individual to perform a multiplicity of responses or at least suggest the possibility of multiple responses to a few or all of the immediately present objects or situations. This result is made possible as we have seen by the organization and reorganization of stimuli and responses.

VI. *The Modes of Psychological Association.*—Almost obvious it appears that such a constant and pervasive phenomenon as association is, will exhibit a variety of forms in the various behavior circumstances of individuals. We have already met with some of these varying modes in our discussion so far, but for purposes of further explication and in spite of repetition we may enumerate the following modes of association.

1. *Primary and Secondary Association.*—In the stimulus-response connections we find reactions which are originally connected with certain stimuli as in the case of a bit of meat serving as the stimulus for the salivary reflex action. Now when this reflex is conditioned we assume that the responses are attached to some other form of stimulus as the sound of a bell or an odor. The first connection accordingly we will call primary, and any succeeding connection may be called secondary, tertiary, etc., to the limit of associational capacity. Naturally, this classification will have to be mainly confined to simple forms of response, for only in the simple forms of behavior can we definitely determine what are original stimuli and only in such cases can we observe the appropriation by another or an additional object of the rôle of an inciter to action. No doubt, exists, however, that this process of transconnection between stimuli and responses is a common occurrence in our most complex behavior.

2. *Temporary and Inseparable Association.*—Another mode of association refers to the relative permanence of the connections when formed. Probably most of these connections when made between stimuli and responses or between stimuli persist indefinitely, although some associations become dissolved in the course of a longer or shorter time. Every case of forgetting or the loss of skill of any sort involves the dissolution of some connection between associated members whether responses or stimuli. Language connections exhibit many illustrations of inseparable associations which apparently should be dissolved. Thus sunrise and sunset persist as names for events which we know do not occur. Again, the expressions about the lack of brains or good brains survive in spite of intelligent information concerning psychological activity. Every person who is troubled about his own or some other person's bad habits knows the difficulties of disconnecting reaction associates.

3. *Original and Formed Associations.*—Of the connections between responses some are original associations necessary for the occurrence of given adjustments to stimuli. As such we may mention the movements constituting the combina-

tions of reflexes and the integrations of response factors in habits. Among the formed associations we may classify the organization of series of responses as nonsense syllables and various language connections, although in some cases of language reactions, notably where articles are inseparably connected with names as in the German language, we may consider such associations as original. The criterion we are using in this particular classification may be considered then to be (1) the degree of deliberateness with which the associations are formed when the individual forms them, and (2) the question whether the individual is responsible for the connection or whether the adjustments are socially dictated.

4. *Logical and Conventional Association.*—A fairly broad and sweeping distinction can be made between logical connections existing between responses and stimuli, and those based upon pure convention. Most associations which we form through the direct influence of the stimuli-objects themselves will illustrate the logical type of association. When we jump out of the path of an automobile we may justify speaking of such a response as a logical adjustment to the stimulus. Quite otherwise is it with another large mass of our responses. Attaching a sex name to a ship or gun is in no sense a logical association but merely customary. The domain of language is full of such illustrations of the logical and conventional associations. This distinction of logical and customary connections is likewise illustrated in our responses to sound. We speak of high and low, hard and soft tones, when as a matter of fact the names or descriptions given to such sounds are arbitrary and in many cases illogical.

5. *Direct and Indirect Association.*—As our last mode of association we may name the direct and indirect connections. As direct we may consider any immediate connection of associational members usually made possible by the fact that the person is in direct contact with the stimulating object when stimulus-response connections are formed. On the other hand, indirect associations are such as involve the intervention of a third factor when two members are associated. Direct associations are exemplified by the infant's

development of a withdrawal reaction by being burnt in the candle flame, while the indirect association is exemplified by acquiring informational responses to a foreign country by means of a geographical atlas. Indirect language associations are illustrated by the names we give to objects because of a resemblance in appearance, use or sound. Thus, we use the word glasses for spectacles, binoculars, or drinking glasses. Possibly the largest number of our indirect associations involve language and informational responses, for notice that all fixed figures of speech involve the indirect mode of association. When the indirect associations are not linguistic we find that in most cases they are formed because of the inaccessibility of the objects; so that the original contacts with them are brought about by reading of them or indirectly hearing about them.

Our discussion of these five modes of association offers conclusive evidence of the fragmentary character of the enumeration. Not only is it not practicable to enumerate all of the modes of association, but even in these five there is much overlapping. Again, it is not easy to hit upon a single criterion or even a few criteria upon which to base the enumeration. And so we have not attempted to distinguish between individual and social association, or between the formation, existence, and use of association. Just why an exhaustive inventory of all or most of the modes of association falls without the limits of wise undertakings, is found we believe in our much reiterated remark that association as a psychological process is a universal factor in all psychological behavior.

VII. *Levels of Associative Formation.*—From the fundamental and pervasive nature of association we may readily infer that the connections between the organism and its stimuli, as also the organization of responses themselves, take place upon every conceivable level of activity. If we start with the earliest elementary forms of connection between stimuli and responses such as constitute the basis of differential behavior and psychological activity in general we may say that the lowest association level is found in the biological



maturation of the organism. As a definite example of associative connection at this level we may proffer the case of reflex action, for we believe that the organization of response factors for the most part takes place during the intrauterine life of the person. Also, we might indicate, although this point is not wholly without ambiguity, that in the early weeks of postuterine development the connections between reflex acts and their stimuli take place.

To consider now associations formed during the individual's more active contacts with his surroundings we may note that many of them are developed without any intention of the person and in many cases without his knowledge. Illustrative of such situations are the cases of the infant who forms all sorts of reactional connections with the objects stimulating him besides acquiring many language responses through contact with persons who use that language. In both cases the infants may be said to have the associations made for them although they are by no means passive participants in the situations.

On the other hand, in active learning of all sorts associations are formed with the knowledge and consent of the person. At this level the individual is far more active in the organization of responses to stimuli or in the formation of connections between acts. When we learn to drive an automobile or operate any kind of new mechanism, or when we attempt to acquire any kind of book learning, we deliberately form associations for our own purposes.

Possibly the most complex and highest level in the formation of associations is the critical one of science. Here are developed the most definite forms of associations between the investigator and the objects which he studies. Because of the scientist's interest in the causal connection between things he must make abstract and very indirect associations. Clearer appears this point from the observations of things or inferences from those observations. Many scientific associations are of course the symbolization of the connections which the scientist discovers to exist between objects and events in nature. But in equally as many cases the relations between

things are so obscure and difficult to get hold of that a very indirect method of knowing them must be utilized.

VIII. *General Conditions of Association.*—Besides the specific conditions for the formation and operation of association which our discussion has brought out, a number of general conditions determine the kind, number and strength of connections which are formed.

Obviously, one of the most prominent of the general conditions must be the opportunities to form associations. In other words, the larger the number of our contacts with objects the larger is the number of reactions we build up with which to adjust ourselves to them. Likewise the greater the variety of things and events which affect us, the greater will be the number and types of our associations. Practically speaking we must, in order to develop many and various associations, visit new surroundings or have them brought to us through descriptions.

An equally influential condition for the formation of associations consists in the social surroundings of the person. The customs of the groups in which one lives are potent determiners of the behavior development of the individual, prescribing as they do what one shall learn, as well as determining what we must and must not do.

For the operation of association much the same conditions prevail. The more objects we are in contact with which can serve as adjustment or substitution stimuli for responses which we have acquired, the more likely is it that the responses will be elicited. And let us not neglect to consider the effect of the present attainment of the person upon his association formations. Skill and knowledge reactions depend for their development upon the present information and ability of the individual. We all know that the more information one has upon any subject the easier it is to acquire more. Similarly, the acquisition of specific sorts of associations develops a line of less resistance for the further development of associations in that general direction; the ground is prepared for definite interests and urges to do certain things and to develop desired behavior connections. On the other

hand, such acquisitions inhibit and interfere with the formation and operation of certain other associations. To possess particular prejudices means we will be prevented from indulging in certain activities and acquiring associations of specific sorts. The inhibitory effect of previously acquired associations even goes so far as to prevent us from performing actions which under the circumstances would be especially desirable or effective.

Of no slight importance for the formation and operation of associational connections is the general health condition of the person, and this extends to the matter of fatigue also. These points, however, it is unnecessary to stress, since they are operative with equal force in all cases and in all phases of behavior.

Manifestly, a general condition for the development and use of associations is practice. Without practice the acquisition and fixing of skill and informational responses would be an impossibility and certainly when associations are formed their use is greatly facilitated by constant and frequent exercise.

Finally, we have to consider the normality of an individual with respect to his associational reactions. If for any reason he is below par in his functional capacities he becomes disoriented, that is to say, his associates become dissolved and he loses contact with his surroundings. As a record of fact, the dissolution of association which we call disorientation is one of the most prominent symptoms of psychological disorder and disability. From the nature of association this is, of course, precisely what we would expect. In many cases, too, the disorientation may be owing to the stimuli factors, with the consequence that it is entirely possible that the disorientation or the lack of associative connections is itself the abnormality. Hysterical blindness, deafness, etc., are dissociations of this type, although they are frequently connected with other untoward conditions of the person and are not the result entirely of overwhelming external circumstances.

IX. *Psychological Association and the Neuronic Theory.*—Perhaps as a final indication of the character of psychological

association we might make clear the point that the process of association refers exclusively to the immediate or mediate connections between the acts of the person and surrounding stimuli. The term mediate connection refers to the associations in which series of responses are connected of which perhaps one or only a few members are in direct linkage with stimuli. What we wish especially to make plain is that the stimuli and responses are the end and sole factors in association. That is to say, association consists of the various organizations of these factors. What follows then is that we may not think of the connection between stimuli and responses or between responses and responses as the manifestations of something else.

Frankly, we want to deny that the connections between associational members are the manifestations or effects of connections between neurons or neural patterns. Further, we might go in our disavowal and say that we cannot accept anything of a neural basis for association. In opposition to the neural theory a number of objections may be strongly urged.

In the first place, to assume a neural basis for association means to distort associational facts in two particulars. (1) The function and efficiency of the stimulating situations and objects are set aside and not given place or prominence in the description of the associational facts. Besides preventing us from correctly describing the facts of association such a procedure inevitably misleads us into limiting the number and varieties of association to accommodate the theory. It is not improbable that to the neural theory may be laid the charge of excluding from associational types all the connections but those of ideas and sensations.

(2) No less serious objection to the neural theory is the criticism that its upholders attempt to make some phase or a part of one of the members of an associated couple a causal condition of the connection. More and more widely recognized is it becoming that we must not look upon the neural phases of psychological action as anything but integral factors of a total reaction. Now it is plain enough that even

when we are discussing associations between reaction couples we blunder by taking the neural components of one or both members as causing or conditioning factors. How much more culpable is it then when one or more members of the associated complex are stimulating objects or situations. Precisely how serious is this present criticism may be judged from the fact that when we maximize the importance of the neural factors in behavior we thereby submit the reactions to needless diremption, separating the neural activities from the many other components. And usually we follow up such descriptions by calling the neural mechanism an intervening process between the stimulus and the response, the response here being of course the remaining processes of the single adjustment act.

(b) Further, from the standpoint of an organismic psychology, the neural theory of association stands condemned because it perpetuates the doctrine of autonomous mental states. Instead of allowing psychological phenomena to be described as definite concrete reactions of the individual to his surrounding stimuli, the neural assumption presupposes that psychology is dealing with mental or psychic states for the existence of which the nervous system provides a basis and for the organization and operation of which the nervous system constitutes the mechanism. Whether we accept or reject a psychology of mental states we still face the problem whether the process of association is confined to the connection of simple units of a complex mind or state of mind, or whether the process includes also the connections of responses with stimuli, an addition which may be expanded to include the general interconnection of persons with their surroundings. A crucial problem is here involved affecting the very foundations of psychological science.

(c) From the actual development of psychology we learn that the insistence upon a neural basis and mechanism for psychological association involves a very doubtful procedure, namely the attempted correlation of specific neural elements with particular ideas or other mental states. How manifestly erroneous such a procedure is, is readily indicated by the

denial of every psychologist that he is really attempting such a correlation. No psychologist, it is safe to say, would care to admit that he means to connect an idea with a specific neural element; but is this not the inevitable implication of a neural theory? From the earliest correlation of neural and mental phenomena the aim of psychologists has been to make use of the neural apparatus to account for the organization and association of mental states; and how, we may ask, could this desired effect be brought about unless specific neurons were connected with specific mental states? Of a certainty this entire procedure is very vague and without the slightest shred of support from competent neurologists, and yet the aim of the psychologists although denied by them is indubitable.

What follows if the psychologist does not attempt an exact correlation between neural and mental elements? Simply this, that the nervous system is clearly neither a mechanism nor a basis for association or any other kind of psychological process. As we have more than once indicated, the neural theory not only does not help us at all in the interpretation of associational facts but it precludes our investigating the neural mechanisms themselves as integrant factors of complex reaction systems.

X. *Summary.*—Precisely as in the case of an earlier psychological period associational processes today may be looked upon as fundamental and universal mechanisms for all psychological phenomena. But unlike the earlier period in which association was considered as having to do only with mental states, we must today consider it as referring to the organization of actual stimuli-response situations. Associational processes, then, we may conclude constitute some of the basic facts in an objective and naturalistic psychology. We have attempted to point out that the specific reactions to stimuli such as we call learning, remembering, thinking, and the manipulation of skill are all the operations of connections between stimuli and responses. Also, psychological capacities of various sorts besides specific responses may be looked upon as the association of many responses and stimuli

of some given type, all of which in their operation give the person a series of general competencies serviceable in his various adjustments.

Now just in this fact that we can find common ground in such apparently widely separated psychological positions as associationism and objective psychology do we find support for the validity of our hypothesis that association is a fundamental basis for all behavior. Let us observe that after all the associationists may be considered as having magnified a single kind of associational process, namely connections between implicit responses. Our study, however, has sufficiently indicated that from an objective standpoint we must, along with the response factor, include the stimulus phase of a behavior situation as an essential factor also, no matter how many reaction systems are associated in a pattern of response to form the reaction phase connected with the particular stimulus. Since associational processes are in the last analysis orientation processes connecting the organism with its various surroundings, we must include among the types of stimuli studied the objects, events, and persons which arouse the individual to action.

Associational processes we have found to include always two phases, one the organization of stimulus and response connections, and the other the subsequent operation of the responses when the previously associated stimuli are presented. To a very slight degree then we might correlate the organizational phases of association with the simultaneous association and the operational aspects with successive associational phenomena.

Since we look upon associational facts as definite reactional processes we do not expect to find a few "laws" governing the operation of associational mechanisms. Innumerable contributing conditions accompany of course both the acquisition of associational connections and their subsequent functioning, but none of these is in any sense a directing principle of the connections between stimuli and responses. In contrast to directing principles or laws the conditions of association connection are the facts obtained in empirical

observation concerning some actual association. Similarly what we have called modes and levels of associations are designed to bring out specific empirical association features.

And finally, we conclude that if the facts of association are definite responses of organisms to their surrounding stimuli, then we can in no sense look upon any phase of the response such as the nervous apparatus as the cause or condition of the associational connection. In the first place, no such causal means of explanation is required to account for the facts of association, and in the second place, it would be impossible to give any causal explanation in terms of the neural mechanisms of the response factor. For our own part, we are content with our description when we give an account of the interconnection of stimuli and responses with the circumstances attending such an interconnection.