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DO WE THINK IN WORDS?

BEHAVIORIST VS. INTROSPECTIVE CONCEPTIONS

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1. *Purpose of the Discussion.*—The following discussion takes its departure from the reading of Dr. John B. Watson's 'Psychology from the Standpoint of a Behaviorist.'

It is the purpose of the writer to discuss certain hypotheses which are put forth with seeming conviction in the text but which are believed by the writer to be false.

To discuss the whole subject of the Behaviorist point of view, in relation to the more generally accepted points of view in psychology would be quite impossible in the scope of this article. That a text in psychology should be written in which the author not only purposefully avoids the mention of such concepts as perception, ideation, association of ideas, consciousness, attention, will, etc., but even goes so far as to claim that these concepts are useless for purposes of psychology, is of course quite a source of wonder. The indispensability of the concepts avoided by Behaviorist psychology and of the use of introspection will be apparent, we believe, from the discussion of but one 'assumption' which it makes. We shall confine this article to the discussion of this assumption.

The hypothesis referred to is 'the point of view that has been advocated throughout the text, namely, that thought is the action of language mechanisms' (p. 316). The meaning of the expression, language mechanisms, is carefully defined by the author as referring to any of those muscles

of the body which actuate to produce words whether spoken, written, or gesticulated (as by deaf mutes). The meaning of the word, thought, as used in this hypothesis is not explicitly stated, but may be inferred with confidence from various passages which we shall quote[1] and is here taken to be the same as the meaning of thought when used by those who are not Behaviorists.

To be sure, the author states in the preface that "the terms thinking and memory have been carefully redefined in conformity with Behaviorist psychology." On page 14 we find in italics the expression: '"thinking," by which we mean subvocal talking.' This may constitute the re-definition, but if so it obviously begs the question which we are discussing; namely whether 'thinking' as ordinarily understood does consist of subvocal talking. We shall therefore leave this re-definition out of account.

It will be realized that the adjustment of an individual to his environment may involve acts requiring mental activity of all degrees of consciousness, from the most automatic habitual or instinctive acts requiring little or no consciousness, such as moving the eyes toward an object it is desired to see, to the solving of problems requiring the

[1] "A man may sit motionless at his desk with pen in hand and paper before him. In popular parlance we may say he is idle or 'thinking,' but our *assumption* is that his muscles are really as active and possibly more active than if he were playing tennis. But what muscles? Those muscles which have been trained to act when he is in such a situation, his laryngeal, tongue, and speech muscles generally" (p. 15).

"We manipulate vocally" (when trying to think of the name of a familiar person) "by running over the names beginning with each succeeding letter of the alphabet, or by saying 'black hair,' 'blue eyes,' 'six feet tall,' and the like" (p. 305).

"The explicit and implicit language habits are formed along with the explicit bodily habits and are bound up with them and become a part of every total unitary action system that the human organism forms. . . . They are present in the simplest types of adjustment that he makes. We can see the functioning of language habits only slightly in certain activities, as, for example, in swimming, tapping on the table with a pencil, while in certain other types they form an integral part . . ." (p. 309).

"Our view is that overt language develops under social training. It is thus absorbed into and becomes a part of every total integration of the individual. Hence when he is making adjustments in the absence of other like beings language remains as part of the process" (p. 323).

". . . the maiden thinks of her lover in words . . . . . the beautiful thoughts of the idealist for mankind as a whole or of the mother for her child . . . are couched in words or their equivalent" (p. 325).

most concentrated mental effort. It is hardly conceivable that the Behaviorist would claim that *all* such adjustment involves language mechanisms, as the passages quoted would imply if taken literally. To simplify matters, however, we will limit our discussion to that type of adjustment ordinarily referred to as 'thinking,' namely, those mental processes of the problem-solving sort which require some degree of conscious mental effort, since these are open to introspective investigation. That even these processes of adjustment do not necessarily require language we shall attempt to show by appeal to logic and common experience, omitting arguments *ad hominem*.

2. *Examples of Thinking.*—Let us consider one or two simple cases of problem solving and subject them to critical psychological analysis in order to determine whether they involve language.

Suppose I have unfolded a new map and am attempting to fold it again as it was. I have no complete habit, not having folded a map exactly like this before. Let us see what happens. Surely there is a better way than to let someone watch me and report his inferences. He would merely see me look at the map and, let us say, try to fold it in one way but fail and then try another way and succeed. He might infer that my method was the so-called 'trial and error' or 'perseverance' method. Or if my lips have moved he might infer that I arrived at the solution of the problem by means of the action of the muscles of my lips and other speech organs. This appears to be the method of the Behaviorist.

Let me introspect and report from direct observation what happened from the point of view of one looking on from the inside. The writer does not wish to be misunderstood as assuming that introspection is infallible. One's testimony is not infallible even when he observes with his own eyes an incident which transpires directly before him. Relatively speaking however, introspection is far more direct and reliable than inference based upon observation from the outside.

On introspection I report as follows regarding my action with the map. More or less mechanically, as we say, that is, while thinking about what I had seen on the map, I began to fold the map along one of the creases. After a moment I became aware that the map was not falling into its accustomed folds. I then became aware of the need of finding the correct way to fold the map and I unfolded it in order to begin again. I recalled from previous experience that the crease on which the first fold must be made is one which runs entirely across the paper. I therefore looked for such a fold and on finding it folded the paper on it and repeated the process until the map was entirely folded up, making no further error.

Now this adjustment which I have made to the problem of folding the map was 'thinking,' alike in the popular usage and that of the psychologist. The Behaviorist claims that thinking is the action of language mechanisms. Let us go over this example of thinking again and examine it very minutely to see whether there is any necessary connection between language and the solving of the problem.

First of all, how do I become aware that the map is not falling into its accustomed folds? If I go slightly back of this awareness I note a feeling of contradiction between a subconsciously expected feeling of flatness and the experienced feeling of bulginess. This contradiction, we may say, caused me to become aware of the improper folding of the map—caused the shift of my attention from the thoughts of what I had seen on the map to the matter of folding the map.[1] How did I then become aware of the need of finding the correct way of folding the map? The experience suggests no other explanation than merely to say that the idea of contradiction 'called up' or 'suggested' the idea of need. This idea in turn called up the idea of beginning again. We may explain this process by saying that it was probably

[1] That a subconscious awareness of contradiction may give rise to an idea of need, together with an affective state which effects a shift of attention (clear awareness) to the need, is a matter of so frequent observation in structural psychology as to be considered a scientific fact. Such a fact, however, is of course quite unthought of in Behaviorist psychology, being wholly outside of its scope.

the result of a previously formed habit. One has learned in such cases that it is best to begin again. When the idea of unfolding the map again has come to occupy more or less of the whole of consciousness, 'the thought takes form in action.' Behaviorist psychology concedes such a phenomenon, so we need not attempt to explain it. Having unfolded the map I recalled previous experiences regarding the folding of large sheets of paper. We will say that the perception of the paper before me and the idea of need of folding, together served to bring forth from my memory store those ideas which came to my mind. These together with the perceptions of the map during the process of folding served to educe that train of ideas which guides the folding to a successful termination.

Now what is the material of all this mental activity? What do these ideas consist of? They consist of images, visual, tactual, kinæsthetic, etc., of maps, and of certain aspects of these images such as creases, folding movements, flatness, bulginess, etc. They have nothing to do with language, necessarily. The idea of flatness is tactual or visual or both, the idea of a folding movement may be visual or kinæsthetic or both. The idea of the length or direction of a crease is visual or kinæsthetic or both. Possibly other types of imagery enter to a slight extent. But no language need be involved.

Let us now consider another type of thinking. Let the reader ask himself why it is more difficult to play a game of chess blindfolded than with the chess board visible before him. Obviously the answer is that the perception of the relative positions of the chess men is a great aid to the mental manipulation which constitutes the basis of the study of moves. Moreover, anyone who has played chess or checkers will immediately appreciate the aid that would be derived from actually making the trial moves that are contemplated, in more clearly appreciating the relations that such moves would introduce. If the thinking were done by means of subvocal language it would seem that seeing or not seeing the chess board would make no difference. The obvious

answer is that the thinking is done by means of the perceptions of the board and men as they are, the mental imaging of the movement of the men into new positions and the appreciation of the spacial and temporal relations between the pieces and their possible moves as introduced after the mental manipulation. No language whatever is required. As we shall show, a person may indeed talk to himself while contemplating moves, but this activity is entirely secondary and supplementary.

3. *The Material of Thought.*—Thinking, as an adjustment of the individual to his environment, as the solving of problems, consists of the evolving of new ideas, concepts, or meanings, from old. This is accomplished by recombination of the elements of the old into new patterns. By ideas, concepts, and meanings are meant image patterns, whether they be of words, objects seen, sounds heard, things felt, tasted, sensed in any manner whatsoever, or any quality, attribute, or aspect of such image patterns as may be conceived separately by abstraction, such as shape, color, surface, volume, extent, duration, intensity, symmetry, movement, similarity, difference, causality, symbolism, abstractness or affective quality; or of whatever degree of clearness or attenuation or incipiency the images or image aspects may be. We may think, therefore; that is, we may evolve new ideas, concepts, meanings, in terms of image patterns of any kind whatsoever, or of the consciousness (idea) of any relationship whatsoever between these image patterns.

For example, I am thinking when I am effortfully engaged in composing a piece of music. I sit at the piano with music paper at my side. My mind is occupied with perceptions and images of tones, tone combinations, tone sequences, tone relationships, tone emotional effects, tone symbols (dots on paper) the making of these symbols, etc.

My effort consists in the maintenance of my attention to the work, the calling up of sequences of tone images,[1] the

[1] Strictly speaking I adopt the mind set that will result in the calling up of tone images, or that is calculated to do so. (Sometimes I may succeed better than at other times.) We cannot call up an image necessarily at will. Generally it is a case of taking a certain mental attitude ordinarily called 'trying to think' which usually results in the recall of the idea desired.

comparison of these, the appraisal of their respective æsthetic values, the choice of one or another, the calling up of the proper symbols of notation in which to write down the musical ideas, and the writing of these. No language is involved in any of this thinking (except perhaps a final translation of the results of thought into symbols). In this case also I may compose without the piano; but this is more difficult, since I am compelled to make my judgments upon images only, whereas with the piano I may employ the perceptions of the tones themselves in my judgments. If my musical thinking were all done by means of the action of speech muscles we do not see that it would make any difference whether the piano were struck or not.

Similarly, one is thinking when he is creating a new architectural design, or a drawing or painting or statue or stage setting, or conceiving of a new dance movement or inventing a new mechanical contrivance or playing tennis or searching for the cause of engine trouble. The material of one's thoughts in all these cases is in the form of images, which need be only visual, auditory, tactual, kinæsthetic, may be, in fact, of any kind whatever according to the requirements or to one's ability to call forth such images. As we have said, one may do any amount of talking to oneself while thinking—which is merely putting one's thoughts in words after they are thought—but the talking is not the thinking. It is supplementary to it in exactly the same way that describing a landscape is supplementary to seeing it.

Thinking may be called the controlled association of ideas, in contradistinction to the free association of ideas. In the free association of ideas, by which we refer to what is ordinarily called day dreaming or revery, ideas follow one another in a more or less unguided manner, yet in a fairly rational way as compared with the incongruous manner of idea sequence sometimes experienced in dreams. Doubtless there is some sort of control even in 'free association' though it may be the general interest in the subject of thought or the control occasioned by thought habits. However, in what we have called controlled association of ideas characterizing

thinking, the ideas are guided in their sequence by some conscious aim, *e.g.*, a problem to be solved. Irrelevant ideas are discarded (attended from), relevant ideas are attended to. That which does the controlling is often also in the form of a definite idea. This is best illustrated when one is given two digits written one above the other: if told to add them, under the influence of this guiding idea they call forth their sum; if told to subtract one from the other, under the control of this guiding idea they suggest their difference. The same stimuli give rise to either one or another idea according to the nature of an additional and controlling idea.

Similarly, we may have occasion to think of the *opposite* of a given concept, or of a subordinate, or the superordinate or the symbol of a given concept. In any case one idea calls up a second under the guidance of a third.

We may not only occupy our minds with ideas of the color, size, shape, etc., of objects, as referred to above, but we may *compare* two objects as to color, size, shape, weight, motion, acceleration, symmetry, etc., and *judge* which is the best suited to our needs. Of two individuals we may compare the good looks, cordiality, sincerity, hospitality, integrity, adaptability, intelligence, etc., as conceived in ideas of conduct, feelings, appearance, facial expression, and of the many circumstances under which the impressions were gained. All these mental activities dealing with ideas as material—their association, recall, generalization, abstraction, comparison, judgment, etc., are elements in adaptation, yet they may be experienced or accomplished quite independently of words. The idea of a color is not a word. The idea of one color being more intense than another need not have anything to do with language. The choice of this or that color for an æsthetic purpose does not require language, nor does the act which the choice calls forth. Yet all this is adaptation.

4. *Words may be the Material of Thought.*—As has been suggested throughout the discussion, words may be the material of thought. The place of words in the range of material of thought may be stated as follows. The material

of thought, as explained below, begins with perceptions; then come images resembling perceptions, then more and more attenuated images or aspects of images singled out by abstraction, and finally symbols. By symbol is meant any concept which is used in place of another. The best illustration of thinking in symbols is in the case of the number symbol system used in arithmetic and algebra. The idea of eight (not in the word but the number: ********) is represented by the symbol: 8. The idea of seven (seven things: *******) is symbolized by the figure: 7. Now if we have the problem of finding the sum of these numbers (******** and *******) we may do so by translating them into their respective symbols and give our attention to the symbols only. Having previously formed an association between the symbols, 7 and 8, and the symbol of their sum: 15, the symbol 15 is called up when the symbols, 7 and 8, and the guiding idea of summation are in mind. We may then proceed to make other arithmetical computations in terms of number symbols only, letting these call up the number idea (****—) when needed. Similarly in algebra we may let x represent one number with which the problem deals and let y represent another number, etc., and then by means of habits established in connection with these symbols we may do thinking of a simple type in lieu of what would be far more difficult if done with the original concepts of number. This type of thinking is exemplified in the following algebraic reasoning:

If $x^2 - y^2 = z$ then $(x - y)(x + y) = z$.

There are of course many kinds of symbols. In addition to the number symbols just mentioned there are the symbols of operation upon numbers such as those of addition, multiplication, integration, involution, etc., there are the symbols of musical notation, symbols of punctuation (?, !, ", *, -), symbols on maps representing roads, trees, buildings, bridges, tunnels, etc. (an engineer can think very effectively in these symbols). There are even symbolic facial expressions used by actors to portray emotions which off the stage would not be expected to produce those expressions. A skull and cross bones symbolizes danger. The flag symbolizes country,

etc. Last, and most important, of course, words and sentences symbolize thought of every description. Occasionally we feel that we have experienced some thought or sensation or feeling which cannot be expressed in words. But in general all ordinary thoughts and feelings can be represented by some word or sentence.

We see therefore that language constitutes only one of the various kinds of symbolization, and symbols constitute only one type of material of thought.

Words are themselves the material of thought under many circumstances. Whenever we have to communicate thoughts to another or learn the thoughts of another through language we have to deal with words. By far the greatest use of language of course is in the calling up of language symbols to represent meanings or the calling up of meanings represented by language. Occasionally however we may think in terms of language almost exclusively, as when dealing with the rhyme and rhythm of poetry. In the case of syllogistic reasoning we may be truly said to be thinking in words, when the expression "All *A* is *B* and all *B* is *C*" calls up the language idea: "All *A* is *C*," or when part of a sentence suggests the rest as "All is not gold that ——."

5. *Language the Symbolization of Meaning.*—We have attempted throughout this discussion to distinguish clearly between a *meaning* and the language by which it is symbolized. We cite the following illustrations to bring out this distinction still more clearly.

If one says: "I saw John Jones on the street this morning" the hearer will get the meaning of the sentence at once. "Getting the meaning" means to the ordinary person getting an image, more or less faint perhaps, of the speaker looking at Jones on the street. But let us take another sentence. Here is one in which the meaning of a new (coined) word is stated. Every word in the statement of the definition except the new one is perfectly intelligible and familiar and the statement is a perfectly logical and meaningful one, yet we are confident that the reader will not get the meaning from the language on first reading. This is the sentence: "Let

us define the word, incration, as meaning the increase in the number of feet per second per second by which the motion of a body is accelerated." Anyone who has gotten the meaning of this sentence clearly should be able to point out immediately the error in the following statement, which if correct would follow as a corollary to the above definition: "The unit of incration is one foot per second per second." (The correction is indicated in a footnote.) If the reader is unable to point out the error it is merely because he has not gotten the meaning of the definition, which is something quite apart from the words by which it is symbolized and consists of images either of the motion of a body or of the path of its motion. Without such images we are confident the meaning can in no way be appreciated.[1]

As has been said, the utterance of sentences or of parts of sentences or of analogous statements often *helps to bring out* the meaning, that is, helps to call up the imagery necessary to build up the meaning, or helps to fix the meaning in mind by symbolizing it after it is appreciated. But the meaning may exist entirely independent and apart from any utterance, either overt or implicit.

One often hears the expression from pupils in school: "I know but I can't tell." This is generally a simple case of having a meaning or idea without the ability to symbolize it in language.

Moreover, as has been stated, even an adult may have experienced perceptions, ideas, or feelings which he will declare cannot be expressed in words. Even if they could,

[1] The correct statement is: The unit of incration is one foot per second per second per second.

A reasonable comprehension of the meanings of these statements may be built up with the help of the following leading statements. The *rate* of motion of a body is the number of feet per second which it moves. The unit of rate is one foot per second. The *acceleration* of a moving body is the increase in its rate, that is, the increase in the number of feet per second which it moves in succeeding seconds. The unit of acceleration is one foot per second per second, that is, one foot per second every second. And again, the *incration* of a moving body is the increase in its acceleration, that is, the increase (from second to second) in the number of feet per second by which its rate is increased, or in other words, it is the number of feet per second per second by which the motion of the body is accelerated. The unit of incration is the unit of acceleration every second, that is, it is one foot per second per second per second.

his inability to do so testifies to the independence of the thoughts from the language by which it would be symbolized. We say of our memory of a sunset that it was 'indescribable' and 'would have to be seen to be appreciated,' which is entirely true. We say, 'Words fail me' regarding the expression of our thoughts of past emotional experiences. The emotional experiences of love, hate, fear, anger, etc., may be the material of thought just as well as the experience of perceiving the color blue. Even our best attempts to express our thoughts of experiences in words often fail to carry full meaning to the hearer unless he has had a similar experience. Thus, one may say that an experience was like that of a sudden drop in an elevator or like flying in an aëroplane, but unless the hearer has had an analogous sensation or experience the expression is devoid of essential meaning to him. What can the expression, 'like being struck by lightning' or 'like finding oneself caught under the ice' mean to one who has not had the experience in comparison to what it means to one who has had the experience! Yet the language is identical in the two cases. One and the same expression from the lips of an oratorical person may convey a meaning to one hearer which will call forth tears, a meaning to another hearer which will call forth anger, and a meaning to still another hearer which will call forth laughter. Such a phenomenon would be of course entirely impossible if there were but one meaning to the expression, a meaning inherent in the language itself. It is a platitude that the meaning of language is something which is brought to it from the experience of the hearer, that it does not reside in the language.

6. *The Genesis of Language.*—Not only may we have thoughts for which we cannot think of the existing appropriate language, but we may often have an idea for which there is no corresponding word or phrase. Indeed language is built up by the coining of new words and phrases that are needed to symbolize new thoughts for which no corresponding language exists. The word, automobile, for example, did not come into existence until after there had been made,

or at least conceived, a machine which would move itself, and which needed a name. Similarly the expression, 'carry on,' came into use in response to the need of a name for an action which was well comprehended but for which no convenient language equivalent existed. Ideas originate first; afterward they are named—symbolized in language.

Perhaps the clearest example of the temporal relation between the genesis of ideas and their symbolization is the case of the naming of persons. First the child, which we perceive, is born. Afterward it is given a name. Why do we give a child a name? It is, of course, for the reason that to refer to it always by description would be cumbersome and inaccurate. When we think of a person deliberately we think of his form and features, his speech, manner, expression, etc. When we think of him more fleetingly, however, our imagery becomes attenuated, even perhaps to the extent exemplified by the representation of Roosevelt by merely a pair of glasses and a row of teeth. But for the purpose of one person conveying the thought of an individual to another, such attenuated imagery is inexpedient. We therefore symbolize the whole picture or idea of the individual by a single word (a name). The name then, in cases of rapid thinking, may nearly take the place of the concept of the individual as imaged. The name, however, still does carry with it something of the original imagery. The idea of 'James' to one person carries with it something which characterizes his brother, James. The idea, James, to another person, carries with it something which characterizes his uncle, James, a different individual. This additional something is needed to constitute the difference in meaning between 'James' for the one person and 'James' for the other. To a third person who knows no one by the name of James, the idea is merely a word, known to refer to some individual.

On the other hand the perception of a person whose name is not known does not carry with it any idea of a name, nor need any word come to the mind. When I see a man I do not think 'man.' When I think of a crowd of persons I do not think of a crowd of words! Language is as distinct from

the ideas it represents as the name of a person is distinct from the perception of the person himself.

An infant of course does not use language habits until a year or so after birth. Yet an infant can think—perceive, compare, judge, choose, decide, act upon decision, etc.—before language habits begin. The material of his thoughts is the sights, sounds, smell, tastes, feelings, etc., which he experiences throughout his waking state.

To illustrate the genesis of language habits we must go back to the early days of a child's life when it is just beginning those 'Abbreviated and short-circuited actions (which) become a necessity if it is to hold its own in that environment and make progress' (p. 319). The child's perception of its doll, its desire for the doll, its idea of searching for the doll when not in sight, its idea of creeping toward the doll when seen, its idea of reaching for the doll when within reach, its idea of grasping and the new ideas which arise from the manipulation of the doll—assuming these ideas sufficiently well fixed by habit that the actions have reached an 'abbreviated and short-circuited' stage and are purposeful and adaptive—these ideas constitute the beginnings of thought (conscious adjustment to the environment).

The stimulus, 'tata' (p. 320), cannot call up the concept, doll, before the concept, doll, is in existence. Nor can it create the idea. The child must have some idea of the doll, formed from perceptions of the doll itself, *before* the idea of 'tata' can be associated with it. Language in general bears just the same relation to thought in general that the idea, 'tata,' as a word, bears to the idea of the doll, as something seen, touched, etc.

Similarly the idea of number is formed before any symbol representing number can be associated with it. We may talk about number in the hearing of a child for months after it has begun the use of language, but until the child has by observation and comparison become conscious of the two-ness of its hands, of the two-ness of its feet, and of the two-ness of many other separate things, so that the idea of two-ness as an abstraction becomes a separate idea in the child's mind—

until this time the sound of the word 'two' is meaningless to the child, and only attains meaning when finally associated with this abstract idea of the two-ness of any two things. The meaning comes first; afterward the language symbol (word) is associated with the meaning and may be substituted for it when occasion demands. One has but to attempt to teach a child, who is just learning to talk, to count and deal with number concepts to see how absolutely meaningless the words are to the child until he has had opportunity in the course of his daily experiences to make the abstractions necessary to form these ideas. We may teach a three-year child to pronounce perfectly the sentence: "The square root of twenty-five is five," and if the action of language mechanisms constituted thought we should expect the child to understand perfectly the meaning of what he had said! Further comment seems unnecessary.

It will be noted that in this discussion it has been necessary to use concepts which are not found in Behaviorist psychology. These are the concepts of 'meaning,' 'idea,' 'concept,' 'conscious,' 'purposeful,' 'association of ideas,' 'abstraction,' 'symbolization,' etc. Yet these are fundamental to structural psychology and from the above discussion we deem it apparent that a consideration of the acquisition of language habits, their function in thinking, and the material of truly non-language thought, is totally inadequate without these concepts. To be sure we find passages in a Behaviorist psychology attempting to state what goes on in the mind of an individual. Thus (p. 305): "We manipulate vocally" (in attempting to recall the name of a familiar person) "by running over the names beginning with each succeeding letter of the alphabet, or by saying 'black hair,' 'blue eyes,' 'six feet tall,' and the like." This seems to the writer to be one of several excursions quite outside the realm of Behaviorist psychology. He does not know whence these ideas came but judges that it was by some sort of inference, partly because the Behaviorist does not use introspection and partly because he is unable to corroborate them by introspection.

7. *The Inadequacy of the Behaviorist Conception of Thought.* —To illustrate what is believed to be the wholly inadequate conception of thought as entertained by the Behaviorist, we cite the soliloquy postulated on page 332. "The implicit word processes (aroused by whatever previous stimulus) 'it's a fine day, I think I will go to the races; it's twelve o'clock now, I have just time to catch the train,' serve to start you to get your hat and field glasses. Some unfinished work meets your eye or other conflicting word processes are aroused, as 'but I have to write those letters and I have a luncheon engagement with X.' These tend to drive the organism as a whole into some other form of action; for a time there is a conflict (inhibition). Finally when the conflict is over the final word act issues, 'Well, I guess I'll have to give up the races and write those letters and keep my engagement with X.' Here we see implicit word processes tending to arouse overt acts and actually arousing the initial steps. But since the human individual is a completely integrated affair, associated word processes arise which may drive the organism into a totally different form of activity from that which was first initiated."

The writer contends that the 'previous stimulus' together with the mental activity which called forth this soliloquy would be sufficient to start one to get his hat and field glasses, without the accompaniment of any action of language mechanisms, and that such action itself would not suffice. The reasoning is as follows. Let us suppose the previous stimulus to be the perception of the green grass and sunshine and warmth of the outdoors. This perception called forth by association the memory of previous days when races were attended and of the accompanying pleasure. These memories contained the urge to renew the pleasures. They gave rise to the decision which is expressed in the language: "It's a fine day, I think I will go to the races." The decision made, the thought took form in vocal expression. At this point either the clock struck twelve, this serving as a stimulus, or the idea of going to the races naturally called up the idea of when to go, which in turn suggested the

idea of looking at the clock, resulting in the perception that it was just twelve o'clock. None of this mental activity required language. The perception of the time of day having been made in one way or another, the idea called up the words which would express it and the individual added, 'It's twelve o'clock now.' What happened next? Presumably at this point came the idea of going to the races by train, followed immediately by the idea which if expressed in words would be, 'When does the train go?' which in turn called forth the memory that the train goes (let us say) at twelve-fifteen. Immediately there came to the mind the idea of the preparation which is necessary to catch the train and a judgment is made as to how long this will take, based upon past experience. The individual must also go through a certain mental operation of determining how much time there is available before train time and make a comparison between these lengths of time in order to make the decision which when expressed in words is, 'I have just time to catch the train.' This idea possibly suggests the idea of haste which together with the idea of going to the races calls forth ideas of the appropriate preparation, getting the hat and field glasses, etc. These latter ideas take form in action.

In view of the obvious necessity for the mental activity of perception, judgment, decision, etc., intervening between the advents of the ideas which took form in the language quoted, we submit that, as stated above, it is impossible that the soliloquy postulated could of itself have given rise to the getting of the hat and field glasses. Moreover, the ideas themselves which suggested the soliloquy could have given rise to the acts and there need have been no language, explicit or implicit, involved whatever. Thus, the ideas of time may have been conceived in visual imagery—the imagery of the face of the clock and the movement or path of the minute hand. No language is required. The ideas of preparation for the train would consist of memory of the acts of getting hat and field glasses, walking or riding to the station, buying the ticket, etc., these consisting chiefly of visual and kinæsthetic images. No language is necessary.

The ideas involved in the judgment of distance (to the station) or of time required for preparation and traversing the distances, etc., would be kinæsthetic or visual or other ideas of space and motion, the comparison of these ideas of space and motion, etc., resulting in ideas of the relations between them. No language is required. Moreover, the ideas which take form in the acts of getting the hat and field glasses are visual, tactual, and kinæsthetic and are quite independent of language. The fact is, one could conceivably note the weather, decide to go to the races, make preparations, board the train, hand the conductor a ticket, note the progress of the train, get off at the race track, pay the entrance fee, and watch the races, all with mental activity and acts in no way involving language. Any amount of soliloquy or conversation may accompany the expedition, but this is wholly incidental, secondary, and unessential.

8. *Introspection.*—We believe that Behaviorist psychology is entirely sound *within its own sphere*, that is, so long as it confines its study to the behavior of the individual as seen from without. A psychology so limited, will, of course, necessarily leave untouched a vast field of useful knowledge which can in time be made scientific where not already so, after extensive investigation, comparison of findings, determination of general tendencies, and the careful observation of everyday experiences. But should one desire to explore the realms of psychology outside the scope of Behaviorism, he must then supplement his external observation by as thoroughgoing, extensive, and careful an examination of that which takes place within the mind—as seen from within—as is possible by highly practiced and trained introspection.

To direct the attention to the color of an object is a very easy matter. To direct the attention to the difference in shade between two colors may be slightly less easy but it is entirely possible. To direct the attention to the idea of the æsthetic value of the colors requires perhaps appreciably more practice, but it is none the less possible. However, to direct the attention to the nature of the mental process of choosing between two colors, and to the manner

in which the choice gives rise to appropriate acts, may be quite difficult, not to say impossible, for the inexperienced person. Yet these phenomena are available for observation no less truly than the habit of typewriting is open to acquisition or the length of a rail is capable of being measured to the thousandth of an inch. These accomplishments require long practice or minute observation, but we do not say they are impossible. An unpracticed person cannot direct his attention to the less tangible aspects of thought any more than he can play a theme on the piano. Because it is difficult however, one does not forego the learning of piano playing, if he desires to learn to play. Again, it is possible that no two observers might obtain the same measurement of a rail to the thousandth of an inch. Nevertheless we do not say that measurement is of no use in physics. Observers can nearly all agree on the length of a rail to the tenth of an inch, and on the length of a needle to the hundredth of an inch not to say to the thousandth.

Similarly in psychology, those inexperienced in introspection may not be able to distinguish between middle C on the piano and the C an octave above, or to observe that they see objects double which are not focused upon. Moreover, persons highly trained in introspection may not always be able to distinguish between the perception of a very faint sound (as the distant ticking of a watch) from the auditory image of the sound (imagined sound) nor to state just what constitutes the mental element of difference between the emotions of fear and anger. But there should be little difference of opinion between persons of extended experience in introspection as to whether the material of our thoughts, when we create new ideas, and conceive new modes of activity in the fields of music, art, drama, mechanics, etc., is in the form of language or in the form of tones, visual pictures, etc.

9. *Summary.*—There may be no experimental proof whether or not thinking—conscious adjustment to the environment—is invariably accompanied by the actuation of some language mechanism as the larynx, lips, fingers, etc., in the incipient production of some form of language, spoken

or written, but the evidence would seem to favor the belief that no such invariable accompaniment is necessary. One uses the eyes in observing objects attended to almost throughout the waking state. It would seem more plausible to assert therefore that some form of "implicit" *eye* movement is a necessary accompaniment of all thinking. Much evidence such as that from the observation of a chess player studying his moves could be brought forth in support of this view. All this, however, is quite beside the point. The claim is made by the Behaviorist that "thought *is* the action of language mechanisms" (italics mine). Certainly the evidence against such an assertion is overwhelming.

Man is an organism highly adapted physiologically to his environment, provided with sense organs of sight, hearing, taste, smell, touch, pain, heat, cold, muscle movement, body position, etc. Each of these sense organs is capable of giving rise to sensations which take the form, in the mind, of images or image patterns. (The word image is used in a very broad sense as shown below.) The organism has at its disposal any or all of these incoming percepts or stored images or image patterns as material for thought, for working over into new combinations, new thoughts, which will give rise to new actions, new adaptations to the environment. In the event of the bringing together of two or more concepts—images—or of the dividing of one concept into two or more (as when a child first separates from the concept ball the concept roundness)—in the event of this working over of concepts, they are necessarily abbreviated, composited, exemplified, attenuated, or substituted for by others. If the substituted concepts are of a kind remote from the kind for which they are substituted but are more or less definite and commonly understood, we call them symbols. A careful description of the manner in which thought material is abbreviated, composited, attenuated (even to a point which is considered by some psychologists to be 'imageless'), etc., is of course quite impossible within the limits of this article.

However, the mental activity which brings forth a new act may be the result of the combination or division or other

working over of any type of mental material—the bare sensation, the fresh vivid full percept, the fairly vivid memory image, or the image or image pattern when abbreviated, or attenuated, or composited, or exemplified, or in any manner generalized or particularized, or finally in the form of symbols. And language, as has been shown, is but one general type of symbol system.

In conclusion, then, let it be said that we *may* think in words, and when we do, the thinking may be accompanied by the action of language mechanisms. But thought—even conscious mental adjustment—is not restricted to the material of language any more than it is restricted to the material of musical tones or of architectural designs or of facial expressions, nor is it restricted to the action of language mechanisms any more than it is to the mechanism of hearing or of sight or of locomotion.