

# A NEW FORMULA FOR BEHAVIORISM [1]

Edward Chace Tolman (1922)

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The idea of behaviorism is abroad. In the most diverse quarters its lingo, if not its substance, is spreading like wildfire. Why?

In the first place, it is to be observed that ever since the days of Ebbinghaus's experiments on memory the inadequacy of the merely introspective method as such has been becoming more and more obvious. And the recent work in mental tests and animal psychology has strengthened this conviction. In the second place, there has always been a formal logical difficulty about the introspective method which has troubled certain minds. That is, the definition of psychology as the examination and analysis of private conscious contents has been something of a logical sticker. For how *can* one build up a science upon elements which by very definition are said to be private and non-communicable? And, thirdly, the introspective method is practically arduous and seemingly barren of results. It is these three features, then, which seem to have been primarily responsible for the spread and catching of behavioristic categories.

What, now, does the behaviorist offer as a substitute? We turn to the arch-behaviorist, Watson. Behaviorism, he says, will be the study of stimulus and response such that given the stimulus we can predict the response, and given the response we can predict the stimulus. Very good! But how does he define stimulus and response? He defines them, he says, in the terms in which physiology defines them; that is, stimuli are such things as "rays of light of different wave lengths, sound waves differing in amplitude, length, phase [p. 45] and combination, gaseous particles given off in such small diameters that they affect the membrane of the nose," etc., and responses are such things as "muscle contractions and gland secretions."<sup>[2]</sup> We turn, however, to a later chapter<sup>[3]</sup> and read with astonishment, in a footnote, that "It is perfectly possible for a student of behavior entirely ignorant of the sympathetic nervous system and of the glands and smooth muscles or even of the central nervous system as a whole, to write a thoroughly comprehensive and accurate study of the emotions." But how can this be, we ask, if, by very definition, behavior is a matter of 'muscle contractions' and 'gland secretions?' How, on the basis of this definition, can a person 'ignorant of glands and muscles' write a behavioristic account of anything? That he can write such an account we would admit. The only difference between our point of view and Watson's would be that we should insist that such an account would be the only truly *behavior* account, and that an account in terms of muscle contraction and gland secretion, as such, would not be behaviorism at all but a mere physiology.

It should be noted that the possibility of a behaviorism which shall be not a mere physiology but something different has apparently already occurred to a number of writers. Thus, for example, Holt says that "the phenomena evinced by the integrated organism are no longer merely the

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excitation of nerve or the twitching of muscle, nor yet the play merely of reflexes touched off by stimuli. These are all present and essential to the phenomena in question, but they are merely the components -- now the biological sciences have long recognized this *new and further thing and called it 'behavior'*." [4] Mrs. de Laguna also explicitly states that what we want is a behaviorism which is not mere physiology. "In order to understand behavior we must resolve it into a system of interrelated *functions*, just as in order to understand the physiological workings of the human body we must envisage [p. 46] the complex of chemical and mechanical processes as falling into such fundamental groups as digestion, circulation, etc., constitutive of the physiological economy. Now just as there is a physiological economy, so there is a larger vital economy in closest union with, yet distinguishable from it. This is the system of behavior, by means of which the being, animal or human, maintains his relations with the environment and forms a factor in its transformation. The science of behavior has the task of tracing the lineaments of this larger economy." [5]

A.P. Weiss also seems, to some slight extent at any rate, to lean towards this same view of the desirability of a non-physiological behaviorism. For example, the following: "The investigation of the internal neural conditions form part of the behavioristic programme, of course, but the inability to trace the ramification of any given nervous excitation through the nervous system is no more a restriction on the study of effective stimuli and reactions in the educational, industrial or social phases of life than is the physicist's inability to determine just what is going on in the electrolyte of a battery while a current is passing, a limitation that makes research in electricity impossible." [6]

The two essential theses which we wish to maintain in this paper are, first, that such a true non-physiological behaviorism is really possible; and, second, that when it is worked out [7] this new behaviorism will be found capable of [p. 47] covering not merely the results of mental tests, objective measurements of memory, and animal psychology as such, but also all that was valid in the results of the older introspective psychology. And this new formula for behaviorism which we would propose is intended as a formula for *all* of psychology -- a formula to bring formal peace, not merely to the animal worker, but also to the addict of imagery and feeling tone.

But how can this be done? By what single common set of concepts can we possibly take care both of the facts of gross behavior and of those of consciousness and imagery?

Before attempting to suggest such a set of concepts, let us indulge in a preliminary epistemological skirmish. Let us start from the usual dualistic hypothesis implicit in traditional psychological thinking. Suppose, that is, we assume that consciousness is (for the purposes of psychology at any rate if not for those of an ultimate metaphysics) a new kind of something or other which is added to certain behavior situations but not to others. Introspective psychology claims the study and analysis of this new something or other as its own peculiar field. Consciousness is assumed by it to be something private to each individual which he alone can analyze and report upon. And the introspective account purports to be such an analysis and report. What now can our behaviorism answer to this? Our behaviorism will reply that whether or not there is such a private something or other present in the conscious behavior situation and lacking in the unconscious one, this private something or other never 'gets across,' as such, from one individual to another. All the things that do 'get across' are merely *behavior* phenomena or the objective possibilities of such phenomena. Suppose, for example, that I introspect concerning my consciousness [p. 48] of colors. All you can ever really learn from such introspection is whether or not I shall behave towards those colors in the same way that you do. You never can learn what the colors really 'feel' like to me. It is indeed conceivable that just as immediate 'feels' (if there are any such things) the colors may be something quite different for me from what they are for you, and yet if I agree with you in behaving to them; *i.e.*, in my namings of and pointings to the colors, no amount of introspection will ever discover to you this fact of their uniqueness to each of us as immediate 'feels'. You will only discover what the colors are for me as behavior possibilities.

Let us now turn to some of the actual concepts which seem to me to be required by such a point of view. We will confine ourselves to four: *stimulating agency, behavior-cue, behavior-*

*object*, and *behavior-act*. They may be thought of as very loosely analogous to the physiologist's concepts of external stimulus, receptor-process, conductor-process, and effector-process.

The *stimulating agency* may be defined in any standardized terms, those of physics, of physiology, or of common sense, and it constitutes the independent, initiating cause of the whole behavior phenomenon. Thus on different occasions it may consist variously in, and be describable as, as sense-organ stimulation (in the case of perceptual behavior), as the administering of a particular drug, e.g., hasheesh (in the case of hallucinatory behavior), or as the neurological end-result of a preceding activity (in the case of a behavior based upon memory or recall).

The nature of the *behavior-cue* will be understood most readily from a consideration of the dialectic which underlies the experimental work on sensory discrimination in animals. In such work the results, when strictly interpreted, are found to tell us nothing but the possibility of differences of behavior as a result of different stimulating agencies. If, for example, we find that a mouse can learn to behave differently as result of blue and yellow stimuli but not as a result of a red and green stimuli, we do not conclude anything as regards [p. 49] the animal's consciousness of these colors, as such, but merely something as regards the behavior-cues which these colors are capable of evoking in him. That is, blue and yellow wave-lengths are capable of producing in him two different behavior-cues, whereas red and green wave-lengths are capable of producing in him only one. In other words, where the older psychology talked about sense-qualities our new behaviorism will talk about behavior-cues.

The new concept is identifiable with the older one in so far, but only in so far, as the latter explained the possibility or lack of possibility of differences of *behavior*. The new concept departs utterly from the old in so far as the latter implied something concerning 'immediate feels' as such. By applying different stimulating agencies to our organism we discover the number and range of his possible behavior-cues. We learn which stimulating agencies he can use as a basis for differences of behavior and which he can not use as cues for different behaviors. And we learn something concerning the degrees of difference between these different behavior-cues. For example, we learn that, in a human of normal color vision, although the stimulating-agencies designated as orange and red wave-lengths produce behavior-cues which are different from one another, still these behavior-cues are more similar to one another (in that, on occasion, they are more likely to lead to an identical behavior) than are the two behavior-cues produced by the stimulating agencies known as red and green wave-lengths-and so on. In other words the sum of the behavior-cues possible for any given organism constitutes a total system which is to be defined not merely in terms of its relation to the stimulating agencies which evoke its members, but also in terms of the interrelations of similarity and difference between those members. We do not learn, however, anything about sensation-qualities, as such, neither when we observe the gross behavior of another organism nor when we ask the latter to *introspect*. We learn the nature of his behavior-cues. We do not learn the nature of his 'immediate feels'. [p. 50]

Let us turn now to a consideration of the next of our four concepts, that of the *behavior-object*. Just as the concept of the behavior-cue was found to bear a certain relation to a concept of the older psychology (viz., that of sense quality) so the concept of the behavior-object bears an analogous relation to another concept of the older psychology; viz., that of the perceived or apperceived *meaning*. A behavior-object results from a behavior-cue or a group of behavior-cues which, because of a particular behavior situation, possesses for the organization in question a specific behavior-meaning. For example, we present an ordinary western European with a chair, it produces in him, because of the structure of his sense-organs and as a result of its color, shape, etc., certain specific behavior-cues. In addition, however, because of his particular training and past experience and state of behavior-readiness at the moment such behavior-cues resulting from these shapes, colors, etc., arouse in him a very specific group of behavior-tendencies; e.g., those of sitting upon, getting up from, kneeling on, moving up to the table, etc. This group of aroused tendencies defines his behavior-object. That is, they constitute on that particular occasion the behavior-meaning of the colors, shapes, etc.

To use the terminology of the older psychology we would say that the behavior-cues in question are here apperceived as the behavior-object chair. On another occasion, however, this same group of behavior-cues might be apperceived not as a chair, but as a very different sort of behavior-object. If we were drunk, it might be apperceived, not as a thing to sit on, to kneel on, but as a thing to run away from, to scream at, etc. Thus, the behavior-object is to be defined in the last analysis simply in terms of the group of behaviors to which it may lead. And it is to be emphasized that it, no more than the behavior-cue, can be defined in terms of 'immediate conscious feels.' For no one of us ever knows for certain what another organism's 'conscious feels' may be. We know only the behavior implications of those conscious feels. [p. 51]

We turn now to the last of our four concepts -- that of the *behavior-act*. The behavior-act is simply the name to be given to the final bits of behavior as such. The behavior-act together with the stimulating agencies constitute the fundamentals upon which the rest of the system is based. They are such entities as to 'sniff,' to 'sit,' to 'scratch,' to 'walk,' to 'gallop,' to 'talk.' They are directly correlated with the action system of the given organism. They vary and increase in number with the growth and development of the organism. But it is they alone which, at any given stage in this growth and development, tell us all that we know of such an organism's 'mentality' (even when that organism is another human being who can 'introspect'[8]). Used as a means of comparing different stimulating agencies on the basis simply of the relative discriminability and non-discriminability of the latter, the behavior-acts provide us with our definition of behavior-cues (*i.e.*, sensation and image qualities). And used to discover the totality of different alternative behavior which may result from a given collection of behavior-cues, the behavior acts provide us with our definition of behavior-objects (*i.e.*, perceptions and ideations).

If, now, we sum up the situation it will appear that the problems for our behavioristic science must fall into three groups: those of (1), given the stimulating agency, determining the behavior-cues, (2), given the behavior-cues, determining the behavior-object, and (3), given the behavior-object, determining the behavior-act. The first of these problems is the well known one of the older physiological psychology of determining the relations between sensory and image qualities and their underlying physiological conditions. The second problem, that of the relation of behavior-object to behavior-cue, is the old one of perception and apperception. Our rewording of it will not, I think, make it any the less easy of final solution. Finally, the problem of the relation of behavior-act to behavior-object is the extremely important problem of  *motive*. It is the problem of desire, emotion, instinct, habit, determining set. It is a problem which the [p. 52] older analytical formulation tended to obscure and make almost impossible. If our behavioristic formulation has any practical value at all-if, that is, it has any value in addition to that of unifying under a single rubric all the different types of method which psychology employs, then that practical value will be, I believe, in the more successful treatment which it will allow and suggest for this matter of motive, determining set, and the like.

What, finally, are we to say about those difficult, and to the opponents of behaviorism, seemingly insuperable problems of imagery, feeling-tone, language, introspection? An adequate discussion would cover many pages. I can here merely throw out a suggestion or two. In the first place I would suggest that consciousness as such, *i.e.*, conscious behavior as opposed to merely unconscious behavior, it to be thought of simply as the case in which a *number* of behavior-acts are being made or tending to be made simultaneously. If I am *conscious* of the chairness of a chair, it is because I tend not only to sit, but to stand up, to kneel, etc., simultaneously. If, in addition, I am conscious of the color and shape of the chair as such, I tend, am set, not merely to behave in these appropriate ways toward chairs but also to discriminate by all other possible behaviors its particular color and shape from all other colors and shapes.

Images and ideas would be simply a particular case where behavior-object and behavior-cue have different space and time implications from those holding in the case of presented objects and qualities. And feelings and emotions would be treated as combining both behavior-objects and behavior-cues in that they involve both discriminable qualities and specific unvarying types of behavior (for example, approach, avoidance, and the like). Finally, language in general and

introspection in particular are simply themselves behavior-acts which in the last analysis indicate to the observer the very same behavior-cues and behavior-objects which might be indicated by the mere gross forms of behavior for which they are substitutes.

In closing this very brief and inadequate sketch it may [p. 53] be remarked that its excuse is to be found in the hope that it may have suggestive and propaganda value, if nothing else. The five points I should wish to emphasize are:

1. There are obvious formal inconsistencies in the subjectivistic formula as such.
2. The possibilities of a new non-physiological behaviorism have already found expression on the part of a number of writers.
3. Such a non-physiological behaviorism seems to be capable of covering not only behaviorism proper but introspectionism as well. For, if there are any such things as private mental 'feels' they are never revealed to us (even in introspection). All that is revealed are potentialities for behavior.
4. As a first step in working out such a non-physiological behaviorism I suggest the concepts of stimulating agency, behavior-cue, behavior-object, and behavior-act. And,
5. The value of the new formation will be in part theoretical, in that it will bring under a single rubric all the apparently different and contradictory methods of actual psychology; but in part, also, practical, in that it will allow for a more ready and adequate treatment of the problems of motive, purpose, determining tendency, and the like, than was made easy by the older subjectivistic formulation.

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#### Footnotes

[1]. Read in part before the Western Psychological Association, Berkeley, Calif., August 5, 1921.

[2]. 'Psychology from the Standpoint of a Behaviorist,' p. 10.

[3]. *Op. cit.*, Chap. VI, 'Hereditary modes of Response: Emotions,' p. 195.

[4]. E.B. Holt, *J. of Phil., Psychol., & Sci. Methods*, 1915, 12, 366.

[5]. Grace A. de Laguna, *PSYCHOL. REV.*, 1919, 26, 410-411. See also other articles by the same author. 'Dualism in Animal Psychology,' *J. of Phil., Psychol. & Sci. Methods*, 1918, 15, 617-627; 'Dualism and Animal Psychology, A Rejoinder,' *J. of Phil., Psychol. & Sci. Methods*, 1919, 16, 296-300, and 'Empirical Correlations of Mental and Bodily Phenomena,' *J. of Phil., Psychol. & Sci. Methods*, 1918, 20, 533-541.

[6]. 'The Relation between Physiological Psychology and Behavior Psychology,' *J. of Phil., Psychol. & Scientific Methods*, 1919, 16, 626.

[7]. Attention should be drawn to two other very significant attempts to begin a detailed 'working out' of such a behaviorism in addition to Mrs. de Laguna's in the article on 'Emotion and Perception from the Behaviorist Standpoint' already quoted from. These are to be found in a series of articles by J.R. Kantor: 'A Functional Interpretation of Human Instincts,' *PSYCHOL. REV.*, 1920, 27, 50-72; 'Suggestions toward a Scientific Interpretation of Perception,' *PSYCHOL. REV.*, 1920, 27, 197-216; 'An Attempt towards a Naturalistic Description of Emotions,' *PSYCHOL. REV.*, 1921, 28, 19-42, and 120-140; 'A Tentative Analysis of the Primary Data of Psychology,' *J. of Phil.*, 1921, 18, 253-269. And in a series of articles by R.B. Perry, 'A Behavioristic View of Purpose,' *J. of Phil.*, 1921, 15, 85-105; 'The Independent Universality of Purpose and Belief,' *J. of Phil.*, 1921, 18, 169-180; 'The Cognitive Interest and its Refinements,' *J. of Phil.*, 1921, 18, 365-375. It must be pointed out, however, that whereas both these authors are giving yeoman strokes in the direction of just such a non-physiological behaviorism as the writer is contending for, neither of them seems himself to be wholly self-

conscious of this essential difference between such a true behaviorism and a mere physiology.

[8]. Such introspection is itself but one of these behavior-acts.

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