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CHILD DEVELOPMENT AND THE INTERPRETATION OF BEHAVIOR[1]

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A YEAR ago upon this occasion, Professor Walter R. Miles delivered an address in which he presented the results of a series of studies upon longevity and senescence. To-day, I propose to start with the opposite end of the life process and consider some of the theoretical implications of modern studies of infant and child development. Since titles for vice-presidential addresses are sent in much in advance of their delivery, this paper has greater scope in its title than in its content. For it started to discuss the implications of several principles and ended with one; thus illustrating its final topic, the movement from generalized to specific behavior.

[1] Address of the vice-president and chairman of the Section on Psychology I, American Association for the Advancement of Science, St. Louis, Missouri, December 31, 1935.

Despite some differences in detail and in the interpretation of results, it may quite fairly be said that in the early stages of all responses studied genetically, behavior is more generalized, partakes more of the nature of mass activity, involves more of the whole organism, than is true of that behavior observed later in time. Coghill[2] has elaborated upon his phenomenon and discussed some of its implications. It appears alike in studies of prenatal and infant behavior and in the studies of older children. Sometimes this early behavior is described as mass activity or diffuse movements of the whole organism; in other instances as a likelihood that almost any response may be obtained on the first application of a stimulus, known

[2] G. E. Coghill, "Anatomy and Human Behavior." Macmillan, 1929.

later to elicit a specific response. Early behavior seems to possess some degree of fluidity, diffuseness, of lack of organization in contrast with its later fixity, precision and organization. In the discussions of this phenomenon, among other terms "individuation" and "differentiation" have been used to describe the developmental course. Both terms emphasize internal process, and perhaps even imply that the process described would go forward in a minimal environment. That a good case can be made for such a position, if attention is confined to prenatal and early infant behavior, is rather widely admitted. But it can also be shown that this phenomenon is characteristic of all the adjustments of the organism, whatever the stage of growth.

The thesis of this paper is that specificity of behavior is a result of external necessity, rather than of internal constitution. It arises because the environment demands that responses be simple, integrated and specific, in order to be effective in a world of objects in space. Objects must be lifted, moved, thrown, manipulated; in other words, directed energy must be applied to them at specific points. Generalized activity will not move a golf ball off a tee—highly specific activity will send it two hundred yards into space. As a result there is imposed upon response a selective process that results in specificity. Corresponding to increasing specificity of response there is progressive differentiation of the stimulus field. The final reaction of the organism is not to wholes in the sense that every potential stimulus in the environment bears some relation to the response, so much as to specific parts of the stimulus field, each of which has been sorted out in the history of the organism.

When all the response systems of the organism are considered another selective principle is involved. Since the organism is both structurally and functionally an independent unit with physical boundaries in a space world and is limited to a single major activity in a moment of time, there is imposed upon its potential abilities and partial skills a second selective process, in which some are chosen ahead of others for practice and progress toward specificity. The final result is an organization of behavior that is both specific and unique for each individual.

In order that these principles may operate, there must be in the organismal-environmental relation the material from which selection can be made. Both within individual systems of response, and within the responses of the organism as a whole, such material is available. But, the relation between organism and environment is not one of complete freedom for development in any direction; it is one which has definite limits.

Recent studies on infants and young children are clarifying our conceptions of these limits. Roughly they can be divided into types. Within any sensory field there are absolute limits beyond which a person can not respond and relative limits determined to some extent by past experience with particular types of sensory stimulation. On the side of physical structure and response there are limitations too frequently neglected in psychological discussion. Walking is perhaps not so much a neuro-muscular pattern as the only type of progression which can develop in a biped. How would human behavior differ if there were a universal joint at the elbow instead of a hinge? In Kellogg's[3] study structural differences in the hand of the chimpanzee and the human infant resulted in marked differences in their prehensive behavior on similar problems. There are also functional limitations which also arise out of the developmental level of the child at the moment. In the Hilgard[4] study of twins, a child of a given age level moved up to a limit of performance with continued practice. Weeks or months later, the control child, in a much shorter period of time, moved up to the same or a higher level of performance. Task limits become effective when the complexity of the task is not sufficient for the organism to show its potentiality. Mattson[5] has recently studied the relation between the complexity of tasks and behavior in a learning and relearning situation. There are functional limits under which might be included much of the material covered in our customary discussions of individual differences. Thus the behavior of the organism is definitely circumscribed by limitations arising out of structure, out of developmental level, out of task limits and out of the functional relation of the organism to the environ ment.

It would be interesting and worthwhile to make a more complete analysis of the limits which surround functioning at every turn, and to speculate on the possibilities of behavior were they different. But the comic papers have preempted this field with Pop-eye, Buck Rogers and a host of other characters. Even gravity, that physical limitation which controls all of us, seems to vanish in the comic strip.

Limitations are characteristic of all organizations of matter, whether living or inanimate. Iron ore, multi-potential in its original form, becomes, when fabricated, limited by its organization. A locomotive, for instance, can not be used for shaving, nor does it

[3] W. N. and L. A. Kellogg, "The Ape and the Child." New York: McGraw-Hill. 1933.

[4] J. R. Hilgard, *Genetic Psychology Monographs*, 14: 493–567. 1933.

[5] Marion L. Mattson, *Genetic Psychology Monographs*, 13: 299–398. 1933.

make a good hoe. In an organism so far along in the evolutionary process as the human being, there is already in the first appearance of any response system some degree of organization or limitation.

Instances of particular response systems may be examined in order to illustrate the operation of these principles. For this purpose responses that have been studied in great detail must be selected. For our interest is not so much in the presence of arbitrarily defined responses as in the variability and fluidity of response in its earliest appearances. As long as the approach to infant and child behavior was dominated by the view that reflexes were specific from the outset and that development consisted in tying them into chain reactions, little material was available. In the clinical approach, reflexes were looked upon as specific indicators and recorded or not recorded on the basis of arbitrary definitions. Far too often the investigator sorted out of a behavior matrix that which fitted such an arbitrary definition.

Two systems of response in infancy have been much investigated; one the plantar response and the other the sucking response. In accordance with our assumption we shall expect variability in the first appearances followed by selection as development proceeds with ultimate high specificity, if the response produces effects in the practical world.

Pratt[6] and Richards and Irwin,[7] working independently, recently made extensive and well-controlled studies of plantar reactions. Instead of one plantar response, Pratt finds that stimulation of a particular area may release several patterns of response, while stimulation of different areas may evoke the same response. To quote: "Out of 1,581 responses to stimulation of 13 different cutaneous areas, only 185 segmental patterns of response were discovered." "The fact that 4 (2 per cent.) of the response patterns—account for 29 per cent. of all responses—occur to stimulation of 13 different areas, that 12 (6 per cent.) accounting for 50 per cent. of the total responses—extend to stimulation of at least 10 different areas and that 27 (15 per cent.) accounting for 75 per cent. of all responses—extend to at least 7 different cutaneous regions, is sufficient evidence for the assertion that there is little rigid, specific limitation of the reflexogeneous zone."

What happens to these responses as the organism develops? For the answer we must turn to the Richards and Irwin study, which likewise found great variability and fluidity in early response patterns. To quote: "It would appear, therefore, that plantar responses in human development are variable and inconsistent at birth and probably during fetal life. Gradually, however, there emerges from this mass activity of the limb a more definite reactivity of the toes. Perhaps there emerges also from the mass activity of the toes a more definitive toe response, tending slightly at first to be of extensor character and eventually (at from six to eighteen months) of flexor character as well. Gradually all reactivity appears to decrease until at four or five years it has become negligible, and the characteristic result of plantar stimulation is the elicitation of no response whatever."

For sucking, Pratt, Nelson and Sun[8] found that, although produced by almost any type of stimulation, it was most frequently elicited by stimulation in the mouth region. In studying differential reactions to taste, in infants from 2 to 11 days old, they found 85 per cent. reactions, of which 29 per cent. were specific sucking movements and 71 per cent. movements other than sucking. They conclude (p. 209), "The infant at birth represents an organism in which differentiation has proceeded to a point where there are many effectors and receptors. Its behavior, however, is generalized; that is, stimulation of almost any group of receptors by almost any kind of stimulus will lead to a response in almost any part of the organism." To this statement Jensen adds the phrase, "which is set to respond." Jensen[9] finds that mass activity disappears immediately after the nipple is put in the baby's mouth, and that sucking becomes disorganized as the baby becomes satiated. Since Jensen's study was confined to the newborn no picture of the development of the sucking response is given. But Pratt, Nelson and Sun find that with increasing age the stimulus for sucking becomes more specific.

In these systems of response much greater variability is characteristic of their first appearance than previously supposed. But for the plantar response, which is of little or no significance in affecting the practical world, although variability is present in some degree for some years, ultimately both the response and the sensitivity associated with it disappears. With sucking on the other hand, there is rapid selection and fixation of a single response, since the internal drive of the organism is great, and the possibilities of precise behavior high. Generalized activity, if continued, will not insure a stream of milk. Undoubtedly there is a relation between the speed with which this selective process moves and the intensity of the drive and the adequacy of its satisfaction. But there is also a relation between the speed of selection

[6] Karl C. Pratt, *Jour. Genet. Psychol.*, 45: 22–38. 1934.

[7] T. W. Richards and O. C. Irwin, Univ. Iowa Studies in Child Welfare, 11, No. 1, pp. 1–146. 1935.

[8] Karl C. Pratt, A. K. Nelson and K. H. Sun, Ohio State University Studies. Contributions in Psychology, No. 10, p. 1–237.

[9] Kai Jensen, *Genetic Psychology Monographs*, 12: 361–479. 1932.

and the specificness and adequacy of the final response in its relation to the world of space and space objects. What is here stated is quite similar to the law of effect—with this exception—adequacy of response is not entirely a matter of what happens within the organism—it is also partially determined by adequacy in an environmental relation, *i.e.*, the readiness with which specific changes in the external world of objects are produced.

In learning, evidence of the essential variability of early response is at once apparent. Trial and error behavior and the progressive selection and fixation of response are familiar to all. There is both material for the selective process and clear demonstration of the final appearance of precise response. What is not quite so clear is that the speed of the process is directly related to the degree to which it is possible, by specific response, to produce change in a world of space and of objects in space. On the basis of this analysis we would expect that simple acts (simple in the sense that a particular result in the external world is readily produced) would become fixated more rapidly than complex acts (in which such an outcome is not so readily possible) and that there would be an intimate relation between the character of the goal object (to use Tolman's term) and the rate at which selection and fixation occur.

With development, in the case of a response that is of utility, there goes progressive differentiation of the stimulus field which parallels specificity of response. If, however, the response is of no utility, sensitivity disappears and the stimulus field, in spite of its original wholeness, becomes ineffective. Development and learning alike then involve a sorting over both of stimulus potentialities and response potentialities in the organism-environmental relation. In the earlier stages, the organism reacts to a wide variety of the stimuli with a wide variety of responses. As development or learning proceed some are sorted out so that ultimately the stimulus field becomes one of detail. To the novice a picture is a picture, a whole which is pleasing or not pleasing. To the artist it is a matter of areas of light and dark, of composition and balance, of proportion and perspective. Actually the artist sees more, because of the highly specific responses he has developed in order to produce effects in his own pictures.

In this process, what is the relation between differentiation and integration? In a former presentation Dr. Goodenough and I expressed ourselves thus: "Development proceeds from the generalized uncoordinated responses of the infant to the specific and highly differentiated behavior of the adult. There is, however, another aspect of the picture. Parallel with the process of differentiation which is the result of development, there is going on a process of integration or recombination of responses which is the result of experience. Although we may distinguish between these two processes theoretically, it is impossible to do so in actual practice since experience without development or development without experience are alike impossible. It is important to realize however that the complexity of the integrating or reorganizing process is directly dependent upon the degree of differentiation which has taken place."[10]

In our relations with material objects and with persons the constant demand is for single and simple responses. Generalized response in itself possesses no adaptive character beyond supplying the material upon which the selective process can operate to meet the demands of the environment. With the development of specific response, complexity comes, not so much on the response side as upon the situational side. Skilled behavior seems extraordinarily smooth and simple in comparison with unskilled behavior. But back of skilled behavior there is extraordinary complexity in a wide range of stimuli comprehended. As experience is gained, wholes are broken up into parts and specific reactions are set up. From the point of view of sensory process this is progressive differentiation. From the standpoint of response, the organism is engaged in building integrated patterns which tie elements of the stimulus field into functional wholes.

For instance, a boy may be able to catch a ball, to dodge and to run. Ultimately it will be necessary for him to receive a punt with opposing ends bearing down upon him. In this total situation, account must be taken both of the ball and of the approaching ends. If only the ends are perceived, he is likely to fumble; if account only of the ball is taken, he is likely to be thrown for a loss. If he reacts simultaneously to both the ball and the opposing ends, he may respond in such a way that yardage will be gained. Here is coordination of highly specific elements within the sensory field, plus a unified, integrated and single response. Effectiveness increases as the response becomes simple and as the range of apprehension within the sensory field increases. This principle, which holds clearly in the field of motor response, holds also in the field of symbolic process. Language symbols are highly specific and simple from the standpoint of their production; in their representative character they, however, increase in value as they subsume wider and wider ranges of experience.

[10] F. L. Goodenough and J. E. Anderson, "Experimental Child Study," pp. 25–27. Century Company, New York, 1931. Pp. 546.

For certain types of activity, we have been very successful, almost too successful through deliberate analysis in breaking up the series of responses that ultimately develop into component parts and arriving at a conception that, by emphasizing these component parts, we can somehow facilitate this whole procedure. Hence there arises the concept of the fundamental in our practical concern with educational and motor skills. But all too frequently, having taken the adjustment process apart, we can not put it together again. When the organism itself fractionates the stimulus field, an orderliness in the evolution of response results, that may or may not be duplicated if the field is artificially split. Only now are we beginning to see quite clearly that sound training procedures involve some retention of the original relation between stimulus field and response pattern and that fractionation is often better achieved through retaining this relation.

So far the application of the general principles to single systems of response has been discussed. It now remains for us to consider the whole series of responses appearing in the organism. Here likewise progress is from generalized to specific activity. The infant is multi-potential—*i.e.*, he possesses a repertoire of possible abilities, behavior sequences, skills, traits, etc., which supply the material upon which the selective process may operate.

Examined in detail, development consists in the appearance of multitudinous patterns, of which some originate as part of the progressive unfolding of the organism under intrinsic nature and some out of the environmental demand. The human being is not an organism who moves uniformly and in clock-like fashion from one point of time to another. Rather he is a continually shifting aggregate in which now this and now that and now the other structure or function spurts ahead or wanes. Almost the first characteristics of development that attract attention are increases in height, weight and the ability to meet the demands of life. Once we cut behind these obvious aspects of increase in size and ability, all is not so simple. For the human being is a complex of many structures and functions, which develop at different rates, reach terminal points at different times and deteriorate at different times and rates. If each is examined in detail, the growth process is found to be continuous in the sense that both in development and decay there are increments and decrements that are infinitesimal in amount. This principle, which can so readily be demonstrated for physical organs and external body parts, seems to be equally true of mental life. The conception of the growth of behavior as a weaving together of a whole series of growths and developments each of which has its own history rather than as a simple compounding of elements, is of comparatively recent origin. It is somewhat difficult to describe since we are so much under the influence of a type of thinking that seeks always to reduce behavior to its simplest elements and assumes that such elements can be found. If the elements themselves are in a continued process of flux, if there are no bricks out of which a wall of behavior can be built, then it becomes clear, I think, that we must think of behavior in terms of pattern and function rather than in terms of elements or component parts.

In the course of mental development many items of behavior run their course without being used in subsequent behavior, while upon others an overlay of behavior is erected. What persists, does so, in large part, because the environment selects from an organism of basic capacities those which are in line with its demands. This does not imply that internal and maturational factors completely disappear. But it does imply that the complete history of the organism can not be written in terms of those activities, skills and behavior patterns which persist to maturity. In the early vocal patterns of the infant a wide variety of sounds are to be found, many of which are not utilized in the language the child learns. Some sounds utilized in German but not in English are found in the vocal habits of American infants. For the American or English school child they are difficult; for the German school child they seem natural and easy.

What factor determines the fundamental nature of this selective process? In common with all other living organisms, the human being is a unit, in which all the structures and functions distinguished for scientific and practical purposes are confined within a single body. This body possesses the capacity to move as a unit from place to place, and maintains a physical independence from the surrounding universe by means of well-defined boundaries. Moreover, this organism is limited in time, since only one major activity can be carried on in a moment of time. The child can not, for instance, be practicing music while he is playing baseball, nor can he move toward an object which attracts him without moving away from other objects in his environment. This functional unity of the organism with respect to action enforces a selective process upon behavior, which is always with the organism. From the earliest beginnings of life, there is competition among stimuli and a conflict between patterns for dominance. Action by its very nature involves doing a particular thing at a particular time. Because our interests, as psychologists, are so strongly centered on events which occur within the organism, we often fail to take account of the fact

that the world of space and time relations sets up its own requirements to which the organism must conform, because he too is an object in a space and time world. The most essential of these requirements is that which demands that energy be applied at a specific place in order to produce modifications in the world of external relations. Selection then becomes necessary and inevitable with the result that behavior becomes specific and highly organized.

In much of our psychological thinking we are accustomed to think of abilities as determining the pattern of development. But I wonder if this is entirely correct. Should we not rather say that in an environment of multiform possibilities and of many external demands, the tasks set for human beings sort out the abilities possessed by the human organism rather than the reverse and that in many situations the task utilizes what abilities there are. There is a constant relation between the abilities which are called out by a particular environment and the resultant modification of the environment, which in turn calls upon new abilities or rearrangements in the patterns of ability. Thus in a primitive environment, the selective process operates very differently than in a highly industrialized environment. The determinants of the pattern of behavior may thus be environmental to a striking degree. This leads us to a conception of the human being as an organism of wide adaptability in which abilities are assimilated to interests and external demands. By the term demand is not meant a specific and precise task that can be described with a high degree of accuracy, though there are such, so much a system of social pressures which bear down upon the developmental pattern with increasing rigor as the child grows older.

A particular activity, interest or attitude appears. In one individual it may become like a snowball that is rolling down hill gathering unto itself a surprising number of other capacities and abilities, until a very complicated and significant behavior pattern results. In another individual, there may be no such result. Thus a young child learns to swim. It may be possible to demonstrate that a fourteen- or a ten-year-old child can learn to swim in one half or one quarter the time required by a six-year-old child. But if a six-year-old learns to swim, he may swim at every subsequent opportunity and develop a series of interests and activities which center about swimming that modify the course of subsequent development.

With increasing age the process of diverting the organism, so to speak, becomes more and more difficult, since each new activity or skill has to compete with others already established. The early acquired skill or activity not only gains by virtue of its priority, but also by virtue of its capacity to block other acquisitions.

This may be the reverse of the process described by Professor Miles last year, when he demonstrated the effect of practice in preserving abilities into senescence. Here we are concerned with the effect of practice in building activities of a high level by a process of assimilation. In either case the effect is to take the ability out of the regular course of growth, maturation and decay and give it special status.

Moreover, the nature of the environment is such that it determines the content of the demands (this is what we mean by culture) and sets up a series of social pressures which must be met. This social necessity imposes an order and system of values upon responses. In this selective process as the child passes out of infancy the demands of the environment come to have more weight than the demands of internal constitution. Soon environmental factors are determining the skills that shall be eliminated or practiced. In time these factors take precedence over basic abilities and assimilate such abilities, traits and skills to them, rather than the reverse. Hence, instead of thinking of the individual largely in terms of traits and basic capacities, as we have in the past, we might better be thinking of him in terms of interests, wants, attitudes and goals.

This brings us to a distinction between the significant and the non-significant in the environment. The significant is that which produces a modification in the developmental stream and carries the process of assimilation forward and the non-significant is that which does not affect the developmental stream. Although at the moment of stimulation both may be equal in intensity and similar in their external aspects, necessarily they must differ in the field relations within the organism. It becomes impossible, in view of the significance of this selective process, to describe the organism in terms of the stresses and strains of a moment in time. Herein lies the difficulty with Lewin's[11] skilful analysis of the dynamics of child behavior, in which the relation of the child at any moment of time to his environment is described. Little attention is paid to the internal structure of the organism which, if examined in detail, would be seen to be the resultant of many factors. Parts of this structure are definitely related to developmental levels. Parts are clearly products of past reactions to the environment, *i.e.*, the human organism is mnemonic in character and carries forward into subsequent behavior traces of earlier behavior. Parts are clearly the product of the forces and stresses inherent in the

[11] Kurt Lewin, "A Dynamic Theory of Personality." McGraw-Hill, New York. 1935.

environmental situation. We may, however, agree with Lewin that both internally and externally behavior is a relation involving fields of forces, drives and stresses, rather than a series of absolutes.

In a selective process, operating upon an organism with a very wide and fluid repertoire of behavior, is to be found the story of human development. This organism is exposed to an environment or a culture which sets up universal requirements to which all must conform in some degree and other requirements to which some must respond. It is an extraordinarily rich environment, when considered from the point of view of the range and variety of stimuli presented to the organism. In spite of the very strong and ever-present tendency forcing him toward specific behavior, the human being possesses a bodily mechanism that is extraordinarily versatile. Where many organizations of matter, both living and inanimate, are driven into narrow channels of response by the nature of selective processes to which they are exposed, the human organism preserves some capacity for reacting in almost every medium. He may not, for instance, be able to swim naturally, but he possesses arms and legs, which though specialized for walking and manipulation lend themselves to swimming. He may not be able to fly, but he possesses the ability to adapt material objects to his purposes, and extend the application of specific energy to points in a space world, so that he can build a flying machine. His hand, though it can not grasp a branch or support his weight as well as that of the chimpanzee, has an astounding range of manipulative adjustment. Man's bodily mechanism carries the greatest potentiality for generalized response with which there goes in the face of an energetic selective process the possibility within his own life of building new patterns of response of an almost infinite variety.

As the outcome of the interrelation of the organism and his environment, each individual comes to possess the quality of uniqueness. This is not accidental, but is the result of lawful forces operating throughout life. Starting with differential heredity, moving into a differential environment and subjected at all times to a differential selective process that sorts over all his capacities and skills, the human being becomes increasingly unique and different from every other of his kind. Herein lies psychological problems of great moment. We have tended too long to look upon individual behavior as a variant, rather than as the product of lawful process. In part, the variation that makes it difficult to describe and determine the laws of behavior results from the fact that every stimulus impinges in a developmental stream. Whether it becomes significant or not for later behavior depends upon the manner in which it affects that stream. Two men discovered America; one, Leif Ericson, made the more hazardous voyage and the greatest accomplishment when considered in terms of the moment, the other, Columbus, made by far the greatest accomplishment in terms of the ultimate outcome. For in the first case, there was no effect upon the developmental stream of history, in the second case the effects continued throughout centuries and will continue for many centuries more. Where developmental relations are involved, we deal mainly with lawful but nonreversible processes, *i.e.*, once a factor is introduced that affects the developmental stream, it can never be completely isolated, nor can the organism be returned to its former state. These processes are logical and meaningful when viewed from the end results. When viewed from the point of the impact of the phenomena upon the developmental stream, unless we know that stream in detail, both in its internal structure and its external relations to an environment, they do not seem so.

If this view holds, the differences between inherited and learned responses become matters of degree rather than of type, since in both the same fundamental principles are operative. In those responses appearing in prenatal life and of early infancy, the possibilities of any single system of response are distinctly limited, first because the limits within which variation occurs are narrow, and second because the environmental demand is for specific responses of a relatively low complexity. As the child grows older, the potentialities of any single system of response increase, because there is more variation within material out of which response patterns are evolved and because the level of environmental demand has shifted.

Finally we come to those complex demands of the environmental organism relation which call from the individual all the abilities he possesses, and which utilize him completely. Here we move into those final organizations of behavior in which abilities and skills are assimilated by powerful interests and needs. Here is found the realm of remote goals and ideals. Perhaps functional terms such as these are more significant and important for the understanding of human nature than many of the terms with which we have concerned ourselves. Both in the field of animal psychology and child psychology at the present time, many interesting experiments are under way which center about incentives, motivation, barriers, obstructions, pressure situations, goals, the social milieu and in the Gestalt psychology we have a theoretical formulation that is causing a thorough revision of many of our basic concepts.

The organism is coming to be viewed as a totality or a functional unit. Instead of fractionating be-

havior descriptively, we break the stimulus field up into component parts, and determine by appropriate methods the reaction of the organism to fields so broken up, reconstituted and broken up again. Interest is not in the detailed analysis of sensory phenomena as such, nor in motor phenomena as such, nor in consciousness or awareness as such, so much as in the relation of the organism to his environment, in the light of his phylogenetic and ontogenetic history. For children possess one characteristic essential for the understanding of human behavior, they are always becoming. Difficult as is the task of writing descriptions of human behavior in dynamic terms, hard as is the avoidance of those dichotomies of classification and terminology which distort the unified organism, nevertheless there are many indications that psychology is now moving rapidly away from the conception of elements of behavior as it earlier moved away from the conception of elements of sensation. A science of human dynamics lies ahead. To it the student of child behavior has much to contribute, for he studies and deals with human behavior in the making.

OBITUARY

WARREN ELMER HINDS

WARREN ELMER HINDS, who died on January 11, was born in Townsend, Massachusetts, 59 years ago. In 1899 he received the B.S. degree from Massachusetts Agricultural College, and three years later the Ph.D. degree.

After five years with the U. S. Bureau of Entomology, Dr. Hinds accepted a position with the Alabama Polytechnic Institute as professor of entomology and entomologist of the Experiment Station. After 17 years at that institution, he left Auburn and accepted a position with the Louisiana State University as entomologist for the Experiment Station and Extension Division. These positions he held until 1929, at which time he was relieved of the extension work so that his entire time could be devoted to experimental work.

Dr. Hinds's major problem in Louisiana was the control of the sugarcane borer and other insects attacking sugarcane, and among his outstanding work is the use of a native parasite to control the cane borer. The following is quoted from an editorial in the local paper:

> As an entomologist, Dr. Hinds had risen high in his profession, and had received national and international recognition. In the interest of his work, he had made trips to Peru and to Cuba, and as a delegate from the American Association of Economic Entomologists, which he has headed, he attended an important congress in Paris. Particularly in aiding boll weevil control, and in combatting sugar cane pests his efforts have been valuable here and in the South.
>
> Yet, he was admired most not for any material achievement, but for his upright character, and the kindliness and sympathy that made him beloved in his human relations. His Christian devotion manifested itself in his daily walk and conversation. Always he was to be depended upon, and to him no worthy task or contract, however small, was insignificant. He was a man who invariably did his duty. Yet, in his relations with others, he was one of the most understanding and generous of men, and in his busy life never was he too hurried for the cheerful greeting, and the kindly interest in others.

B. A. OSTERBERGER
LOUISIANA STATE UNIVERSITY

HENRY WARE CATTELL

DR. HENRY WARE CATTELL, pathologist and medical editor, died from cardiac disease in Washington on March 8 at the age of seventy-three years. He was the son of William C. Cattell, president of Lafayette College, from which institution he graduated in 1883 and of which he was later a trustee. He received the doctorate of medicine from the University of Pennsylvania in 1887 and was demonstrator under William Osler. Later he was director of the Ayer Clinic of the Pennsylvania Hospital and pathologist to Blockley, Presbyterian and other hospitals. During the war he was major, later lieutenant-colonel in the Medical Corps, having been pathologist to the Central Medical Department Laboratory and in charge of the post-mortem records of the A. E. F. He was the author of "Post-Mortem Pathology," which appeared in several editions, and the translator of Ziegler's "Special Pathological Anatomy." He was editor of Lippincott's "Medical Dictionary" and of the same publisher's "International Clinics," of which between 1900 and 1932 he edited seventy-eight volumes. Dr. Cattell was unmarried; his only near relative was his brother, Dr. J. McKeen Cattell.

SCIENTIFIC EVENTS

THE ROYAL INSTITUTION

THE bequest to the Royal Institution of Great Britain made by the late Harry Brown of the residue of his estate is expected, according to *Nature*, to amount to approximately £28,000. This sum has been given without restriction as to its use, and it is planned