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Heinz Werner

THE CONCEPT OF DEVELOPMENT FROM A COMPARATIVE AND ORGANISMIC POINT OF VIEW

THE field of developmental psychology, as it is conceived here, transcends the boundaries within which the concept of development is frequently applied: development is here apprehended as a concept not merely applicable to delimited areas such as child growth or comparative behavior of animals, but as a concept that proposes a certain manner of viewing behavior in its manifold manifestations. Such a developmental approach to behavior rests on one basic assumption, namely, that wherever there is life there is growth and development, that is, formation in terms of systematic, orderly sequence. This basic assumption, then, entails the view that developmental conceptualization is applicable to the various areas of life science, and is potentially useful in interrelating the many fields of psychology.

The developmental approach has, of course, been clearly of tremendous heuristic value in systematizing certain aspects of biological phenomena in various fields of life science such as comparative anatomy, neurophysiology, and embryology. Analogously, developmental psychology aims at viewing the behavior of all organisms in terms of similar genetic principles. However, this aim of developmental psychology is perhaps even farther reaching than that of developmental biology. Developmental psychology does not restrict itself either to ontogenesis or phylogenesis, but seeks to coordinate within a single framework forms of behavior observed in comparative animal psychology, in child psychology, in psychopathology, in ethnopsychology, and in the general and differential psychology of man in our own culture. Eventually, in linking these variegated observations, it at-

tempts to formulate and systematically examine experimentally testable hypotheses.

In order to clarify and evolve its conceptual framework, developmental psychology has to search for characteristics common to any kind of mental activity in the process of progression or regression. In this comparative venture one has to be wary of the error made by early evolutionists such as Haeckel and G. Stanley Hall, who sought to treat as materially identical various developmental sequences when the data warranted only the assertion of similarity or parallelism. The statement, for instance, that the individual recapitulates in his development the genesis of the species, and the attempt to identify childlike and abnormal forms of behavior, have, in their extreme formulation, aroused just criticism, but criticism which has spread more and more toward undermining comparative developmental psychology as a discipline.

Between the extremes, on the one hand, of viewing as identical various developmental sequences, and on the other, of denying completely any comparability among them, some beginnings toward a theory of development have been made. These beginnings take into account the formal similarities in these various developmental sequences as well as material and formal differences distinguishing each developmental sequence from another.

THE ORTHOGENETIC PRINCIPLE OF DEVELOPMENT

Developmental psychology postulates one regulative principle of development; it is an orthogenetic principle which states that wherever development occurs it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration.* This principle has the status of an heuristic definition. Though itself not subject to empirical test, it is valuable to developmental psychologists in leading to a determination of the actual range of applicability of developmental concepts to the behavior of organisms.†

We may offer several illustrations of how this orthogenetic principle

* This, of course, implies "directiveness." It seems to us, therefore, that one must on logical grounds agree with E. S. Russell (33) that organic development cannot be defined without the construct of "directiveness."

† In regard to the following discussion, see item 47 in the References.

is applied in the interpretation and ordering of psychological phenomena.

According to this principle, a state involving a relative lack of differentiation between subject and object is developmentally prior to one in which there is a polarity of subject and object. Thus the young child's acceptance of dreams as external to himself, the lack of differentiation between what one dreams and what one sees, as is found in psychosis, or in some nonliterate societies, the breakdown of boundaries of the self in mescaline intoxication and in states of depersonalization—all of these betoken a relative condition of genetic primordiality compared to the polarity between subject and object found in reflective thinking. This increasing subject-object differentiation involves the corollary that the organism becomes increasingly less dominated by the immediate concrete situation; the person is less stimulus-bound and less impelled by his own affective states. A consequence of this freedom is the clearer understanding of goals, the possibility of employing substitutive means and alternative ends. There is hence a greater capacity for delay and planned action. The person is better able to exercise choice and willfully rearrange a situation. In short, he can manipulate the environment rather than passively respond to the environment. This freedom from the domination of the immediate situation also permits a more accurate assessment of others. The adult is more able than the child to distinguish between the motivational dynamics and the overt behavior of personalities. At developmentally higher levels, therefore, there is less of a tendency for the world to be interpreted solely in terms of one's own needs and an increasing appreciation of the needs of others and of group goals.

Turning to another illustration, one pertaining to concept formation, we find that modes of classification that involve a relative lack of differentiation between concept and perceptual context are genetically prior to modes of classification of properties relatively independent of specific objects. Thus, a color classification that employs color terms such as "gall-like" for a combination of green and blue, or "young leaves" for a combination of yellow and green, is genetically prior to a conceptual color system independent of objects such as gall or young leaves.

It may be opportune to use this last example as an illustration of the comparative character of the developmental approach. That the

color classification attached to specific objects involves a mode of cognition genetically prior to a classification independent of specific objects is, of course, consistent with the main theoretical principle of development. In regard to the comparative character of our discipline, however, it does not suffice for us merely to find this type of classification more typical of the man of lower civilization than of the man of higher. The anthropological data point up the necessity of determining whether there is a greater prevalence of such primitive color conceptualization in areas where cognition can be readily observed in terms of lower developmental levels, e.g., in the early phases of ontogenesis. Experimental studies on young children have demonstrated the greater prevalence of concrete (context-bound) conceptualization with regard not only to color but to many other phenomena as well. Again, to take organic neuropathology as an example, in brain-injured persons we find, as Goldstein, Head, and others have stressed, a concretization of color conceptualization symptomatic of their psychopathology; similar observations have been made on schizophrenics.

At this point we should like to state that a comprehensive comparative psychology of development cannot be achieved without the aid of a general experimental psychology broadened through the inclusion of developmental methodology and developmental constructs. There have appeared on the scene of general psychology beginnings of an extremely significant trend toward the studying of perception, learning, and thinking, not as final products but as developing processes, as temporal events divisible into successive stages. Such "event psychology," as one may call it, introduces the dimension of time as an intrinsic property into all experimental data. It stands thus in contrast to approaches, like that of classical psychophysics, in which the treating of successive trials as repetitive responses eliminates as far as possible sequential effects. European psychologists, particularly in Germany and Austria, have turned to the direct study of emergent and developing mental phenomena (34, 42, 46). For instance, using a tachistoscope, we may study the developmental changes in perception which occur when the time of exposure is increased from trial to trial. In studies of this sort, such developmental changes, or "microgenesis," of percepts are predictable from a developmental theory of the ontogenesis of perception. Some of the ensuing parallels between microgenesis and ontogenesis might be summarized as follows (5): In both microgenesis

and ontogenesis the formation of percepts seems, in general, to go through an orderly sequence of stages. Perception is first global; whole-qualities are dominant. The next stage might be called analytic; perception is selectively directed toward parts. The final stage might be called synthetic; parts become integrated with respect to the whole. Initially perception is predominantly "physiognomic." * The physiognomic quality of an object is experienced prior to any details. At this level, feeling and perceiving are little differentiated. Again, in the early stages of development imaging and perceiving are not definitely separated.

There is another important technique of studying the emergence and formation of perception. This method was originally utilized in Stratton's well-known experiments in which a person wearing lenses had to adjust to a world visually perceived as upside down. More recently, Ivo Kohler of the Innsbruck Laboratory has utilized this method in extremely significant long-range experiments. He studies stages of perceptual adaptation to a world visually distorted in various ways by prisms or lenses (16, 17, 49). Again, these perceptual formation stages are found to conform to ontogenetic patterns. Ontogenetic studies have made it reasonably certain that the experience of space and spatial objects grows through stages which can be grossly defined. There appears to be an early sensorimotor stage of spatial orientation, succeeded by one in which objects emerge in terms of "things-of-action" (44), where perceptual qualities of things are determined by the specific way these things are handled. For instance, a chair is that object which has a "sitting tone" (Uexküll). A later stage is that of highly objectified or visualized space where the spatial phenomena are perceived in their rather "pure" visual form and form relations.

Keeping these ontogenetic states in mind, it is most enlightening to follow the reports of the subjects used in the Innsbruck Laboratory as they move from level to level in developmental order, adjusting themselves to a disarrayed world. First, they learn to master space on a sensorimotor level; that is, they are able to move about without error. But, though they may be able to ride a bicycle quite skillfully, the visual world as such may, at this stage, still be extremely confused, upside down, or crooked. The further development toward visual adaption shows some remarkable features: the objects seem to fall into

* In regard to this term, see item 44 (p. 69) and item 45 (p. 11) of the References.

two classes, things-of-action and purely visual things. The observer conquers first the things-of-action and only later purely visual things. For instance, observers wearing prisms which invert left and right can see an object already in correct position if it is part of their own actions, but incorrectly – that is, reversed – when purely visually grasped. In a fencing situation, a subject sees his own sword correctly pointing toward the opponent, but at a moment of rest it becomes visually inverted, pointing toward himself. By the same token, a little later in development any object-of-action, such as a chair or a screwdriver, whether it is actually handled or not, is correctly transformed, whereas purely visual objects, such as pictures or printed words, remain reversed. Only at a last stage the differences disappear, and complete transformation of the visual world is achieved.

Another area of general psychology where genetic methodology has been fruitfully applied is that of problem-solving behavior. Whereas Wertheimer's contribution to productive thinking, outstanding as it was, remains essentially agenetic, the signal importance of Duncker's work (7) lies in its genetic methodology. Duncker studied the problem-solving process in terms of genetic stages which follow each other according to developmental laws well established for ontogenesis.*

UNIFORMITY VERSUS MULTIFORMITY OF DEVELOPMENT

The orthogenetic law, being a formal regulative principle, is not designed to predict developmental courses in their specificity. To illustrate, it cannot decide the well-known controversy between Coghill's and Windle's conceptions (6, 50) concerning ontogenesis of motor behavior. According to Coghill, who studied the larval salamander, behavior develops through the progressive expansion of a perfectly integrated total pattern, and the individuation within of partial patterns that acquire varying degrees of discreteness. Windle's conception, derived from the study of placental mammals, is that the first responses of the embryo are circumscribed, stereotyped reflexes subsequently combined into complex patterns. It may be possible to reconcile, under

* Duncker has also clearly seen one aspect of creative thought processes, hitherto little recognized, namely, the fact that successful problem-solving depends not only on the ability to progress along new ways, but also on the ability to regress back to a point from which new development can take place. In other words, he has observed a most important genetic principle, that of oscillatory activity in terms of progression and regression. (See the last section of this paper.)

the general developmental law, both viewpoints as follows: The development of motor behavior may, depending on the species or on the type of activity, involve either the differentiation of partial patterns from a global whole and their integration within a developing locomotor activity (Coghill) or the integration of originally juxtaposed, relatively isolated global units which now become differentiated parts of a newly formed locomotor pattern (Windle). In both cases there are differentiation and hierarchic integration, although the specific manifestations differ.*

Now, it is precisely this polarity between the uniformity of a general regulative principle and the multiformity of specific developmental changes that makes the study of development necessarily a comparative discipline. If we were merely to seek the ordering of changes of behavior in terms of a universal developmental principle, developmental theory might still be of interest to the philosophy of science and theoretical psychology, but it would be of far lesser value to empirical psychology.

In order to get a clearer picture of what is involved here, it might be advantageous to refer to one of our studies, namely, that of the development of the acquisition of meaning, by the use of a word-context test (48).

In this experiment eight to thirteen-year-old children had the task of finding the meaning of an artificial word which was embedded successively in six verbal contexts. For instance, one such artificial word was "corplum." After each of these six sentences the child was interrogated concerning the meaning of the artificial word.

The six sentences in which "corplum" (correct translation: "stick" or "piece of wood") appears, are as follows: (1) A corplum may be used for support. (2) Corplums may be used to close off an open place. (3) A corplum may be long or short, thick or thin, strong or weak. (4) A wet corplum does not burn. (5) You can make a corplum smooth with sandpaper. (6) The painter used a corplum to mix his paints.

Now, the task confronting the subjects in the word-context test is essentially the synthesis of the cues from a set of six contexts for the purpose of forming a general meaning of the word, that is, a meaning applicable to all six sentences. The success of such an operation is re-

* Cf. the excellent discussion by Barron, presented at the Chicago Conference on Genetic Neurology (2).

flected in two kinds of results. The first shows a steady and continuous increase in the achievement of a correct solution with increasing age. The second reflects changes in the underlying patterns of operation. As to the first point, there is a developmental increase in achievement which signifies the increasing capacity for hierarchization, that is, for integrating the various cues within a common name. However, the finding concerning a steady rise in achievement of correctness was, for us, not the most important result. Our main aim was to study the processes underlying such achievement. We were far more concerned with detecting the fact that conceptual synthesis is not achieved by a unitary pattern of operations, but that there are various sorts of processes of synthesis which differ from each other developmentally. The lower forms were found to emerge, to increase, and then to decrease during intellectual growth, yielding finally to more advanced forms of generalization (48, p. 97).

Studies of this sort inform us that the workings of the orthogenetic law as a uniform, regulative principle have to be specified through the ordering and interpretation of the multiform operations. Such a view implies the rejection of a tacit assumption made by many child psychologists that the measured achievement always reflects unequivocally the underlying operations, or that overt achievement is necessarily a true gauge of the developmental stage. This assumption is untenable; the same achievement may be reached by operations genetically quite different (41). An analysis of types of operations rather than measurement merely in terms of accuracy of performance often reveals the truer developmental picture.* In fact, a greater accuracy in certain circumstances may even signify a lower developmental level, as in the case of a decorticate frog who shows greater accuracy in catching flies than the normal frog. Gottschaldt (10) presented normal and mentally deficient eight-year-old children with the task of constructing squares or rectangles from the irregular pieces into which these figures had been cut. The normal children had difficulties with the test because they tried to relate the figuratively unrelated pieces to the end form. Operating on a purely mechanical level, the mentally deficient children matched the edges of the same length and thus performed quicker and with fewer errors. Again, a thinker oriented toward and capable of highly abstract thought may be at a disadvantage in certain concrete tasks of concept formation, compared with a concretely thinking person.

* It is not accidental that out of the immense field of potentially great significance for developmental psychology, the two main areas emphasized by psychologists in this country were the area of intelligence and the area of learning. They were chosen because they were clearly amenable to rigid quantification on a continuum in terms of more or less. The successes of workers in these fields obtained by statistical treatment of overt behavior and the successes in practical application have reinforced the conviction that outside the rather trivial notion of continuous increase in achievement with increase in age, developmental theory is not needed. In regard to intelligence testing the evaluation of G. Stanley Hall, the father of comparative genetic psychology, still seems to hold: Intelligence tests and measurements, he stated, have done a great work in applying psychology to life and industry but have added scarcely a scintilla to our knowledge of human development (11, p. 450). As to the situation in the area of learning, it seems significant that a man as deeply informed as Hilgard, in a well-balanced evaluation of this field of research, comes to the conclusion that undue stress on quantification may lead to a collapse when underlying processes are not understood (13, p. 328).

CONTINUITY VERSUS DISCONTINUITY OF DEVELOPMENT

The orthogenetic principle of increase in differentiation and hierarchic integration is not meant to imply continuous progress as the exclusive characteristic of developmental change. A good deal of the controversy centering in the continuity-discontinuity problem appears to be due to a lack in clarification of these terms. In particular, there has been considerable confusion about two different aspects of change. One is the quantitative aspect of change. Here the problem of continuity versus discontinuity is related to the measurement — in terms of gradual or abrupt increase with time — of magnitude, of efficiency, of frequency of occurrence of a newly acquired operation in an individual or in a group. The other aspect concerns the qualitative nature of changes. Here the problem of continuity versus discontinuity centers in the question of the reducibility of later to earlier forms — emergence — and the transition between later and earlier forms — intermediacy.

It seems that discontinuity in terms of qualitative changes can be best defined by two characteristics: "emergence," i.e., the irreducibility of a later stage to an earlier; and "gappiness," i.e., the lack of intermediate stages between earlier and later forms. Quantitative discontinuity* on the other hand, appears to be sufficiently defined by the second characteristic.

* To facilitate distinction and alleviate confusion, I would suggest substituting "abruptness" for quantitative discontinuity, reserving the term "discontinuity" only for the qualitative aspect of change. It also appears feasible to distinguish between two types of emergence: (a) emergence of a single operation, e.g., abstract function, (b) emergence of a novel pattern of operation. A novel pattern may

Now it seems that in many discussions, particularly among psychologists, the quantitative and qualitative forms of continuity and discontinuity have not been clearly kept apart. Thus, a change may be discontinuous in terms of quality but may become distinguishable (e.g., measurable) only gradually; i.e., there may be a continuous quantitative increase, such as in frequency of occurrence or in magnitude. For instance, the attempt of the young child to walk on two legs is discontinuous with four-limb locomotion, though the successive actual attempts may show gradual progress toward precision and success.* In accordance with our definition given above, two-legged locomotion cannot be reduced to four-limbed locomotion, and, furthermore, there is limitation in regard to intermediate steps.

Another related mistake is that of accepting smallness of change, whether qualitative or quantitative, as an indicator of continuity. For instance, the genetic changes termed "mutation" may be very slight, but there has to be "discontinuity inasmuch as there are no intermediate forms between the unchanged and the changed."† This significant fact in mutation, namely, discontinuity, says Schroedinger, "reminds a physicist of quantum theory: no intermediate energies occurring between two neighboring energy levels. He would be inclined to call de Vries's mutation theory . . . the quantum theory of biology." Because of the smallness of change, in developmental psychology as well as in developmental biology, one often will find it possible to argue for discontinuity only on the basis of extensive data accumulated in extensive temporal sequences; discontinuity in change may then be concluded after a trait has become sufficiently distinct in terms of frequency, permanency, and magnitude.

emerge as a consequence of new operations that enter the pattern, or it may also emerge through a reorganization of the existing characters within a certain pattern, through a changing dominance between these existing characters, etc. One may note here some analogies between psychological emergence and biogenetic emergence coming about (a) through mutant genes, and (b) through changes in local constellations of genes.

* Such paradoxical coexistence of qualitative discontinuity and gradualness of appearance (progression) seems to pertain to developmental changes of various kinds. For instance, regenerative development of transplanted tissue is either determined according to the domicile within which the transplant is embedded (place-wise) or according to the original extraction of the transplant (origin-wise). This determination is an all-or-none phenomenon; however, visible differentiation is not instantaneously evident but progressive (26, pp. 70f).

† Schroedinger, p. 34 (37). Schroedinger points out that Darwin was mistaken in regarding the small, continuous chance variations within a species as the basis of evolution by natural selection. These variations (e.g., length of awn in a pure-bred crop) cannot be formants of a new species because they are not inheritable.

Other factors that are often not clearly recognized for their importance in determining sequences as either continuous or discontinuous are (a) the handling of the data and (b) the nature of the universe of discourse.

Concerning the first factor, it should be realized that discontinuous process changes typical in individual development may be obscured by averaging developmental achievement scores of individuals to secure a composite curve for a group which then suggests continuous growth.*

Another fallacy in deriving continuity of behavioral development from group scores has been most recently discussed by Lashley (21) in regard to a particular feature of the usual mental tests, namely, the heterogeneity (discontinuity) of the items which the test patterns comprise. Lashley's criticism implies that discontinuity of processes may be obscured by interpreting developmental data on the assumption that variations in achievement can be based only on variations in a single underlying process. As noted before, the achievement of correctness on our word-context test shows a steady increase with age, whereas underlying processes give a picture of the rise and decline of more or less primitive operations and the abrupt rise of an adult type of generalization around ten or eleven years of age. Reference should be made here to the important study by Nancy Bayley (3) concerning mental delevopment during the first three years. She could show that in terms of accumulated scores there was a steady increase with age; however, a further analysis of the test items in terms of underlying operations revealed a shift from one type of function ("sensorimotor") to a qualitatively different type ("adaptive") occurring at approximately nine months of age.

Secondly, it should be recognized that it is the universe of discourse, the interpretational frame within which the material is grasped, that often determines the ordering in terms of continuity or discontinuity. To illustrate by an analogy, one may represent the relation between color hues in physical terms, i.e., wave length, that change continu-

* Lecomte DuNoüy (8) in his remarkable book, *Biological Time*, takes the extreme view that continuity always is "manufactured" by our treatment of the data: "one of the roles of consciousness is to manufacture continuity from discontinuity."

ously within the range of visibility. Within the psychological frame of reference, however, there is discontinuity. The gradual variation from blue to green is discontinuous with the gradual variation from green to yellow, which, in turn, is discontinuous with the gradual variation from yellow to red.

There is no logical necessity for a concordance in terms of continuity between the quantitative and qualitative aspects of any developmental series. A discontinuous (epigenetic) qualitative change may become distinct gradually; that is, it does not need to be "saltatory" in a quantitative sense, if by that word is meant that a new form or function becomes suddenly overt. Nor does unevenness—spurt versus depression—of any growth curve necessarily point to novel process formation. However, though we have to beware of confusing quantitative discontinuity-continuity with qualitative discontinuity-continuity, quantitative unevenness may, possibly more often than not, point to qualitative discontinuity or emergent evolution. We may illustrate this from Paul Weiss's discussion (40) on embryonic growth: "An obstacle to simple mathematical treatment of growth is its lack of continuity; for embryonic growth advances unevenly, in spurts and jumps, with intermittent depressions. These depressions correspond to phases of intensive histological differentiation" (p. 44). Furthermore, if embryonic growth curves in terms of weight are compared with progress in terms of differentiation and morphogenesis, one finds that both kinds of progressions advance unevenly, but, that "maxima of differentiation coincide with minima of growth." From this, Weiss concludes that "acceleration of differentiating activity is attended by retardation of growth activity, or in other words, that there is some antagonism between differentiation and growth" (p. 134).*

Weiss's observations point to an important instance where the saltations and depressions of "accumulating" activity (growth in terms of quantitave discontinuity) appear to be vicariously related to morphogenetic processes directed toward the production of "discrete discontinuous . . . cell types which are not connected by intergradation"—development in terms of qualitative discontinuity (p. 98).

Quite possibly there are analogies to this vicarious correspondence between quantitative growth and qualitative development on the

* One may note the possibility of discriminating between "growth" as a process of accumulation versus "development" defined by differentiation.

level of psychological behavior. To illustrate, one such analogy might be found in a frequent observation concerning certain phases of speech development. There appears to occur between the stage of babbling and that of naming, a period during which vocalizing is depressed (22, p. 82). It seems plausible to interpret this period as one during which the awareness of sound patterns as verbal symbols emerges. Once this novel operation has emerged, the child bursts forth with naming, increasing its vocabulary at a swiftly accelerating rate.

In conclusion, it seems to me, that development cannot be comprehended without the polar conceptualization of continuity and discontinuity. Within the "universe of discourse" in which the orthogenetic law is conceived, development, insofar as it is defined as increase in differentiation and hierarchization is, ideally, continuous. Underlying the increase in differentiation and integration are the forms and processes which undergo two main kinds of changes: (a) quantitative changes which are either gradual or abrupt, and (b) qualitative changes which, by their very nature, are discontinuous.*

UNILINEARITY VERSUS MULTILINEARITY OF DEVELOPMENT

The orthogenetic law, by its very nature, is an expression of unilinearity of development. But, as is true of the other polarities discussed here, the ideal unilinear sequence signified by the universal developmental law does not conflict with the multiplicity of actual developmental forms. As implied in the conclusion of the preceding section, coexistence of unilinearity and multiplicity of individual developments must be recognized for psychological just as it is for biological evolution. In regard to human behavior in particular, this polarity opens the way for a developmental study of behavior not only in terms of universal sequence, but also in terms of individual variations, that is, in terms of growth viewed as a branching-out process of specialization or aberration.

To illustrate, "physiognomic" perception appears to be a developmentally early form of viewing the world, based on the relative lack of distinction between properties of persons and properties of inanimate things (44, pp. 67f). But the fact that in our culture physiognomic

* For further discussion of the continuity-discontinuity problem, see Bertalanffy, ch. 12 (4); DuNoüy (8); Huxley, ch. 5 (14); Lillie (23); Novikoff (27); Simpson, ch. 14 (39); Schneirla (35, 36).

perception, developmentally, is superseded by logical, realistic, and technical conceptualization, poses some paradoxical problems, such as, What genetic standing has adult aesthetic experience? Is it to be considered a "primitive" experience left behind in a continuous process of advancing logification, and allowed to emerge only in sporadic hours of regressive relaxation? Such an inference seems unsound; it probably errs in conceiving human growth in terms of a simple developmental series rather than as a diversity of individual formations, all conforming to the abstract and general developmental conceptualization. Though physiognomic experience is a primordial manner of perceiving, it grows, in certain individuals such as artists, to a level not below but on a par with that of "geometric-technical" perception and logical discourse.

FIXITY VERSUS MOBILITY OF DEVELOPMENTAL LEVEL OF OPERATION

The assumption that all organisms normally operate upon a relatively fixed and rather sharply circumscribed developmental level appears to be tacitly accepted by many psychologists. A contrary view is that all higher organisms manifest a certain range of genetically different operations. This means, for instance, that a child of a certain age or an adult, depending on the task or on inner circumstances, may, qua normal, perform at genetically different levels. Furthermore, there is, so to speak, not only "horizontal" differentiation but also "vertical" differentiation; that is, the more mature compared with the less mature individual has at his disposal a greater number of developmentally different operations.

It should be recognized that these views are not necessarily antagonistic; i.e., fixity as well as mobility of levels of operation coexist as polar principles of development. The principle of fixity is implied in, or can be inferred from, the intrinsic trend of any evolution toward an end stage of maximum stability. Such maximum stability, as the end stage of a developmental sequence, implies the ceasing of growth; that is, implies the permanency, for instance, of specialized reaction patterns, or automatization of response. But the principle of fixity would finally lead to rigidity of behavior if not counterbalanced by the polar principle of mobility. As most generally conceived, mobility implies "becoming" in contrast to "being"; it implies that an organism, having attained highly stabilized structures and operations may or may

not progress further, but if it does, this will be accomplished through partial return to a genetically earlier, less stable level. One has to regress in order to progress. The intimate relation of regression to progression appears succinctly expressed in the statement of one of the early evolutionists, Richard Owen (32). On interpreting the resemblance of the embryo to the phylogenetic ancestry, Owen said: "We perceive a return to the archetype in the early embryological phases of development of the highest existing species, or ought rather to say that development starts from the old point" (p. 108).

An impressive illustration of the relation between renewed development and regression on the biological level can be found in the processes of regeneration. Such regeneration, as extensively studied at the amphibian level, consists of two phases, regressive as well as progressive. The progressive phase – analogous to normal embryonic development – starts with the formation of the "blastema" or regenerative bud. But prior to progression there is regression. The regressive phase involves de-differentiation of already specialized cells (26, p. 3). Another probable source for blastema formation is reserve cells, that is, cells that have remained at a low state of differentiation (40, p. 466). It is noteworthy that power of regeneration, being associated with capacity to de-differentiate is, in general, inversely correlated with the organism's ontogenetic or phylogenetic status of differentiatedness (26, p. 62).

In speculating by analogy from biological events of this sort to human behavior one might argue that in creative reorganization, psychological regression involves two kinds of operations: one is the de-differentiation (dissolution) of existing, schematized or automatized behavior patterns; the other consists in the activation of primitive levels of behavior from which undifferentiated (little-formulated) phenomena emerge.

The polar conceptualization of normal levels of operation in terms of fixity-mobility appears thus closely linked to another polar distinction, namely, that involved in the relation between lower and higher levels of operation. In regard to this relation, one particular problem among many has aroused considerable interest. It concerns the degree of fixity or mobility of an operation emerging at a certain level, in relation to developmentally later forms of operation.

As mentioned before, development, whether it concerns single functions, complex performances, or the totality of personality, tends toward

stabilization. Once a certain stable level of integration is reached, the possibility of further development must depend on whether or not the behavioral patterns have become so automatized that they cannot take part in reorganization. We may refer here to Rapaport's concept of "apparatus" (31, p. 76) or to Piaget's concept of "schema" (30). The individual, for instance, builds up sensorimotor schemata, such as grasping, opening a box, and linguistic patterns; these are the goal of early learning at first, but later on become instruments or apparatuses for handling the environment. Since no two situations in which an organism finds itself are alike, the usefulness of these schemata in adaptive behavior will depend on their stability as well as on their pliability (a paradoxical "stable flexibility").

Furthermore, if one assumes that the emergence of higher levels of operations involves hierarchic integration, it follows that lower-level operations will have to be reorganized in terms of their functional nature so that they become subservient to higher functioning. A clear example of this is the change of the functional nature of imagery from a stage where images serve only memory, fantasy, and concrete conceptualization, to a stage where images have been transformed to schematic symbols of abstract concepts and thought.

DIFFERENTIAL VERSUS GENERAL DEVELOPMENTAL PYSCHOLOGY: INDIVIDUALITY AS A PROBLEM OF DEVELOPMENTAL PSYCHOLOGY

At Clark University we are becoming increasingly impressed with the fruitfulness of the developmental frame of reference for the study of group and individual differences. We may illustrate this approach to the many problems which are in need of investigation by referring to a few studies on cognitive organization.

One problem concerns the over-all maturity status of the individual, that is, his cognitive level of operation under optimal conditions, and the stability of this level under varying internal and external conditions. Friedman, Phillips, and their co-workers at Worcester State Hospital and at Clark University have constructed a genetic scoring system of the Rorschach test founded on developmental theory, and standardized through an ontogenetic study of children. The scoring system is based essentially on the occurrence and frequency of "genetically low" and "genetically high" scores. Restricting ourselves here mainly to the various whole and detail responses, genetically low responses are those which indicate amorphous, diffuse, or confabulatory percepts where little attention is given to part relations and to perception of contours. The genetically high percepts are reflected in the responses whereby the percept is that of a precisely formed unit with integrated parts, where the whole is composed of relatively independent sub-wholes brought together in an integrated fashion. Applying this developmental scoring analysis to the responses of 160 children of from three to eleven years of age, Hemmendinger found the basic principle of development confirmed. That is, with age there is a decrease of the undifferentiated diffuse whole and detail responses along with an increase of the highly articulated, well-integrated whole and detail responses. There is further an interesting shift from the early whole responses toward small detail responses between the ages of about six and eight; later on there is a decline in favor of the integrated whole responses (12).

This genetic scoring method has been utilized for the gauging of developmental levels of cognitive organization in normal and deviant persons in studies carried out at Worcester State Hospital, Clark University, and Boston University.* According to the theory, the most severely impaired groups should here show the genetically lowest responses, and there should be a decrease of these responses and an increase in the genetically high responses with less impaired or unimpaired groups. The evidence is in good agreement with this expectation (see Figures 1 to 4). It was found that the genetic scores of the hebephrenic-catatonic schizophrenics resembled those of children three to five years of age. The paranoids were similar to children six to ten years of age; the psychoneurotics were intermediate between the ten-year-olds and normal adults (9, 28, 38).

We may add at this point that for the study of individual differences in their developmental aspects, experimental methods other than those based on ontogenesis have become available. Among these, probably the most promising method is that of "microgenesis." This method, already mentioned above, is based on the assumption that activity patterns, percepts, thoughts, are not merely products but processes

* The illustrations given here refer to perceptual organization. For some of our pertinent studies on language behavior, see items 1, 9, 15, 24, 45, and 47 of the References.

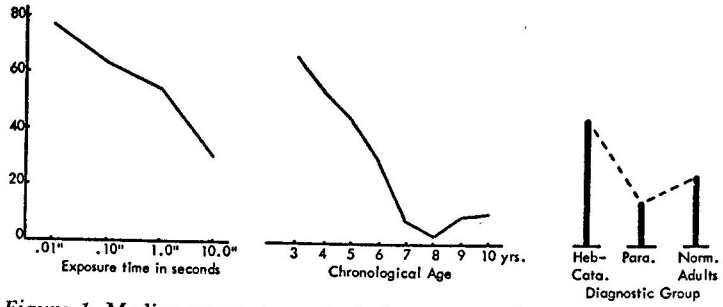

Figure 1. Median percentage of whole responses in normal adults at tachistoscopic exposures, and in children and diagnostic groups at full exposure, of the Rorschach.

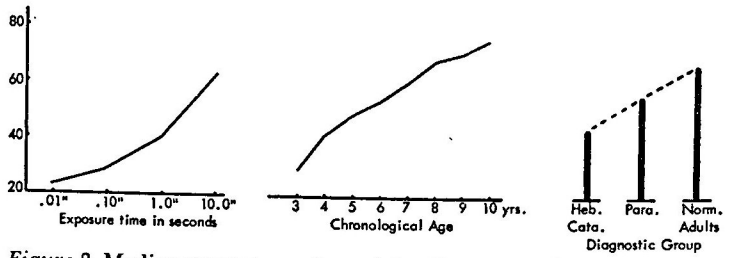

Figure 2. Median percentage of usual detail responses in normal adults at tachistoscopic exposures, and in children and diagnostic groups at full exposure, of the Rorschach.

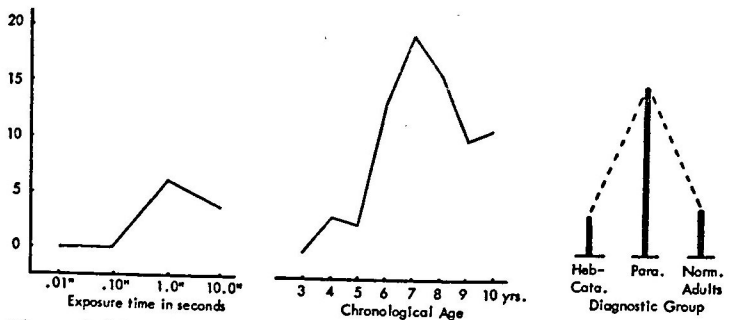

Figure 3. Median percentage of rare detail responses in normal adults at tachistoscopic exposures, and in children and diagnostic groups at full exposure, of the Rorschach.

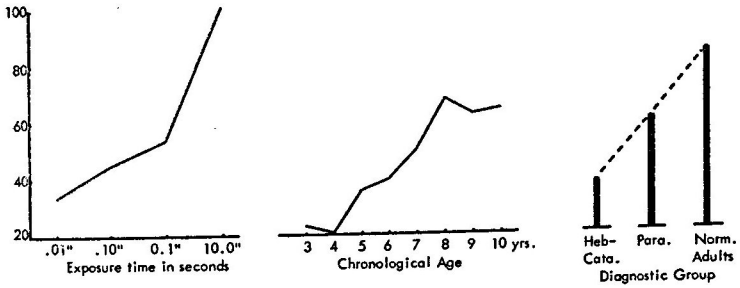

Figure 4. Percentage of developmentally-mature whole responses of all whole responses in normal adults at tachistoscopic exposures, and in children and diagnostic groups at full exposure, of the Rorschach.

that, whether they take seconds, or hours, or days, unfold in terms of developmental sequence.

To study microgenesis of perception, Framo presented the Rorschach cards to 80 normals. Twenty subjects in each of four groups viewed the cards at exposures of 0.01 second, 0.1 second, 1 second, and 10 seconds, respectively. A comparison of the responses in this study with the ontogenetic data obtained by Hemmendinger show striking agreements (29).*

The over-all conclusion is that the responses of the clinical groups represent various, more or less immature levels of perceptual development as compared to those of normals.

This evidence is supplemented by a study which E. Freed carried out under the direction of Leslie Phillips (29). Freed hypothesized that hebephrenic and catatonic schizophrenics would fail to show increased differentiation with time. Using the same design as Framo, he exposed the Rorschach to a group of 60 hebephrenic-catatonic schizophrenics, 15 at each of four exposure times. At the shortest exposure time their performance was not grossly different from that of the normal adults, but as exposure time was increased these schizophrenics increasingly lagged behind in the development toward perceptually mature responses (see Figure 5). It can be concluded, therefore, that unlike the

* Figures 1 to 4 show the W. D. and Dd responses and the genetically high responses (Mature W%, Mature D%) for (a) microgenetic changes and (b) ontogenetic changes, and (c) the responses of hebephrenic-catatonic schizophrenics, paranoids, and normals under the usual Rorschach Test conditions.

normal subjects, these schizophrenic groups did not utilize the increases in exposure time to improve their perceptual adequacy and integration.*

If we combine the notions and the evidence in terms of ontogenesis, microgenesis, and regression, we may conclude that perceptual processes develop and come to a halt at different levels. At what level the processes stop depends on such conditions as age, experience, and complexity of stimuli, and on the normal or pathologic maturity status

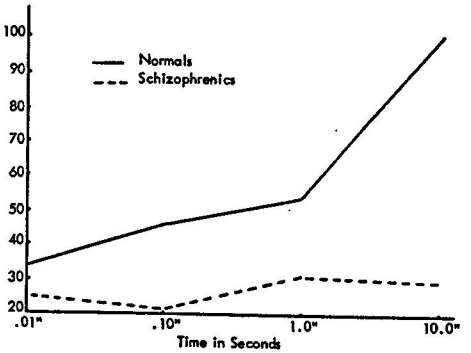

Figure 5. Median percentage of developmentally mature whole responses for normals and schizophrenics at four exposure times.

of a person. Thus, it might be said that by evaluating the Rorschach responses of a person through genetic scores, one tests the level of perceptual formation to which such a person under optimal time conditions progresses.

Not only has degree of psychiatric intactness been found to correspond to levels of development, but preliminary work at Worcester suggests that forms of symptom expression can also be ordered to the developmental sequence, as indicated by the genetic Rorschach scores. Thus, a number of studies have shown that persons whose symptoms are characterized by immediacy of overt reaction function at developmentally lower levels than those whose symptomatology represents dis-

* Another area of abnormal behavior to which the microgenetic methodology has been applied is that of speech pathology. Experiments on apprehension of tachistoscopically presented words by normal subjects suggest that paraphrasic naming is related to microgenetically early stages of name formation (46).

placement to more mediated forms of behavior. This has been shown by Misch, who found that a directly assaultive group is developmentally lower than a group of individuals who only threaten to assault (25). Similar findings have been obtained by Kruger (19) for subjects who demonstrate overt sexual perversion in contrast to those who only fear that they may act in a sexually perverse fashion. In addition, Kruger found that those patients who made a serious suicidal attempt were developmentally lower than those who only threatened to commit suicide.

Another developmental aspect of individuality that is in need of experimental and clinical study concerns what one might call the genetic stratification or the developmental heterogeneity of a person. Developmental stratification means that a person is structured into spheres of operations which differ in regard to developmental level. Still another aspect concerns the flexibility of a person to operate at different levels depending on the requirements of a situation.

In a particular way, it seems to us, this aspect of flexibility is connected with a further problem of individuality, namely, that of creativity. Now creativity, in its most general meaning, is an essential feature of emergent evolution, and this, in turn, implies progression through reorganization. Since we assume that such progress through reorganization cannot be achieved without "starting anew," that is, without regression, it follows that a person's capacity for creativity presupposes mobility in terms of regression and progression. The hypothesis would then be that the more creative the person, the wider his range of operations in terms of developmental level, or in other words, the greater his capacity to utilize primitive as well as advanced operations. This hypothesis is currently being tested at Worcester State Hospital and Clark University by means of the genetic Rorschach scores of relatively creative versus relatively noncreative adults.*

It might also be possible to study persons at the other extreme end of mobility, that is, those who, because of their excessive yearning for security, are coping with the environment in terms of rigidly formalized behavior. In this regard the work by the Swedish psychologist Ulf Krogh (18) seems very suggestive. He studied the microgenesis of complex pictures with various groups of people. Among other results he

* The study, well advanced, is being carried out by C. Hersch.

found that persons such as the compulsion-neurotics, whose reaction patterns to the environment are inordinately formalized, are lacking in microgenetic mobility, that is, they are lacking the intermediate steps that are normally present during the unfolding of percepts.

We should like, then, to conclude with this observation: The original aim of developmental theory, directed toward the study of universal genetic changes, is still one of its main concerns; but side by side with this concern, the conviction has been growing in recent years that developmental conceptualization, in order to reaffirm its truly organismic character, has to expand its orbit of interest to include as a central problem the study of individuality.

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