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Wolff, Peter H. The developmental psychologies of Jean Piaget and Psychoanalysis. Psychological Issues, 1960, Volume 2, No. 1. Monograph 5. International Universities Press, Inc., New York.

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Introduction

The experiments and observations described in ~~these books~~ more than 180 studies on the psychology of intelligence, which include among them 21 full-length books and numerous monographs, which Jean Piaget and his associates have published "...are the foundation on which Piaget has constructed a genetic theory of knowledge which postulates that motor action is the source from which mental operations emerge (i.e., thought arises from sensorimotor activity); that man's knowledge about the world derives from his concrete experiences with it; and that the unfolding of man's psychological potentialities exposes him to an ever-expanding section of reality. Its central assertions are that: 1. Intelligence is only one aspect of the general biological adaptation to the environment... 2. Intellectual adaptation is the progressive differentiation and integration of inborn reflex mechanisms under the impact of experience... 3. The differentiation of inborn reflex structures and their functions gives rise to mental operations by which man conceives of objects, space, time, and causality, and of the logical relationships which constitute the basis of scientific thought... Considered as a whole, his writings are a theory of knowledge more than a psychological theory of development, and as such they are a subject matter for the philosophy of science....his writings also imply a psychological theory which can be extracted and compared with other developmental psychologies. Piaget's theory lends itself particularly well to a comparison with the psychoanalytic theory of development because their respective genetic assumptions correspond more closely than those of other developmental psychologies (with the possible exception of Heinz Werner's comparative psychology of development). (Werner, H. 1926, "Comparative psychology of mental development--3rd ed., 1957, & "The concept of development from a comparative and organismic point of view" in The Concept for Development, ed. by D. B. Harris, Univ. of Minn. Press, 1947, pp. 125-147).....The two theories assume an inborn organization as the structural basis of development, and biologically rooted functions as the organizing forces which, under the impact of experience, differentiate and integrate the inborn structure into an increasingly complex organization. Both theories postulate an adaptive relationship between organism and environment in which the organism establishes and maintains an internal equilibrium through active interchange with the environment...Both psychoanalysis and sensorimotor theory do not simply formulate identical processes in different terms: because their methods of investigation differ radically, their data and formulations cannot be directly compared. Piaget used a method of direct observation, ad hoc experimentation, and scheduled interviewing; his data, although they are interpreted from introspective reports and in the framework of his theory, are behavioral and objective. Psychoanalysis obtains its data from introspective reports and bases its developmental theory on retrospective reconstruction. It employs theoretical inferences whenever its clinical methods do not provide direct information" (9-11).

Historical Survey

"Piaget's investigations of development fall into three phases which may be distinguished by the material he studied, the methods he used, and the theoretical formulations which guided him. 1. From 1923 to 1932, already concerned with the task of finding a biological explanation of knowledge, Piaget began his psychological studies by systematically recording the verbal productions of three- to ten-year-old children. He recorded their talk while they played alone or with other children, and their conversations with him and his assistant. His method combined the recording of spontaneous speech and clinical interviews which were adapted to the child's level of comprehension, often being only the elaboration of the child's own questions and statements. Thus Piaget avoided imposing his adult preconceptions on the childish and prelogical world...He collected and systematized the forms of verbal expression according to age levels, and demonstrated a lawful sequence governing the development of the child's reasoning process, his use of language, and his conception of physical and social reality...The



findings of these studies were reported in five volumes...From these studies, Piaget concluded that thought passes through a series of stages, from early animistic through magical and artificialistic forms to rational thought, and that at each level the child constructs a systematic 'cosmology' of the world according to the modes of reasoning available to him at that stage. 2. During the first phase of his work Piaget concentrated on the content and form of the child's verbal behavior, and did not concern himself with the underlying mental processes. His assumption was that verbal intelligence is identical with intelligence in general, and that a chronological analysis of speech samples would demonstrate the mental mechanisms involved in intellectual development. But his studies led him to conclude that verbal intelligence is only one particular expression of mental functioning, and the concrete manipulation of objects another expression of the same processes; and that he would have to look beyond the manifest verbal or motor behavior to find common laws of mental functioning covering both expressions of intelligence. In the second phase he therefore studied infants during their pre-verbal development and relied on the infants' concrete manipulations of objects and responses to stimulation as the behavioral criteria from which he inferred the underlying mental processes...3. From his studies with children up to the age of four, Piaget set down general laws of intelligence development in terms of the underlying mental processes, and in the third phase of his work he tested their validity when they were applied to the development of intelligence from the age of five through adolescence. The focus of his investigation was no longer on the manifest content of behavior as such, but on the processes of transformation which would account for a functional continuity between reflex behavior at birth and those intellectual functions by which the adult mind performs abstract logical operations, conceives of unperceivable (non-Euclidean) spaces, and calculates with imaginary numbers...The publication of the last volume of *L'Epistémologie génétique* in 1950 completed the investigations of cognitive development....Since then, Piaget and his co-workers have been continuing their investigations of the development of perception which they began in 1939. Although perception was always treated as an integral part of intelligence and was investigated as part of sensorimotor development, specific investigations of perception as distinct from and complementary to cognition are not begun until the child has already acquired language...On the basis of twenty years of work, Piaget has so far concluded that: a. Perception, like cognition, tends toward a stable equilibrium; b. The developmental laws governing perception are different from those governing logical intelligence; c. Perceptual structures never reach the degree of stability (reversibility and associativity) which characterizes intellectual structures." (13-19).

The General Theory and Model:

The theory: "Sensorimotor theory postulates the existence of two 'kinds' of reflexes at birth: (1) fixed stimulus-response patterns which are not altered by experience, although neurological maturation may modify them; these are the classic reflexes of neurology; and (2) relatively automatic stimulus-response patterns which require stimulation for their stabilization, are modified as the result of experience, and are the basic behavioral units from which more complex forms of behavior emerge. These are the only reflexes with which sensorimotor theory is concerned, and the only reflexes which will be referred to here. The sensorimotor theory of intelligence assumes further that every sensory perception and motor experience which results from the activation of a reflex will influence all subsequent performances of that reflex. The infant's reflex response to an external stimulus is therefore simultaneously determined by the inborn reflex (the given structure), by past activations of the reflex (experience), and by the particular stimulation in the present (the environment). Piaget has postulated the existence of flexible mental organizations--the schemata--in order to account for the influence of all previous experiences of a particular behavior pattern on the form of that pattern in the present. The schema is the primary unit of mental organization in Piaget's theory of development, where it plays as predominant a role as does the concept of energy in psychoanalysis....Sensorimotor experiences are registered in the schema by the 'invariant' function of assimilation. It



is the fundamental tendency of all human organisms to assimilate organic substances, sensory events, and ideas, for which there already exist more or less stable internal organizations. At the biological level, assimilation refers to physical-chemical incorporation of concrete substances into an organic structure (an organ system); at the primitive psychological level, assimilation refers to the tendency of the organism to incorporate sensory and motor components of a behavior into the reflex schema ~~xx~~ they have activated; and at later developmental stages, it refers to the tendency of the mental apparatus to incorporate external ideas and the products of mental activity into a complex system of thought schemata.... Parallel to assimilation, and complementing it to bring about an adaptive relationship between organism and environment, is the function of accommodation. The assimilation of sensorimotor elements to a given schema alone would 'enrich' the organism with experiences, but would not bring about behavioral changes--i.e., it would not result in adaptation. The processes ~~xx~~ by which the schema changes so as to conform to the assimilated reality condition (accommodation) guarantees that a pattern of behavior is not disrupted when the organism encounters new objects or stimuli which can almost but not quite be assimilated to the schema. At the biological level, accommodation refers to the material alteration of the organ system in response to the assimilation of material substances; at early sensorimotor levels of development, accommodation refers to ^{the} progressive change in the reflex schema as the reflex is repeatedly exposed to a novel stimulus, and its behavioral effects is the gradual adaptation of the reflex to the new stimulus condition; at later developmental stages, when motor action is replaced by thought, accommodation refers to the co-ordination of thought patterns to each other, and its behavioral effect is to modify thought patterns to correspond to reality conditions.

"Whatever is or can be assimilated to a schema is called the aliment for that schema. Organic schemata (organ systems) assimilate, and accommodate to, material aliment (metabolites); the reflex assimilates sensorimotor aliment, etc. The aliment of a schema is not equivalent to the substance or object which, from the observer's point of view, seems to activate the behavior, but refers to those properties of an object which, at each level of development, are assimilated and to which the schema can accommodate.... From the functional concepts of assimilation and accommodation and from the structural concept of schema, Piaget derives the concept of 'desirability,' which is the primary concept of motivation in sensorimotor theory. The source of all motivations is the inherent tendency of every schema to establish and to maintain an equilibrium ~~x~~ between the assimilation of aliment and accommodation to it. The fundamental tendency of any one schema, and of all schemata in relation to each other, is to establish and maintain an equilibrium between assimilation and accommodation. In terms of mental processes, this tendency is called the function of organization; and in behavioral terms, is called the function of adaptation.

"Disequilibrium of a schema implies that ~~the~~ aliment has not been fully assimilated because the schema has not fully accommodated to it, and, conversely, that accommodation is not completed because the schema cannot yet fully assimilate the object or stimulus in question. As long as the adaptation to an object is incomplete, the organism has a 'functional need' (need to function), or there is said to be a 'desirability' for continued contact with it. In contrast to the instinctual drives of psychoanalytic theory which are assumed to exist prior to experience, the need to function arises only after the organism has encountered the stimulus in question, i.e., after the new aliment has upset the schematic equilibrium. Thus the psychological need for an object is the result of contact with that object, and the need persists until the behavior has been adapted to novelty.....

"Once a reflex is activated by external stimulation, or once an adapted behavior is again disrupted by the encounter with a novelty in the environment, the disrupted behavior pattern tends to maintain contact with the original stimulus until the behavior has been adapted to the novelty. This tendency ~~xxxxxx~~ of the organism to repeat actively every experience imposed on it by the environment



is called the circular reaction; it gives the impression that the organism seeks to renew contact with novelties precisely because it has had ~~x~~ previous experiences with them. The repeated assimilation of the same aliment is called reproductive assimilation; its function is to stabilize a newly acquired behavior by circular reaction....

"The process by which new aliment is incorporated into a global schema so as to create disequilibrium, and eventually to construct a series of derivative suborganizations, is called the function of generalizing assimilation. As the consequence of generalizing assimilation a global schema undergoes differentiation, and the newly acquired schemata as well as the original schemata will operate separately or in conjunction in the more highly differentiated mental organization.....
~~The function by which~~ By generalizing assimilation, stimulations which were originally specific aliments for one schema--e.g., grasping activity for the prehensile schema, visual activity for the visual schema, etc.--become aliment for one or more other schemata as well, and the reflexes corresponding to the schema will coordinate.... The function by which two or more behavior patterns (as well as their corresponding schemata) coordinate to form a new pattern of higher complexity is called mutual assimilation and accommodation. Its effect is the integration of schemata into superordinate organizations. Two schemata of which have differentiated from one global schema, or two originally independent schemata which have each assimilated the sensorimotor components of two or more simultaneously active circular reactions, will remain in disequilibrium until they have been integrated as a new superordinate organization. This tendency toward integration is an expression of the organizing function of all mental activity, seeking to establish the highest degree of equilibrium among the various schemata which is possible at any stage of development.... At birth the reflexes are uncoordinated and function relatively independent of each other. With the progressive differentiation of reflex schemata, the same aliment becomes the simultaneous activator for an increasing number of schemata and brings about the integration of all those schemata which can utilize one or more stimulus objects for aliment at the same time. Every differentiation, therefore, implies a simultaneous integration" (21-27).

The principles of development:

"Since Heinz Werner has proposed a set of propositions regarding development based on his own studies of comparative developmental psychology which are quite compatible with Piaget's theory, I have used them here in order to focus my discussion of Piaget..
..Werner (1947) proposed the following principles of development: 1. The orthogenetic law: 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. 2. Uniformity versus multiformity of development: Development may, depending on the species, or on the type of activity, involve wither differentiation of partial patterns from a global whole, and their integration...or the integration of originally juxtaposed, relative isolated global units which now become differentiated parts of a newly formed pattern. 3. Continuity versus discontinuity of development: 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; (b) qualitative changes which by their very nature are discontinuous. 4. Unilinearity versus multilinearity of development:....5. Fixity versus mobility of developmental levels....It can be demonstrated that sensorimotor theory also implies these principles of development: 1. The orthogenetic law. Piaget's theory of development is built on the fundamental assumption that global schemata differentiate under the influence of experience, and that differentiated schemata integrate because of the organism's tendency to maintain a stable mental organization...2. Uniformity versus multiformity of development. In the earliest phases of development, each reflex is a self-contained unit which differentiates and then integrates with the differentiated products of other reflexes. A global pattern branches out into new patterns by generalizing assimilation; in this sense behavior tends to become



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multiform as development progresses. However, ~~the~~ the separate reflexes, which functioned independently at first, are coordinated into more complex combinations and sequences of behavior by mutual assimilation and accommodation. In this sense behavior tends to converge from isolated units toward integrated wholes--i.e., toward 'uniformity.'...3. Continuity versus discontinuity. Every developmental sequence may appear as a smooth continuum when considered as belonging to one historical context, and as a series of discontinuous jumps when considered from a ~~and~~ different point of view...However, when the history of intentional behavior is traced in terms of goal-directedness or self-initiated behavior alone, it becomes apparent that the child goes through intermediate stages in which he seems to want to make something happen in the environment, and uses a familiar motor act as his means. Both self-initiated action and goal-directedness have roots in the first stage of sensorimotor development...Unilinearity versus multilinearity. Piaget's observations show that different children arrive at the same general solution of a concrete problem by different paths...5. Fixity versus mobility of developmental levels. Piaget conceives of development as a progression of stages. The transition from one stage to the next is defined by phase-specific and qualitatively new interactions between the individual and his environment; the transition constitutes a total restructuring of the already present schemata under a new total organization in which the more global (earlier) forms of behavior as well as the more differentiated forms are available to the more mature individual. Global behavior forms may be utilized as such or they may undergo further differentiation....6. Maturation versus learning. The sensorimotor theory includes one developmental principle..not dealt with in Werner's formulations: What is the polarity of maturation versus learning as the crucial developmental factor. Piaget presents no empirical evidence for or against the role of maturation as an autochthonous developmental factor but assumes that the role of neurological or somatic maturation can never be isolated from the influences which learning will have on the maturing behavior pattern while it is being exercised and exposed to environmental stimulation. Neither maturation nor learning...enters into development ~~as~~ as an independent factor; every new behavior pattern which is differentiated as the result of experience acquires developmental significance only after it is integrated into the innate organization...."(29-35).

The Specific Theory of Sensorimotor Development

The Origins of Intelligence and The Construction of Reality trace development from its reflex beginnings to the point at which 'practical mental inventions' first replace the groping motor explorations of the earlier stages--i.e., when action is first transformed into thought. Piaget divides this period of eighteen months into six stages according to the emergence of qualitatively new interactions between the child and the environment. The transition from inborn to acquired behavior patterns characterizes the shift from the first to the second stage; the transition from body-centered to object-centered motor activity initiates the third stage; the emergence of intentional means-ends relationships marks the transition from the third to the fourth stage; the fifth stage is characterized by the intentional ~~motor~~ motor exploration of unfamiliar objects and events; finally, the transition from empirical motor explorations to mental invention characterizes the sixth stage and completes the sensorimotor phase of intelligence development. Although the stages correspond ~~to~~ roughly to age levels..their significance is not that they offer behavior norms for specific ages but that the sequence of the stages and the transition from one stage to the next is invariant" (37).

The First Stage of Sensorimotor Development

"The use of reflexes' extends from birth to the end of the first month...The outstanding characteristics of behavior in the first month..are: 1. The stabilization and improvement in performance of the reflex behaviors. 2. The tendency of the reflex to repeat itself without further external stimulation, once it has been triggered by an external stimulus..3. A generalizing tendency of the reflex resulting in its adaptation to a variety of objects, all of which can sustain reflex activity. From these behavioral data, the following concepts are derived: &



Conservatism: "The tendency of the reflex to repeat by ~~xxx~~ circular reaction is the earliest evidence in Piaget's observations which suggests the organism's basic tendency toward conservatism. ~~The~~ Conservation may be defined as an ideal state which is achieved by the end of intellectual growth, or a ~~as~~/process tending toward this state.....Object Concept: The tendency to conserve the object as a permanent thing regardless of its displacement in space, regardless of its disappearance and sudden reappearance, etc., is one instance of conservation in ~~general~~.. ..The differentiation of action from object, and the conservation of the object as a stable independent 'thing,' will play a significant role in differentiating the self from the environment....Space: It is a fundamental proposition of Piaget's theory that the concepts of objects, space, time, and causality are not a priori categories of thought in the Kantian sense, but that they are slowly elaborated as the sensorimotor actions adapt to the environment and as the corresponding schemata differentiate and integrate. ~~xxxxxxx~~ Space is not a dimension intuitively known from birth but is a concept slowly elaborated as the child manipulates objects and observes their displacement. During the first stage, when the object does not 'exist' except while it is actively manipulated, there is no conception of space apart from action....Causality: The concept of causality--to the extent that it is acquired at all during the sensorimotor phase of development--implies the intentional use (although not the subjective awareness) of relationships between action and the objects affected by action. During the preverbal phases of development the infant's concept of causality is therefore inferred from his apparently intentional manipulation of objects 'in order to' achieve specific goals....Time: To the extent that it is acquired during the first two years, the concept of time develops as an awareness of the relationship between before and after...During the first stage, the child's awareness of time can only be the experience of duration; since duration is the length for which any particular reflex is active, time remains purely a function of action in progress. Intentionality: The concept of intention implies purposeful activity initiated by the subject, and action directed toward a concrete or abstract goal. Viewed as a psychological function, intentional behavior implies further that action and object have been differentiated so that an action may be directed toward a goal which is no longer ~~xxx~~ identified with that action...~~Reproductive Assimilation~~ (Footnote: In using the concepts of consciousness of awareness, Piaget does not assume the existence of a special quality of mental functions arising out of nowhere at a certain stage of development. According to him, consciousness is the result of a progressive integration of mental functions which makes possible the delay of the consummatory ~~xxx~~ act and the insertion of a series of intermediate motor and mental anticipations when the desired goal cannot be immediately achieved, this desire for momentarily unachievable goals itself being a function of schematic differentiations and integrations. Piaget assumes that consciousness or awareness results from a delay between the initial perception of the stimulus ~~xxx~~ and the final consummatory action. Therefore he infers the origin of awareness from observation of intermediate steps which the child undertakes before acting on the goal. At first this is assumed to be only the consciousness of the direction of action, but later it also becomes the consciousness of the goal toward which this action is directed. Piaget's conception of consciousness is similar to Hebb's, which is that 'consciousness is to be identified theoretically with a certain complexity of phase-sequences [analogous to schemata] in which both central and sensory facilitations merge, the central acting to reinforce now one class of stimulations, now another.')......Reproductive Assimilation: Reproductive assimilation refers to that function by which a reflex schema or any acquired schema achieves equilibrium. It consists in the repeated assimilation of the same alient to a schema until a balance between assimilation and accommodation is achieved; its behavioral referent is the progressive stabilization of a single behavior pattern or the coordination of two or more behavior patterns by repetition without any modification ~~xxx~~ other than their adaptation to the original stimulus conditions.....Generalizing Assimilation: Piaget's observations show that toward the end of the first month, the infant applies his reflexes to a variety of objects and that as a result the reflexes become modified and adapted to the new objects in



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question. This is the first indication of a tendency toward generalization which will guarantee that development moves toward diversification in the future just as reproductive assimilation guarantees the consolidation of the past....Accommodation: During the first stage, accommodation refers to (a) the mechanism by which the inborn adapted reflex is stabilized; and (b) the mechanism by which the stabilized reflexes are adapted to new environmental stimulus conditions....Recognitory Assimilation: ..is defined as the assimilation of familiar aliment to a schema which is already adapted to the aliment. The object does not introduce disequilibrium into the existing organization, and in behavioral terms a recognitory act is therefore the organism's motor response to a familiar object...The ability to select one aliment from several familiar aliments in turn implies that the schemata arising out of one global reflex have been integrated into a new superordinate organization, and that one kind of sucking has been related to all other kinds, to be selectively activated because it is different from the others...As the role of organic needs in intellectual development recedes during the later stages, recognitory assimilation will refer only to the incorporation of a familiar aliment to an already stabilized schema which induces no^{dis}equilibrium, and therefore no active search for the encountered object. Reversibility: ..may be defined (a) as a final state of mental functioning which characterizes mature intelligence; and (b) as a process moving towards this goal...Piaget defines true reversibility as that capacity of mental functioning to achieve a final equilibrium 'which insures a permanent possibility for returning to the starting point of the operation in question.' By this Piaget means that at a certain stage of development (ages 13 to 15), the child's cognitive functions have advanced to the point where every direct act or thought will immediately evoke (imply) all those mental operations by which the original action can be canceled (operation of inversion or negation) or be compensated by a detour so as to arrive at the same end point (equivalence operation)...The significance of reversibility of thought is that any new thought operation, or any new assimilated fact, no longer alters the mental structures referring to it nor ~~is~~ the relation of all the mental structures to each other--i.e., the assimilation of novelties no longer introduces disequilibria, because thought is reversible and has available a compensatory thought which will restore the equilibrium...During the first stage, the range of possible stimulus-response patterns is determined almost entirely by the inborn coordinations of the reflexes and their mode of functioning. " (40-56).

The Comparison between sensorimotor theory and psychoanalysis: At birth the infant is able to respond with global and relatively fixed reflex patterns to a limited set of external stimuli. Toward the end of the first stage the child begins to respond more specifically to various external stimuli although the reflexes themselves remain essentially unchanged, since no new motor components are added to them and only their form of execution is modified. 1) While the reflex concept is the structural cornerstone of Piaget's sensorimotor theory, early psychoanalytic theory adopted the reflex arc as its topographic model for all mental functioning. 2) Both theories postulate invariant biological functions which determine the direction of the developmental process and maintain the organism's equilibrium at every level of development. 3) Both theories assume that internal as well as external stimulations play a role in development, but they assign different degrees of importance to the stimuli arising from these two sources as motivation for action. Sensorimotor theory deals almost exclusively with external stimulation, and assigns only a transient role to the organic stimuli. In classic psychoanalytic theory, instinctual drives were considered as the primary sources of stimulation and a subsidiary role was assigned to external stimuli. The accumulation of instinctual tension arising from the somatic apparatus is the primary cause of all behavior....internal stimuli remain the principal sources of motivation. 4) In formulating their respective concepts of motivation, present day psychoanalysis does not deal exclusively with drives and the development of drive-controlling structures, and Piaget does not deal exclusively with structural disequilibria and the hierarchic integration of schemata. 5) The organism's fundamental tendency



is to assimilate external data to itself, according to sensorimotor theory, and to rid itself of all stimulations, according to psychoanalytic theory. 6) Because the effect of external stimulation is of relatively short duration, while internal stimulations are persistent and recurrent, it would appear that Piaget deals with motivations whose effect is transitory, while psychoanalysis deals primarily with motivations whose influence may be long-lasting. Actually, there is no such sharp distinction in the motivation concepts of the two theories.

7) The concept of motivation in sensorimotor theory is inextricably tied to its structural conception; psychoanalytic theory postulated a set of drive motivations which are originally independent from the structures to which they are related.

"Classic psychoanalytic theory, by the method of retrospective reconstruction, arrived at a drive concept of motivation in which the role of structures is secondary to that of instincts. Psychoanalytic ego psychology has refined this conception by attributing more significance to the inborn thresholds and autonomous structures which guarantee an initial state of adaptedness to reality. Sensorimotor theory, by the method of direct observation, arrived at a motivation concept which is indissolubly linked with its structural assumptions, and the theory takes little account of the demands that organic needs and diffuse body states make on the individual." The author then goes on to suggest three avenues which could lead to a resolution between the two theories. He concludes: "Psychoanalytic theory has reconstructed early development with special attention to those periods when the influences of drive tensions are making themselves felt: during states of hunger, fatigue, and discomfort, when the infant is so occupied with inner forces that he does not attend to the outside world. In states of inner tension, the infant is relatively impervious to external stimulation, and relatively incapable of responding adaptively to his environment. Sensorimotor theory is primarily interested in those stabilized and reproducible behavior patterns which can be observed under optimal conditions of internal equilibrium. Most of the observations which Piaget reports are recorded when the infant is presumably comfortable and awake, that is, when organic need is not prominent. The developmental process as outlined by sensorimotor theory may then be assumed to refer to behavior patterns which are activated when organic needs are not pressing and when the infant is in a condition to respond optimally to external stimuli, and in a condition to elaborate reality-adaptive structures. No actual developmental process would correspond to either of these 'pure types' of development--all mental processes and structures would result from a constant interaction between drive-conflict-determined and autonomous adaptive processes. Some behaviors would correspond more closely to Piaget's conception, others more to the classic psychoanalytic conception of development. In this conception, Piaget's sensorimotor theory and psychoanalytic theory would complement each other by providing conceptual tools for explaining the phenomena subsumed both under the drive conception and the need-to-function conception of motivation" (64-65).

The Second Stage of Sensorimotor Development

This period of "primary circular reactions" and the "first acquired adaptations" extends from the second to the sixth month. "During the second stage of sensorimotor development, the limits set by inborn reflex predispositions..are exceeded when new activities are discovered by chance contact and when new motor components become part of the behavior repertory. The changes in behavior characteristic of the transition from the first to the second stage are: 1. The acquisition of behavior patterns for which there were no inborn coordinations; thus the first clear ~~organic~~ indication that experience influences behavior. 2. The coordination of two or more reflexes as new behavior patterns (primary circular reaction). 3. The activation of one circular reaction by virtue of its coordination to another, and no longer only in response to direct stimulation from the outside. Conservatism: The repetition and stabilization of acquired rather than inborn behavior patterns constitutes the advance in conservatism at the second stage, Object: During the first stage, when the child looked for the sake of looking and grasped for the



sake of grasping, these activities remained independent of each other even when they were performed simultaneously. In the second stage, the child begins to grasp for the things he sees and looks at the things he holds in his hand until grasping and looking are coordinated. Sensorimotor theory assumes that the need to both look and grasp arises when either of the acts is stimulated by an external object. The coordination of reflex activities thus gives rise to motor anticipations... Sensorimotor theory assumes that when two or more circular reactions are activated by the same object, and when as a result two behaviors are coordinated, the object is no longer experienced as fully identical with either of the activities which it engenders: the thing grasped and seen at the same time is experienced neither as grasping object alone nor as visual object alone, but as something which has the properties of both 'graspability' and 'visibility.'... During the second stage, externalization is only beginning. The object as a concrete thing remains largely subordinated to the object as the support for activity....

Space, Time, Causality: During the second stage, the concepts of space, time, and causality, like the concept of object, remain essentially subordinated to an action context and 'exist' for the child only as long as he is immediately engaged in activity....

Reproductive Assimilation: Assimilation at the second stage becomes more generalizing and recognitory, but its reproductive aspects retain their fundamentally conservative function of stabilizing those new differentiations and integrations which have been acquired by generalization. Generalizing Assimilation: Generalizing assimilation now has the dual function of (a) incorporating a universe of objects, to which the behavior in question can adapt, and (b) establishing the connections between two or more distinct schemata; this constitutes the basis for schematic integration or the coordination of behavior patterns....

Accommodation: The changes in accommodation during the second stage suggest more clearly than the changes in assimilation how inborn reflex ~~activity~~ patterns are being replaced by learned behavior. The accommodation of the schema to novelties in the environment gives rise to the differentiated behavior patterns, which now include new learned motor components... Intention: Intention comes closer to being acquired by experience is repeated, and (b) one external stimulus leads to the repetition ~~of one or more~~ not only of the reflex motor response with which it has an inborn connection, but also to the repetition of one or more motor acts which have been linked to the directly stimulated reflex by experience..... The goals of intention are no longer set exclusively by inborn predispositions, but also by the organization of past experiences and by the resulting coordination of behavior patterns. Recognitory Assimilation: During the first stage, recognitory assimilation could hardly be considered as a function distinct from reproductive assimilation, since one could infer the recognitions only from observing the full reflex response to the familiar stimulus. During the second stage, repetition and recognition begin to differentiate.... In his observations of the second stage Piaget for first time records affect-expressive movements, and in particular refers to the smile as a preverbal 'indication' of recognition....

Reversibility: The relation of the organism to its environment remains almost ~~it~~ as irreversible as it was during the first stage... the organism remains essentially stimulus-bound in its intellectual functions" (68-74).

The Comparison: While adapting to new and unfamiliar objects, the child acquires behavior patterns which were not given at birth. This change from inborn to acquired behavior forms due to contact with new objects constitutes the first specific influence of environment on the developing mental structure. 1) As the prerequisites of later development, both theories postulate (a) the existence of a favorable environment which will support the most primitive functions, and (b) the infant's innate ability to respond to this environment. 2) Psychoanalysis derives its data from the individual case history, and pays close attention to the effects which variations of inborn equipment and of the environment have on later development; Piaget, concerned with formulating general laws of intellectual development, pays little attention to individual variations and deviations from normal development. 3) Development is essentially the recurrence of disequilibria at successive develop-



mental stages and the correction of these imbalances at more advanced levels. Both theories define this recurrent disequilibrium in terms of a relationship between the motivating force operating at the time and the object which is the goal of motivation. 4) Both theories postulate a relatively loose coordination between the need (motivation) and the need-satisfying object at birth, and assume that the precision of this coordination increases as the motivations differentiate and as the objects needed to maintain equilibrium are experienced more ~~stably~~ discretely. 5) Both theories specify the kind of object which establishes equilibrium (Piaget) or economic equilibrium (psychoanalysis). 6) Neither psychoanalysis nor sensorimotor theory has made a systematic attempt to compare the human with the inanimate ~~factor~~ object as factors in development.

"The discussion of the second stage has focused on the interaction between the organism and objects in the environment, on the transition from an initial stage of adaptedness to a process of adaptation, and on the roles played by the subject on the one hand and the object on the other in structuring the mental apparatus" (80). ~~That author suggests three avenues toward a resolution of the contradictions~~ The author, as he did for the first stage, suggests three avenues toward a resolution of the contradictions which exist between the two approaches in regard to the different ways they define the role of the environment in development.

The Third Stage of Sensorimotor Development

The 'secondary circular reactions' and 'procedures destined to make interesting spectacles last' predominate from the fifth to the eighth month. "While he is practicing and consolidating primary circular reactions, the child inevitably discovers that his action has an influence on external objects, and the focus of his interest shifts to the external effects of the action, with the result that:

1. He appears to search for a particular motor procedure which will repeat the newly discovered spectacle in the environment--i.e., the secondary circular reaction.
2. He generalizes these procedures, once they are stabilized, to all perceived novelties--i.e., the 'magical procedures.'
3. ~~When~~ after having practiced his procedure extensively, he is confronted by a familiar spectacle, the child makes a token gesture which is an abbreviated form ^{of} the earlier procedure." (85-86).

Conservation: As the focus of activity shifts from body action to the effect which this action has on the outside world, the focus of conservation shifts to the coordinations between specific motor acts (procedures) and external events (spectacles) which the child now experiences as being to some degree distinct from his action. Once these conservations are stabilized, the child behaves as if he 'knew' that by applying the procedure he could repeat any novel spectacle which intrudes itself by chance...conservation of the third stage prepares the way for the truly intentional acts of the following stages. **Object:** While using the doll as something to grasp, the child discovers by chance that it is also using something which can be made to swing by striking it. In his effort to conserve the object by grasping, the child has by accident discovered new properties of the object, and now searches for the procedure which will make that new event occur again. Each new property discovered in this way increases the child's awareness of the difference between his action and the result of his action, just as the discovery that an object could be simultaneously grasped, seen, and sucked did during the second stage...object constancy still depends on and is limited by action going on at the moment; when action stops, the object ceases to exist. **Space:** During the earlier stages the child experienced space as the multicolored arena of his own activities; each space was created by action and ceased to exist when the action stopped. As the object acquires a degree of independence, space becomes a relationship between its various displacements. **Causality:** The concept of causality in the third stage goes beyond the vague awareness of effort and efficiency of the earlier stages. When the child notices an interesting spectacle in connection with his activity, and when by repeated trials he discovered a connection between his action and the recurrence of the event, the motor effort as cause and the spectacle as effect differentiate at the same time that action and object differentiate. Effort (cause) now pertains to motor action and is on the way to becoming



internalized, while effect, or the spectacle to be repeated, is becoming externalized. But the 'magical' use of procedures--for example, swinging the arm in order to make a noise recur--indicates how far removed from objectification the concept of causality still is at the third stage....Time: From those observations of the child who hears something interesting, then applies his procedures, and looks to see what has been the effect of his action, Piaget infers that action is now experienced as something temporally distinct from the external result. The child also begins to perceive sequences of events of 'before' and 'after'; and his concept of time is no longer limited to the awareness of duration. Intention: The 'desire to make an interesting spectacle last' implies goal-directedness, while the application of procedures with magical intent to newly discovered spectacles is almost self-initiated activity. Thus, the conditions by which Piaget defines intentional behavior--goal-directedness, self-initiation--are partially fulfilled. However, the goal of action--the spectacle to be repeated--is still determined by fortuitous circumstances, and the intention is only to repeat events as they present themselves to the child while he is active. The intentionality of the third stage therefore stands midway between the simple repetition of 'motor habits' and true means-ends behaviors which give rise to an awareness of direction....Reproductive Assimilation:..remains the function by which the novel, once it has been incorporated by generalizing assimilation, is turned into the familiar, and by which every new coordination between external events and sensorimotor activity is stabilized..

..Generalizing Assimilation: As in the second stage, generalizing assimilation has the dual role of (a) increasing the range of adaptations by the incorporation of all suitable aliment, and (b) integrating differentiated schemata by mutual assimilation and accommodation. The formation of all secondary circular reactions entails the simultaneous use of two or more motor acts, and their coordinated adaptation to one of more specific events in the environment....Recognitory Assimilation: The recognitions of the third stage represent a transitional step in the transformation of motor activity into thought; they illustrate how a concrete and observable sensorimotor act directed toward an object is on the way to becoming internalized as a thought about that same object. In this transitional phase the residues of the motor act can still be observed, while the thought pattern which will replace them must be inferred...Accommodation:..takes on a new function in the third stage when it motivates the child to conserve an aspect of the environment as something distinct from action--when, in other words, accommodation leads the child to 'change himself' in order to keep the environment constant, instead of inducing him to use whatever objects are available in order to support his own activity. This shift implies the beginning of a differentiation of assimilation and accommodation as distinct functions, a differentiation which will become more pronounced in the fifth stage...Reversibility: The differentiation of assimilation and accommodation implies an increased reversibility of intellectual functions.

The Comparison: The child no longer depends exclusively on direct stimulation to guide his actions. Instead he has at his disposal the precipitates of past experience as motor means of influencing his environment. Motor activity for its own sake has been replaced by motor action directed toward concrete goals in the environment. 1) Both psychoanalysis and Piaget's theory consider that motor activity is essential for differentiating the inner and outer worlds. 2) Psychoanalytic theory considers the capacity to differentiate inner and outer worlds, and the transformation of autoplasmic into alloplastic motor activity, to be two separate processes, while sensorimotor theory subsumes them both under a single process--namely, the differentiation of action and object. 3) Although both theories distinguish diffuse motor activity from goal-directed action, only psychoanalysis has specified how these two aspects of motor function differ. 4) In both theories, affect refers to a state of internal disequilibrium. Psychoanalysis has formulated a theory of affect which is distinct from its theory of thought development, while sensorimotor theory considers the development of affectivity and of intelligence as two aspects of the same process. (See David Rapaport, On the theory psycho-
~~and the theory of affectivity and intelligence. Pp. 127-140. In "Psychoanalysis, psychiatry, and psychology"~~



analytic theory of affects. In "Psychoanalytic psychiatry and psychology" ed. by R. P. Knight and C. R. Friedman. New York: International Univ. Press, 1954, pp. 274-310). 5) Both theories assume that when the child first begins to differentiate the inner and outer worlds, he still experiences the environment as an extension of himself and as conforming to his needs and desires. 6) Both theories assume that the repetition of intentional motor acts first results in their automatization, and then transforms the automatized actions into abbreviated or skeletonized residues (formular abbreviations) of their original form.

"Piaget has formulated the development of intelligence as a unitary process pertaining to all aspects of mental development including sensorimotor intelligence, perception, cognition, and affectivity. All of mental development starts with motor activity, all motor activity is intentional and object-directed, and the end result of all motor activity is the elaboration of stable mental processes (schemata) which are the basis of intelligent thought. In contrast, psychoanalytic theory distinguishes instinctual-drive executive action from diffuse vasomotor and motor activity (affect) and ideation, and considers them as three distinct, although highly interrelated, aspects of mental development converging on the single goal of holding instinctual-drive tension below threshold levels. In psychoanalytic theory, the elaboration of mental structures leading to the formation of intelligence is only one, although a significant, result of motor activity, and one important means of achieving the general economic goal of drive-tension reduction. But in this theory, the concept of structures pertains not only to the development of intelligence but also to the elaboration of defenses against direct instinctual discharge (executive action), and against massive affect discharges. The elaboration of defenses in turn results in unconscious feelings and derivative modes of affect discharge" (100). The two theories assign different roles to motor activity as a developmental factor...the discussion of the third stage was focused, though, in particular on the relationship of intentional action, diffuse motility, and affect. Again there were demonstrated certain contradictions, and again the author suggests three alternative solutions..

The Fourth Stage of Sensorimotor Development

This period characterized by 'coordination of secondary schemata and their application to new situations' extends from about the eight to the twelfth month. The child now acts not only to influence external events by magical procedures, but modifies his procedure in such a way as to achieve a specific result. The characteristic advances of the fourth stage are: 1. The acquisition of new motor procedures developed while the child pursues a familiar goal in unfamiliar circumstances. 2. The capacity for delay between the initial perception of the goal and the final action. 3. The use of detours as means toward an intended goal.

Conservation: During the fourth stage, the child persists in his effort to reach the doll, even while he is acting on an intermediate obstacle. The need to function includes a desire to achieve the familiar goal in unfamiliar circumstances, and to undertake intermediate or means actions for this purpose. From such persistent efforts Piaget infers that the child now attributes permanence to objects even when he is not acting on them and that this belief in object permanence sustains his original intention in spite of the intervening action which in earlier stages would have distracted him from his original intention...Conservation is now accomplished by the active regrouping of already available schemata to correspond with the experienced reality, rather than the coordination of sensorimotor actions with one of more objects or object stimulations. Object: In earlier stages, the child abandoned his search either when the object disappeared from his sphere of action (Stages 1 and 2), or when the object disappeared before he had begun to act on it (Stage 3). In the fourth stage, the child will initiate a search for the object even if it disappears before he has started an accommodative response. Space: At the same time as the object becomes independent from immediate action, the child's concept of space begins to involve a set of spatial displacements which are to some extent independent of his ongoing action. Until now, space 'existed' for the



child because he was actively constructing an area for his activities...In the fourth stage, space becomes a set of spatial relations which persist after the action on the object has stopped...At the fourth stage, the concept of space, like that of object permanence, still depends on previous experiences. The child searches only at the place where he last was successful in recovering the object, and not where he last saw it before it disappeared. Spatial relationships thus retain some of their dependence on activity, although this dependence now refers to past sensori-motor acts organized into anticipatory motor patterns. Causality: At the fourth stage, causality becomes a relationship between actions as causes and displacements as results...the child still appears to consider his active participation..a necessary part of the cause-and-effect sequence, and his behavior therefore suggests that there is still a residue of the magical phenomenalism which was characteristic of the third stage: he cannot yet conceive of causes which work totally independent on his intervention. Time: The child appears to use the objective temporal relationship of before and after when he removes the pillow before grasping the toy, and when he grasps the doll after the pillow is out of the way..The child conceives of temporal relationships only between objects on which he is now acting or has recently acted in the past. Intention: The use of one action as a means and another action as the goal results in behavior which is 'truly' intentional because it implies (a) self-initiated action, and (b) awareness of the direction of action...Reproductive Assimilation: Even in the complex behaviors of the fourth stage, reproductive assimilation remains crucial in setting up a controlling goal schema which will subsume all intermediate assimilations and accommodations..Recognitory Assimilation: When the child encounters the pillow by chance while reaching for the goal, he responds to the pillow with a motor anticipation of striking. The pillow is recognized as something to be displaced by striking as soon as it is encountered..The significant difference between this and earlier recognitory assimilations is that the child now assimilates the pillow to a motor anticipatory pattern while his intention to achieve the initial goal is sustained...Generalizing assimilation: By recognitory assimilation, the pillow is incorporated into the striking schema, but by generalizing assimilation the pillow with the striking procedure pertaining to it is also incorporated into the controlling grasping schema, not simply as something to be grasped, but as something which is perceived as lying spatially in front of and temporally before the desired goal...The schemata in question are integrated to each other in such a way as to correspond to actual geometric and causal relations pertaining to the desired object and the obstacle in the way to the goal..Accommodation: The significant change of the fourth stage, which further differentiates the functions of assimilation and accommodation from each other, is the search for a combination of schemata which will have the desired effect in reality..Accommodation in the fourth stage is this search for a suitable combination of already acquired means and ends which will correspond to the prevailing reality conditions...Reversibility: The increased capacity of motor anticipation patterns to conserve the object as independent of ongoing action, which is defined by Piaget as the 'mobility' of the schemata referring to these motor anticipations, is the major step toward greater reversibility of mental functions in the fourth stage. Mobility implies that a schema (referring to a particular act or procedure) has been divested of its specific stimulus-object connection and can now enter into adaptive behaviors as a stable tool of intelligence in many combinations, either as a means or as an end...In addition, the mobile schemata further liberate behavior from its original stimulus-response ties...The roots of the mobile schemata can be traced to the magical procedures of the third stage as these were applied ~~by~~ by generalization to multiple contexts; by the differentiation of action from objects, the magical procedures have been freed from their specific contexts (to make spectacles last) to become generic tools at the child's disposal either as means or ends.

The comparison: When the child intends a goal which he cannot reach immediately by simply repeating one of his actions, he can now delay immediate but ineffective activity and during this delay discover among his anticipation patterns the one which will be an effective detour toward the desired goal. 1) Both theories postulate that an awareness of the direction of action is crucial for reality-adaptive behavior



and that it prepares the way for later intelligent thought. 2) ~~Both~~ In both theories the development of adaptive mental functions involves the replacement of primitive modes of thinking by a more objective appraisal of reality. 3) Sensorimotor theory has stressed the potentially adaptive aspects of primitive mental functioning, while psychoanalysis has considered primarily the drive-discharge potentials of primary-process activity. 4) Both theories consider the capacity for delay of immediate action (sensorimotor theory) or direct drive discharge (psychoanalysis) to be essential for reality-adaptive mental functioning. 5) Delay mechanisms become adaptive only when they are coordinated with detour mechanisms. 6) The elaboration of mental structures which have become independent of their original stimulus-response dependence is essential for delay and detour behavior. 7) Both theories assume that the differentiation and integration of inborn mental structures is essential for the transition from action-centered (autoplastic) to object-centered (alloplastic) activity. The emergence of truly 'intelligent' adaptations in the fourth stage may be compared with the time when the reality principle takes ascendancy over the pleasure principle.

"Sensorimotor theory has focused primarily on the formation, modification, and integration of structures, and has shown how the mental structures acquired during a particular stage prepare the way for more highly differentiated and efficient adaptations later. Since the need to function is its sole motivation concept, sensorimotor theory has not described the formation of structures for the control over organic needs (the instinctual-drive control structures of psychoanalysis). Psychoanalysis, on the other hand, has dealt extensively with the processes by which an organism gains increasing control over immediate discharge by the most direct route, but the theory has not formulated in detail the mechanisms by which a function is transformed into a structure (automatization), by which structures are integrated into more flexible and adaptive combinations, etc. Where sensorimotor theory postulates a reality-adaptive basis for all mental activity, classic psychoanalysis has conceived of reality-adaptive thought as arising exclusively out of the struggle between the tendency toward drive discharge and the prevailing reality conditions conflicting with this tendency. Psychoanalytic ego psychology, however, has refined this conception by assuming that there is an innate tendency toward reality adaptation which is given by the apparatuses of primary autonomy" (120). A contradiction is shown to exist between the two theories regarding the origin of reality-adaptive behavior and the author again suggests three possible avenues toward a solution of the contradiction. (pp. 120-123).

The Fifth Stage of Sensorimotor Development

The period of 'tertiary circular reactions' and the 'invention of new means through active experimentation' extends from the twelfth to the sixteenth month of life. The significant achievement of the fourth stage was the combination of two or more familiar behavior patterns into new means-ends relationships. This permitted the child to achieve a familiar goal in strange circumstances and implied the liberation of sensorimotor patterns from the stimulus-boundness, so that they entered into new combinations which the child discovered by his own mental activity. The fifth stage represents a further and more significant step in making the sensorimotor schema flexible and reversible: the child 'experiments in order to see' and by this method he 'invents new procedures' which will achieve a novel result in the environment; the child also searches for and acquires new means of achieving a familiar goal when the methods of the fourth stage are no longer adequate. The changes in behavior which characterize the shift from the fourth to the fifth stage are: 1. The systematic variation of a procedure in the wake of its chance discovery--the ensemble of experimental variations on a procedure constitutes the tertiary circular reaction. 2. The intentional search for and invention of new procedures as means toward a fixed goal; this constitutes the application of the tertiary circular reaction as a method of reaching a goal determined by the circumstances in reality.

Conservation: Until the fifth stage, conservation as a tendency always referred to the mental processes by which some aspect of the environment was rendered constant in a concrete sense by motor action; as an accomplished fact conservation referred



to the acquisition of motor anticipations standing for learned coordinations between organism and environment..During the fifth stage, the child actually explores the properties of objects and behaves as if he believed that his environment remained substantially constant regardless of his motor action; but since he does not know its details, he applies his action as a tool for exploring these details rather than as a means of keeping the environment permanent. The self-initiated exploration is made possible by the full differentiation of the object from the context of the action in which it is concentrated. The concept of conservation takes on a new meaning when the perceptual cue of an object establishes that object as a certainty for the child, and when he is free to employ actions as tools directed at an 'already stable' environment...Object: During the fifth stage, the child is principally engaged in the exploration of the object and its properties. The effort to discover the unknown by accommodating the action and then studying the changes produced implies that the object has been fully divested of its action context and now has an independent existence, while the action has become the means of studying the object...Space: During the fifth stage, the child explores displacements of objects for their own sake..Space, however, does not become fully objectified in the fifth stage, since the child cannot yet imagine displacements of an object: he cannot conceive how an object might be moved from one spot to another and then be returned to its point of departure, unless he actually performs or sees the action...Space has not yet been internalized in the mental processes as a representational medium in which imagined objects may be moved in thought. Causality: An increased awareness of external centers of causes parallels the advances in object performance and homogeneity in space, and further reduces the child's belief in the magical powers of his actions. On the one hand it leads him to adjust his own action to fit in with external causes, and on the other hand it makes him aware of himself (rather than of his action) as one center of forces among many...Time: As cause and effect become the objective relations between action and object, the child becomes aware of the time sequences involved in objective displacements...Time, like other categories of thought, is freed from its action context, and now pertains to objective sequences of displacement perceived independent of motor participation..Intention: Whereas until now intention directed activity toward the repetition of already experienced events, from the fifth stage on activity is directed toward the future and the unknown. ..In the observations of goal-directed behaviors which utilize the method of tertiary circular reaction, the intention is still determined by the outside, but apparently the child's belief in the permanence of his environment is now sufficient for him to intend to discover new ways of achieving his goal, and this intention sustains his concerted effort through a long process of trial and error. Assimilation: With the progressive differentiation of accommodation from assimilation and with the replacement of motor action by mental activity, the individual steps of assimilation, which has observable referents in previous stages, can no longer be clearly distinguished. The combination of the various types of assimilation will now vary according to the kind of activity the child intends to carry out--i.e., whether he explores for the sake of exploration, or tries to find a new means of achieving a predetermined goal.. ..Accommodation: The intention to explore is made possible by the differentiation of accommodation from assimilation. At this stage it is the child's own intention (i.e., accommodation to unknown novelties) which creates a disequilibrium, and no longer the assimilation of a perceived novelty to a stable schema...Reversibility: By the end of the fifth stage, the behavior sequences, at least the steps between the first assimilation and the final action, are controlled by the spontaneous and self-corrective restructuring of mental anticipation patterns. The child behaves according to a pattern for which no specific directing tendencies are given by the organization of past experiences; he gropes and finds new procedures not by adapting to the immediately perceived ~~unknown~~ situation, as he did during the fourth stage, but by altering the situation in his mind and then translating the change into a new action. Each new variation of procedure now comes about because the child has 'worked it out in thought' before applying it. During the fifth stage the mental reconstruction of reality still proceeds in fragmentary steps, and each step must be reconfirmed by a concrete perception of the change in reality which has been effected before the next variation can be 'thought through.' The new procedures are therefore discovered by trial and error rather than by sudden intervention.



The Comparison: During the fifth stage, the child enters a phase of autonomy and spontaneity in relation to his physical environment: he initiates novelties rather than merely repeating what the environment offers him; he intentionally searches for new procedures and thereby discovers new means of achieving a familiar goal.

1) Both theories describe a specific period in development when the child becomes aware of his autonomy from the environment, and at the same time becomes aware of the limitations which reality imposes on the power of his mental and motor activity.

2) From the point of view of mental mechanisms, a sense of personal autonomy depends on automatized mental processes (mobile schemata or autonomous ego apparatuses) which will remain stable from moment to moment regardless of the context in which they are used. 3) From the point of view of behavior, an awareness of personal autonomy depends on a belief in the permanence of the external world. 4) Both theories assume that a belief in the constancy of the environment and therefore a sense of personal autonomy prepare the child to explore those aspects of reality which are still unknown to him. 5) From their respective data, both theories conclude that the child has great difficulty in overcoming a belief in the magical power of his activity and in accepting an objective estimate of his own causal powers and the forces outside of him. 6) Furthermore, both theories assume generally that the subject may revert to earlier forms of adaptation when he encounters situations which he cannot master. 7) Both theories assume that regression is not necessarily maladaptive but may also be an adaptive response to unfamiliar situations and may result in more highly differentiated behavior patterns. ("The concept of 'regression in the service of the ego' was formulated by Kris (1950, Psychoanalyt. Quart., 19:540-560. "On preconscious mental processes"--also included in his book of "Psychoanalytic explorations in art"--as I recall, however, it was not in this article that Kris actually used the term "regression in the service of the ego" but in another article found earlier in the book)) to indicate that a productive or creative thought depends not only on the most highly differentiated and reality-bound ego functions, but also on the capacity temporarily to abandon the ties to reality, and to resort to more primitive forms of (primary process) functioning. The ego 'allows' a temporary topographic regression to more archaic mental mechanisms, and the ideations resulting from such regression are integrated with the more highly differentiated thought processes during an 'elaborative' phase to give rise to creative productions. Without such a regression the reality-determined secondary processes could not avail themselves of 'intuitions,' 'imagination,' etc., to go beyond the objective relationships in reality which are available to perception and rational thought. Rapaport ((The theory of ego autonomy: a generalization. Bull. Menninger Clinic, 22: 13-25)) has extended the concept of regression in the service of the ego to apply to all of the ego's functions. Autonomy of the ego implies on the one hand the freedom of mental functions from the instinctual drives so that they can be applied to the exploration of external reality, and on the other hand the freedom of mental functions from external reality so that they can be applied to the exploration of 'internal reality' or the relation of inner forces to external objects in the service of instinctual-drive gratification.)

~~The comparison of sensorimotor theory and psychoanalysis relative to Piaget's fifth stage has described how the child acquires a sense of personal autonomy, how his new awareness motivates him to explore the environment, and how this advance in development may predispose him to regress to more primitive modes of behavior when he is confronted with unfamiliar situations. The purpose of the comparison was to demonstrate that both theories consider the automatization and autonomy of mental processes a prerequisite for the development of a sense of autonomy, but that they differ concerning the forces from which the child must become free in order to achieve autonomy and acquire the awareness of personal autonomy. It appeared that the two conceptions of autonomy are not necessarily contradictory, but that they represent sufficiently divergent formulations to suggest at least three alternative ways of combining their findings with respect to this advance in development" (141-143).~~

The Sixth Stage of Sensorimotor Development

The period of 'invention of new means through mental combinations' begins at



sixteen months and completes the phase of sensorimotor development. "During the final stage of sensorimotor development, the trial-and-error methods of the fifth stage are replaced by 'true inventions,' which come about by the spontaneous restructuring and differentiation of familiar schemata and the elaboration of new anticipatory thought patterns prior to any interaction with actual objects. The crucial advances which bring the development of sensorimotor intelligence to a close and prepare the way for the phase of 'concrete mental operations' are: 1. The conservation of the object, its displacements, and the temporal and cause-effect relationships pertaining to it even when the object cannot be directly perceived (the mental representations.) 2. The mental anticipation of new ways of interacting with objects before these interactions have been experienced (the mental inventions.)" (148-149).

Conservation: When the narrow opening of a box prevents the child from getting the chain, or when an invisible obstacle prevents him from opening the door, this failure itself creates a need to discover new means of achieving the desired goal, as in the fifth stage. But in contrast to the previous stage, mental invention has replaced empirical trial-and-error groping as the method for discovering these new adaptive means toward the goal...During the sixth stage the child conserves the object, its spatial, temporal, and causal properties, even when he cannot see them, and substitutes for his perception a mental representation which includes the object not only as it is perceived, but also as it might appear if it were subjected to various displacements...The conservations of the sixth stage remain sufficiently unstable, however, so that the mental representations last only for a short period of time.. Object: ~~Object~~ In the sixth stage, the child persists in his search for the hidden object even when some of its serial displacements are hidden from his view or when he momentarily turns his back on the object while taking a detour to recover it. It is assumed that the object is now conserved independent of perceptual contact, because there exists a ~~new~~ mental representation of it which can guide the child in his sustained intention to reach the goal and his search for detours...Space: The concept of space advances during the sixth stage to the point that when confronted by an object, the child can imagine moving it through a series of displacements and bringing it back in thought to its point of departure. The imagined manipulations of objects or mental inventions constitute the 'representational groups of displacement,' which ~~will~~ foreshadow the logical operations of reversibility that will arise at later stages of development...Causality: Toward the end of the sixth stage the concept of causality has been differentiated into personal causes (psychological causality), which are the objectified residues of magical phenomenalism, and physical causes, which are the results of objectifying the external world and of attributing causal as well as spatial and substantial properties to it. Especially by imitating other people and studying the effects of his own body movements (changes in perspective), the child becomes aware of himself in relation to other objects and acquires a sense of the reciprocal interactions which operate between himself and outside causal forces..Time: The conception of time has progressed over the six stages from a subjective awareness of duration to an apprehension of objective relations between before and after.. Intention: Throughout sensorimotor development, and even in the sixth stage, the child intends to act only when the environment presents him with a concrete and desirable novelty. Since he does not set problems for himself simply for the sake of solving them, intention is always directed toward the immediate present. Nevertheless, as spontaneous mental activity replaces motor action during the sixth stage, the choice of the goal, together with the intention that integrates all intermediate steps, will go beyond what the child can directly perceive. Intention now involves assimilating a concrete fact to a flexible system of mobile schemata and spontaneously restructuring the perceived reality in order to devise new means by mental inventions for achieving the intended goal...Assimilation: During the ~~final~~ ^{last} stage of sensorimotor development, motor action has been successfully internalized as mental activity; the behavioral referents of assimilation and accommodation can still be observed in the initial effort to seize the goal and in the final consummatory act, but all the intermediate ~~steps~~ are inferred by a reconstruction from earlier stages. Reproductive Assimilation: Thus it must be assumed that reproductive assimilation contributes to adaptive behavior by providing a control schema under which all



intermediate steps will be assumed. Assimilation sets the stage and gives direction to intention; it contributes further by stabilizing any newly formed schema by repetition; and, finally, as cumulative assimilation, it immediately groups the separate mental trials under a 'method schema' as in the fifth stage, except that the separate trials are now performed in thought rather than in action. Generalizing Assimilation: The work of generalization still combines separate schemata with each other to make possible their differentiation and integration, and as the result of generalizing assimilation any given schema is applied to a universe of new elements, whether these are now actual objects and events or their mental representations. What was formerly a gradual coordination of behavior patterns by sensorimotor interaction now takes place as the spontaneous mental restructuring and integration of two or more anticipation patterns, still under the influence of generalizing assimilation and accommodation... Finally, generalizing assimilation of the sixth stage implies that all mobile schemata of a means or of an auxiliary capacity may be drawn into the central goal-directed action to elaborate new approaches, new detours and reversals spontaneously. The result of such generalization is the reciprocal integration of thought patterns.... Recognitory Assimilation: With the advent of mental inventions and representations, the child begins to recognize in a situation not only the directly perceived circumstances, but also a variety of possible variations 'if he were to act in this or that way.' The perception of the actual situation activates a series of mental anticipation patterns (by recognitory assimilation) which can then be linked as means to ends before they are tried out in reality. By inventing displacements and transformations of objects, the child also imagines new situations which by further recognitory assimilation activate other mobile and auxiliary schemata specific to these transformations... Finally, new behavior patterns appear suddenly without any observable preparation; the child seems to recognize immediately the action possibilities of an object which go beyond his direct experience. Accommodation: The influence of accommodation must be inferred from the difference between the initial failure to reach the goal and the final successful adaptive consummatory action, because no intermediate steps provide direct behavioral evidence of the work of accommodation... Only a few residual ~~motor~~ ~~behavior~~ patterns (such as opening the mouth while searching for a means of opening the box) still attest to the fact that it is the motor groping of the fifth stage which has become the mental invention of the sixth. Reversibility: Intelligent adaptations become more reversible during the sixth stage because: 1. The child can think about an action before carrying it out. 2. He can temporarily conserve a sector of the external world when he has no perceptual contact with it. 3. He can manipulate the objects he perceives by thinking about conserved objects, and can thereby conceive of the environment otherwise than as he directly perceives it... Piaget defines the capacity to think out actions before executing them as mental inventions; and the capacity to imagine the environment as it is or would be if altered in this or that way, without perceptual clues, as representation. Invention and representation arise in the sixth stage, but they have been foreshadowed by the developmental events of all previous stages...

The Comparison: In the sixth stage of sensorimotor development, mental inventions and representations complement concrete action as the means of adapting the mental processes to reality. The child 'thinks out' his actions fully before executing them, and represents the results of his action to himself before he perceives them. The translation of action into thought introduces a new developmental phase in which the child temporarily abandons contact with concrete objects, mentally experiments with various possible actions, and then translates a suitable and adaptive solution back into executive action. 1) The two theories derive the origins of reality-adaptive thought from different genetic sources. 2) Reality-adaptive thought is essentially an experimental and economical form of action which mediates between the perception of a need and the need-satisfying executive action. 3) In keeping with their motivation concepts, the two theories assign different specific functions to mental activity (thought). 4) Extensive further differentiations and integrations of the mental mechanisms must take place before they can be used as the rational thought patterns of mature intelligence. 5) Both theories stress the role of



social factors in adapting thought to reality, but only Erikson has systematically studied this role during the preverbal period of development.

"We have compared how the two theories regard the formation and function of thought processes. The comparison was intended to show that in sensorimotor theory all earlier schematic differentiations and integrations culminate in the most flexible and therefore the most stable means of adaptation, which are the thought processes. The comparison was intended to show that classic psychoanalytic theory considered all mental activity as essentially a form of wish fulfillment, whether as ideations obeying the pleasure principle or as secondary-process thought obeying the reality principle. Psychoanalytic ego psychology has, ~~however~~ however, arrived at conclusions which reconcile some of the contradictions in these two theories by postulating, in addition to wish fulfillments of instinctual drives, primary autonomous apparatuses and a realistic organization of experiences which their activity imposes on the mental functions" (165). The author then presents three alternative ways in which we could consider the role of thought in development. In brief:

- "1. Adopting the frame of reference of classic psychoanalytic theory, it could be assumed that the essential function of thought is to discharge instinctual-drive tensions: in early development it discharges mobile cathexes by hallucinatory ideation; and later in development, using bound cathexes for experimental action in thought, it mediates between the instinctual needs and effective drive-executive action on the object in reality. In such a conception thought serves ~~the~~ reality principle only after repeated experiences with successful and unsuccessful discharge of inner tension have imposed a secondary organization on the mental processes which supercedes the initial drive organization...Piaget's findings would describe the mechanisms by which primary-process ideations are reorganized according to reality considerations, and by which secondary-process thought functions to some extent independent of the environment while maintaining an internal representation ~~it~~ of it...2. Adopting the frame of reference of sensorimotor theory, it could be assumed that awareness of intention is the precursor of thought, that thought is the activation of stabilized and flexible mental structures in response to actual (and later invented) novelties, and that ~~the~~ function of thought is to adapt the existing inner representation of the world to all perceivable and conceivable reality relationships. In this conception, every advance in development from the earliest motor anticipations to the acquisition of concrete mental operations constitutes a more efficient way of maintaining the external world constant by substituting thought for action and representations for concrete objects. In such a conception the psychoanalytic constructions of early mental life would be interpreted as the vague 'awareness' of a relation between organic need and action on the specific objects which can satisfy that need....3. We could also adopt the frame of reference of psychoanalytic ego psychology and assume that realistic thought is derived from both hallucinatory ideations and the integration of differentiated sensorimotor schemata...." (165-167).

Conclusions

"Wherever structure formation was discussed, Piaget's observations and formulations were almost directly applicable to the psychoanalytic theory of development. This convergence was ~~the~~ particularly evident with respect to the ego-psychological extensions of psychoanalytic theory; there it seemed that the sensorimotor schemata and their mode of functioning (assimilation and accommodation) might serve as a model for all the ego's autonomous functions.....the findings of sensorimotor theory seemed to describe mechanisms which might well play a role in the elaboration of defenses and other control structures, in their integration into the totality of ego functions, and in the reorganization of primary-process mechanisms according to reality relationships..But when it came to a consideration of drive-determined and affective behavior, frustration and the precursors of social interaction, pertinent observations from sensorimotor theory were not available for comparison with psychoanalytic theory,....The integration of the sensorimotor and psychoanalytic theories of early development did not include drive-determined and affective behavior, partly because Piaget was not interested in these aspects of development.



He did not study them because he assumed that they have no bearing on the child's permanent assessment of and internal representation of the external world, although he did observe that momentary fluctuations in the organism's state temporarily impair or improve its adaptive performance.... Thus Piaget eliminated from his observations the 'state of the organism' as a variable. From its clinical investigations of older children and disturbed adults, psychoanalytic theory has, however, concluded that instinctual-drive tensions are not simply interferences with adaptation; that far beyond the reflex stage of development, they play a significant role in the construction of stable adaptive mechanisms. Not only does the theory assume that internal forces in conjunction with reality experiences shape the defense mechanisms, but that these forces are potent factors in the organization of reality experiences and have a long-range influence in all of the child's action and thought patterns" (169-171). The author makes three basic assumptions in conclusion concerning the relation between the organism and its environment. These assumptions are drawn from the formulations of both the psychoanalytic and sensorimotor theories, and are intended as a bridge between the concepts of motivation of these two theories.

1. All behavior at all stages of development is codetermined by two kinds of motivation--the 'long-range' and 'short-range' forces. The 'long-range' forces correspond to the instinctual drives of psychoanalysis or the organic needs of sensorimotor theory. They arise from physiological imbalances and have an inborn coordination to specific objects in the environment which alone can correct the somatic imbalance. The 'short-range' forces correspond to a need to function of ego interests. They arise from the disequilibria of adaptive mental structures, are unrelated to the body's organic state but very much related to the adaptive interaction between the individual and reality....

2. There are inborn and partially differentiated behavior patterns which may be activated by either long-range or short-range forces or both. Some structures are inherently connected with long-range motivations. These include the drive-executive apparatuses, threshold structures as precursors of defenses, and affect-discharge channels. Other structures are inherently connected with short-range motivations. These include reflex circular reactions and primary autonomous apparatuses. A third group of inborn structures may be activated by either short-range or long-range forces depending on the balance between internal and external conditions... In 'normal' circumstances, all inborn structures can function and develop from birth on, although proficiency may vary from child to child. Pathological variations in the structures may seriously affect the course of development....

3. Finally, there is an average expectable environment populated with human beings and inanimate objects. The inanimate objects function primarily as 'stimulus nutriment' (aliment) for reality-adaptive structures and differentiate these according to objective physical laws, but selected objects may also become partial or substitute instinctual-drive objects, depending on the child's experiences during periods of internal tension. Human beings act as autonomous causal agents who respond selectively to the child's expressions of need; in addition, they have all the attributes of inanimate objects.....