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A COMPARATIVE STUDY IN THE DEVELOPMENT
OF THE SENSORI-MOTOR INTELLIGENCE
ACCORDING TO
JEAN PIAGET AND ARNOLD GESELL

A Thesis
Presented to
the Faculty of the Graduate
School of the University of
Omaha

In Partial Fulfillment
of the Requirements for the Degree
of MASTER OF ARTS in the Department
of Psychology

Henri R. Ouellet

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I N T R O D U C T I O N

The discovery of a proper topic for a thesis, as well as the organization of the material to be studied may be born of either a sudden insight into a problem left unsolved until now, or may grow from a long familiarity with scientific facts, with the result that relationships and comparisons gradually emerge and impose themselves as a distinct object of investigation.

The thesis we now submit, as a partial fulfillment for the Master's degree in psychology, is the fruit of both causes mentioned above and of a little more.

All through our years of teaching in the field of "pure" philosophy, and particularly in the area known as "Rational Psychology" we have been preoccupied with the problem of the psychology of Intelligence. The obvious clear-cut difference between the function of intelligence considered in its state of maturity in the adult on the one hand, and the mystery

surrounding the development of that same function on the other hand, led us to believe it necessary for us to investigate this problem beyond the answer of perennial philosophy.

It is with that in mind that we undertook studies in experimental psychology, with particular interest in the field of theoretical problems and child development.

We realized soon that one of the most fruitful alleys of exploration lay in the "developmental approach" to the study of Intelligence. Consequently we found it most rewarding to leave the ivory tower and start to wrestle with the facts, mainly those provided to us by two keen and conscientious observers, Dr. Arnold Gesell and Professor Jean Piaget, who have spent a life-time studying the child's development. Gesell's work THE FIRST FIVE YEARS OF LIFE served as an introduction and made available to us a wealth of precise and clearly recorded patterns of development in

in which we were able to recognize the gradual unfolding of the function called intelligence. Concomitantly we had become interested in the works of Jean Piaget from the Universities of Geneva and Paris. And when in 1954, a Fulbright Fellowship provided us with the opportunity of studying under him at the University of Paris we were only too glad to devote our time to the understanding of his findings and the conclusions he offered.

It is then that the project of the thesis we now offer came vaguely into our mind: a comparative study of the findings concerning the development of the sensori-motor intelligence, as viewed by two authorities who did their research thousands of miles apart. Two years of teaching helped us to bring into focus such an evaluation. Thus this thesis is the result of an insight as well as the outcome of a growing familiarity with the material involved.

Jean Piaget¹ became interested in Child Psychology in 1923 when he published his now famous study of LANGUAGE AND THOUGHT followed by JUDGEMENT AND REASONING IN CHILDREN, (1927).

The startling conclusions he achieved, especially the one about the much discussed "egocentric mentality" of the child led him to further investigations in the phases of child's development. Thus the studies about THE CHILD'S CONCEPTION OF THE WORLD, (1929) and THE MORAL JUDGEMENT OF THE CHILD, (1932).

At this point Piaget realized that continuity being required he had to undertake again his studies of the child's mental development - this time from the moment of birth. Whatever he might find would either prove or disprove what he thought to be pertinent facts set in the previous monographies.

To this we owe the trilogy of THE ORIGINS OF INTELLIGENCE

¹Born in Neuenberg, Switzerland, August 9, 1896, Piaget did special work in the zoology of molluscs. At 15 years old he published his study on the molluscs of Neuchatel, Jura. His Doctorate thesis, written when he was 21 years of age, was concerned with the different varieties of molluscs in the Valaisian Alps.

IN CHILDREN (1948), THE CONSTRUCTION OF REALITY IN CHILDREN (1950) and THE FORMATION OF SYMBOLS IN CHILDREN (1945).

With these studies was then completed the history of the evolution of the child's mind from the moment of birth to later years.¹ The observations described and analyzed in these three works were made by Piaget upon his own children Jacqueline, Lucienne and Laurent. With the facts provided by his years of observation Professor Piaget was thus able to consolidate his original positions, and even reinforce them.

Dr. Arnold Gesell, on the other hand, made his observations at the famous Yale Clinic of Child Development and was involved with a somewhat larger number of subjects who were followed through the years with all the possible means of observation.

¹ Separate monographies were devoted to the study of the formation of the notion of Number (1940), Quantity (1941) Time (1946) Speed and Motion (1946) with a synthesis in the PSYCHOLOGY OF INTELLIGENCE (1957)

Several collaborators, particularly Dr. Frances L. Ilg, and Dr. Louise Ames helped Dr. Gesell in the accumulation and presentation of his findings. This is already in striking contrast with Piaget who was alone in writing the trilogy mentioned above.¹ This of course does not change in any way the value we attach to Piaget's studies; but he is often criticized because of the smaller number of subjects involved compared with those of Gesell.

However we cannot pass under silence that the method of study of Piaget, and particularly the small number of subjects he usually dealt with had led to great controversies about his point of view in this country. Although the Swiss psychologist was very careful to expose clearly his method of observation and investigation a debate raged for

¹ The other monographies of Piaget devoted to Language, Space, Time, Quantity, etc., were the result of team work, including the collaboration of A. Szeminska, B. Inhelder, V. Piaget and others.

a while around his notion of "egocentricity."¹ It may be for this reason that his more recent studies about THE ORIGINS OF INTELLIGENCE IN CHILDREN were not widely publicized in America, at least if one is to judge by bibliographical references in current books dealing with child development.

As we proceeded in our teaching we became more and more aware of the importance of a comparative study between Gesell and Piaget, and the benefit which could be derived for specialists in the field, in terms of establishing some basic facts concerning the early years of the development of the child.

Within the limits of this thesis we shall concern ourselves with the first two years of development. We conceive the organization of the thesis in two parts: first, an

¹The efforts to duplicate his studies, and the whole debate about "egocentricity" are well analyzed and evaluated in CARMICHAEL, MANUAL OF CHILD PSYCHOLOGY, Second Edition, Wiley, 1954, p. 562-570.

analysis of the basic concepts of both authors to provide the stage setting for the exposition of their findings; then a cross-reference chart, self-explanatory in nature, and tending to correlate and mark out the various stages of development isolated as primary features by Professor Piaget and Dr. Gesell.

At the closing we offer an evaluation of points of similitudes and differences between the two authors and finally a brief speculation about the nature of intelligence in the light of these findings.

F I R S T P A R T

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CHAPTER I

DR. GESELL'S BASIC CONCEPTS UNDERLYING THE UNDERSTANDING OF DEVELOPMENT OF SENSORI-MOTOR INTELLIGENCE

I. THE CONCEPT OF GROWTH

Our species has had a venerable history. It has taken Nature a billion years to fashion the structure and the potentialities of the human infant. Each newborn baby is a focal end product of evolution. His heritage is so vast that it takes him a score of years to achieve a measure of psychological maturity. How can we possibly understand him as an individual or as a representative of the species without examining the growth process whereby he attains maturity?

Birth marks the arrival but not the true commencement of an individual. The life career of the individual begins with the conception when the genes of father and mother unite and initiate a cycle of growth. A minute globule of protoplasm becomes an embryo, the embryo becomes a fetus, the fetus an infant, the infant a child, the child a youth, the youth an adult, the adult a parent. With parenthood another cycle of growth is liberated.

The genes initiate the mental as well as the physical products of growth. From the earliest stage the child develops as a unit. He comes by his mind the same way as he comes by his body, namely through the organizing process of growth. Growth, therefore, is the key concept for understanding the nature and the needs of the child mind.

The mind does not have a fixed separate existence within a bodily dwelling. It is part and parcel of an indivisible growing organism, responsive to the joint influence of the genes and the environment. The mind cannot be regarded as pure energy for it is a patterned and patterning system. Indeed, the mind of the child is a living, growing action system.¹

We have quoted at length this statement because it has the merit of including in a panoramic view the basic features and concepts underlying Gesell's approach to the study of the development of the child. In later paragraphs we will have an opportunity to elaborate and analyze more in detail these concepts. We would like here simply to mention some of the striking points and some of the questions which may come to the mind of the reader.

First and foremost the concept of growth is singled out as an over all encompassing solution to the understanding of the child. This concept is offered in a perspective that can be anything but evolutionnistic, since, as Gesell says, "Nature has taken a billion years to fashion the structure and the potentialities of the human infant."

A second interesting feature is the holistic approach which Gesell assumes to be underlying the cycle of growth. Not only does he affirm the development as a "unit", but he equally reinforces his position by stating that "the genes

initiate the mental as well as the physical product of growth," and that "the mind does not have a fixed separate existence within a bodily organism." One may wonder if behind these words Gesell does not intend to state his philosophical position and offer a solution that would do away with the famous problem of cartesian dualism. It is possible that such an issue is absent from Gesell's mind, but it is equally possible that he thinks that the concept of growth would offer such a solution.

Finally Gesell conceives the cycle of growth with the following factors at work: the genes and the environment. A further insight is added with the statement that "the mind is a patterned and patterning system." In other words, the cycle of growth will include a passive and an active aspect, and the study of the various phases of development should bring these to light.

Before we proceed to the details of the unfolding consequences of this concept of growth applied to the child's

development we would like to point out briefly the sources from which Gesell seeks to obtain valuable information and thus build up a science of this development:

A broadly based clinical science of child development will draw upon medical and social research: upon embryology, neurophysiology, biochemistry, genetics, and physical anthropology to elucidate the nature of human organism; upon developmental psychology, factual psychiatry, and cultural anthropology to elucidate the interplay of organism and personal milieu.²

and in the case that one may wonder about conflicting statements from so different sources Gesell points out that the concept of growth will still hold the key to the understanding of the child development.

Fortunately however, the very concept of development serves to integrate and to simplify the multiplicity of data. This concept is monistic; it resolves the dualisms of organisms and environment; of heredity and habit; of structure and function; of mind and body.³

To many this statement will appear too general; We see in fact that it is, for Gesell, the answer to a problem mentioned above, namely the cartesian dualism of mind and body. If it seems to be over conclusive, it has at least the merit of offering a new perspective to the solution of that ever-

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lasting problem. And perhaps that is all one may expect, if one is to remain so close to biology.

II. BEHAVIOR AS THE OBJECT OF STUDY

The reader or the critic who seeks to synthesize Gesell's basic concepts is sometimes confused by the fact that some of his statements are definitely tainted with sociological preoccupations. However, while titles of chapters such as "The Family in a Democratic Culture"⁴ are clear examples of such a direction, the fact is that Gesell is not carried away with such preoccupations. Although he recognizes, - and who does not - that the family remains the "most fundamental unit of modern culture"⁵, and even if he dwells on the concept of democracy as "having far reaching consequences in the rearing of children"⁶, we may rightfully assume that his main objective is to present a clear and objective analysis of the patterns of development.

In the following paragraphs we will therefore discuss the foundations and implications of the processes of growth as Gesell understands them. To conform to the monistic conception explained in the introduction, we should consider growth on all fronts at once. But unfortunately the human mind is unable to visualize anything in such a manner, and we are forced to segment certain aspects of what we commonly call BEHAVIOR. Of course, this term Behavior is also for many an abstraction. In its totality it could very well signify what Gesell calls "the outward aspect of life"-- "the very essence and a culminating manifestation of the life processes of the individual."⁷

Obviously, therefore, Behavior is not a static entity. In fact, for us it is the open vista into the development which otherwise would become incomprehensible. It is because Behavior can be studied and even measured to a certain extent that we can infer, as Gesell does so often, that to

changes in Behavior will correspond to changes in the sequences of developmental levels.

We will find later, as mentioned above, that various aspects of Behavior can be isolated. But here again we will have to remember the fact that whatever multiplicity we may observe is in function of an over-prevalent unifying factor or process, mainly that of growth.

The child's personality is a product of slow and gradual growth. His nervous system matures by stages and natural sequences. He sits before he stands; he babbles before he talks; he fabricates before he tells the truth; he draws a circle before he draws a square; he is selfish before he is altruistic; he is dependent on others before he achieves dependence on self. All of his abilities, including his morals, are subject to laws of growth. The task of child care is not to force him into a predetermined pattern but to guide his growth."⁸

From there it is not difficult to assign a precise role to infancy, the term being conceived in a much broader sense than usual. "Biologically speaking," writes Gesell, "the span of human infancy extends from the zero hour of birth to the middle twenties. It takes time to grow."⁹ This prolonged infancy should be considered as a gift. It is

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directly linked with the plasticity of human nature. This plasticity is in turn related directly to the fact emphasized over and over again: "It takes time to grow."

III. MENTAL GROWTH AND THE MATURATION OF THE NERVOUS SYSTEM

We may now turn our attention to the more detailed analysis of mental growth offered by Gesell. It is, according to Gesell, in the Nervous System, "with its prodigious capacities of growth and learning",¹⁰ that one must look for the "medium" of organization of the child's mental life.

The three levels of Reality - mainly the mastery of the vegetative functions, the conquest of the world of things, and the acculturation to the world of persons, - are the fundamental areas where this development takes place.

If, as Gesell affirms, the development does not "take place on the installment plan" one is right in supposing that, although for a time, all growth seems to be on the vegetative level. However, a close scrutiny would reveal

that within the organization and patterning on that level some gain is equally achieved on the other levels; in fact, this organization is definitely related as a preparatory and all inclusive state in relation to the conquest on the other levels. For again and again Gesell emphasizes the linkage of the mental growth with that of the Nervous System more manifested in the organization of the vegetative functions.

The growth of the mind is profoundly and inseparably bound up with the growth of the Nervous System. This growth begins remarkably early. Five months before the baby is born all of the nerve cells he will ever possess have already been formed and many of them are prepared to function in an orderly way. At this time the fetus makes movements of arms and legs so vigorously that the movements can be seen and felt through the mother's abdominal wall (quickenings); the eyelids can wink; the eyeballs can roll; the hands can clasp; the mouth can open and close; the throat can swallow; the chest makes rhythmic movements in preparation for the event of birth, when the breath of post-natal life will rush into the lungs. All child development is like that; it proceeds with reference to the future. When the time comes the child is normally ready for what we may expect at that time. And he is never ready until the Nervous System is ready.

How does the mind grow? It grows like the Nervous System; it grows with the Nervous System. Growth is a patterning process. It produces patterned changes in the nerve cells; it produces corresponding changes in patterns of behavior.¹¹

To unfold such an evaluation one must go back to some simple forms of organization and see how they gradually

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emerge from an undifferentiated group of reactions. The basic unit of such an analysis is to be found in the behavior pattern simply defined as "a movement or action which has more or less definite form." The blinking of an eye, the grasping at random of an object, are behavior patterns in their simplest forms. These patterns, of course, gradually increase in complexity as the development of the nervous system allows them to do. Slowly, but in a definite sequence, patterns are incorporated one to another, with the result that they soon form an organized structure. A typical example of such an organization is to be found in a study of the growth and development of the visual and prehension systems.

First the visual system:

The eyes of a newborn baby are apt to rove around both in the presence and absence of a stimulus. After several days or even hours, the baby is able to immobilize the eyeballs for brief periods. Later, he stares at surroundings for long periods. When he is four weeks old we may dangle a ring (a four inch red embroidery ring attached to a string) in the line of his near vision: he regards it. We move the ring slowly across his field of vision: he "follows" it with his eyes through an arc of about 90 degrees.

This means that the nerve cells which control those twelve tiny oculo-motor muscles have ripened and furthermore have made patterned connections with the grosser muscles which rotate the head. The mind must be growing, because behavior is patterning.¹³

But vision alone is far from sufficient to conquer the world. Things must be touched, their impact must be felt, and the geometrical properties of their surfaces must be recognized.

Movement is an essential part of sense perception. He must move his hands to manipulate; just as he must move his eyes to inspect. The nerve cells which determine and direct his hands into movements are located in the spinal cord and the brain."¹⁴

Let us now combine together, as Gesell does, the visual and prehension mechanisms:

The eyes are still in the lead. It may take the baby twenty weeks more before he can pick up that same pellet with his hand. The hands and fingers come into their own later (when the requisite nerve connections have ripened.) However, the infant can hold a rattle and look at it while he is holding it at the age of 16 weeks. This is a significant mental growth again.

It means that the hands and eyes are doing team work, coming into more effective co-ordination. Mental growth cannot be measured in inches and pounds. So it is appraised by patterns.¹⁵

The last statement must retain our attention; it is really the crux of the matter, since it relates directly

the growth of the mind, to the patterning of behavior.

There is, then, but one step further to go: it is to conclude as Gesell does: "The advance in behavior patterns is the measure of mental maturity."¹⁶

However, another question lies ahead of us: to what agent, to what cause must such a patterning be attributed? Also, what part do environment and external stimulation play in such a structuration?

Gesell answers that the child "comes into his increasing powers primarily through intrinsic growth forces which change the inmost architecture of his nervous system."¹⁷

This is not to deny the role of the environment which is most helpful to "insure a favorable realization of the inherent potentialities." But the role of environment is definitely not that of a generator of "progressions" of development. It acts only as a supporter and as a modifier. It is within the organism that one must look, according to Gesell, for the forces of propulsion forward.

Again here we find a definite identification of the growth of the mind to that of a biological process:

What is the organism? It is living, growing protoplasm. The mind, so far as we can fathom it by direct observation, is an expression of the organization of this protoplasm, manifested in visible patterns of behavior.¹⁸

IV. MENTAL GROWTH AND THE WORLD OF THINGS

We are now in a position to discuss how the "growing mind" whose organization we have sketchily described, must make the further adjustments to the world of things, "the natural and man-made world of space and time."

It is a fact that we do not consider enough that the child is propelled in a universe which is already prefabricated for him and into which he has to seek orientation and understanding.

To one who may wonder how the visible world looks to a baby, Gesell offers an answer which goes a little further than the so-often quoted picture of "big, blooming, buzzing confusion."

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Much more probably the young baby senses the visible world at first in fugitive and fluctuating blotches against a neutral background. Sounds likewise may be heard as shreds of wavering distinctness against a neutral background of silence or of continuous undertone.¹⁹

When, then, does the world begin to become structured?

Not until he can configure it with experience gained through his eyes and hands.²⁰ It is obvious that a universe so perceived is out of the so called time boundaries; in other words there is no past and no future. The complexity of the organization of time and space will take years to be acquired and will of course be correlated to the neurological growth. Time experience will first be discontinuous because of the poor maturation of the nervous system. But as the growth is achieved on the vegetative level, through it the basic relationship will emerge. It is in the muscular experiences, with their more complex form of activity, that the child will achieve the concept of time and space.

Through ceaseless manipulation of objects he penetrates further into the topography and the solid geometry of space, - the relationship of in and out, on and under, in front of, behind and beside.

Through his tireless locomotion, creeping, walking and running, he builds up a sense of here and over there, of near and far, of wall and corner, of indoors and outdoors.²¹

At this point we are in a position to understand better why Gesell attaches so much importance to the concept of growth. It appears definitely established for him that it is in the unfolding of the maturation processes that one finds the key to a mental organization which, taken at an ulterior moment, seems so complex as to have no relation whatsoever with the preceding chaos.

The next question seems to be: how far can one go in assuming a real relation, and what kind of relation will it be, between the maturation and the growth processes and what we consider abstract thinking and the order or level of concepts? This question may have philosophical implications, but it is still necessary to find where the biologist and the psychologist stand on that problem. According to Gesell we have here a continuum and if we are

allowed to speak of moments of development, we are nevertheless not allowed to speak of quantitative or qualitative break in the growth of the mind.

From a universe felt as "still and almost without form and void" to a world woven into a system of intricate relationships the mind progresses through a constant and unbroken path of organization. It is all the way through "the same growth, a modelling process which produces changes in form." And it is because of the variety of forms, of patterns, ranging from those closely connected with the sensori-motor level, to those culminating into more elaborate and more abstract patterns that we have a tendency to see a break in the process of growth.

Time, space, number, form, texture, color and causality, - these are the chief elements in the world of things in which the child must find himself.

We have shown that he acquires his command of these elements by slow degrees, first through his muscles of manipulation and locomotion, through eyes, hands and feet. In this motor experience he lays the foundation for his later judgments and concepts.²²

It is probably not necessary here to look for more

than Gesell affirms; he is obviously not preoccupied here with a philosophical explanation of the nature of the mind, but is rather engrossed in what one could call the anatomy of the processes which enable the mind to function.

Functions do not operate in vacuo, and our comprehension of child behavior must begin with a factual knowledge of its conformation and patterns. Viewed as a growing complex of action patterns, the mind has a developmental anatomy. The mind has architecture.²³

The philosopher may ask, why stop there? The reason is simple; the inquiry was not set to prove or disprove a theory, but rather to gain an insight in the development of the child's functions. Once it is done, the task is completed.

V. THE GROWTH OF PERSONALITY

The mind is a growing myriad of reaction patterns which mirror the physical world in which the child is reared. It grows not unlike a plant. But the mind is also a person, and as such it mirrors the reaction patterns of a world of persons.²⁴

With these words from Gesell we pass from the world of things to the world of persons. For as we wrote before,

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although growth is a unitary process, to understand so complex a process we have to consider separately the various areas of its development. A real benefit, of course, is to be gained from such a vision: that, mainly, of its manifold extension, and its overall unity.

However our study starts from the same fundamental unit: a growing organism with a nervous system "so constructed that it reacts in a patterned and patterning manner to the world of things." The difference here is simply one of terms. Whereas we spoke before of a growing mind, we will speak here of a growing personality. In Gesell's own words:

His mind (the child's) is an intricate bundle of behavior patterns and behavior potentialities. His personality is the same-self bundle as it functions in a culture.²⁵

Consequently personality

. . . is subject to the very mechanisms and the laws which govern the growth of perception and intelligence.²⁶

And further:

In sketching how the mind grows, we have already

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indicated how the personality develops. The child develops as a whole. What we call his personality is an ever-organizing web of behavior patterns, particularly of personal-social behavior. These patterns constitute and sum up all his reactions to the culture which reared him. They are neither more or less mysterious than his sensori-motor patterns of posture, locomotion and manipulation. They have the same geometry of growth which determines the developmental sequences of vertical, horizontal and oblique. Personality is but an abstraction, unless we agree that it is constituted of genuine patterns of behavior, which grow and have being in the sense that cube behavior grows and makes itself manifest in lawful towers and bridges. Personality is not a force behind the scenes which operates a puppet. It is the whole puppet show, - player, stage, audience, acts and scenes.

It sums up, as we have just noted, all the impact of culture upon the growing organism, and since the personality is at once a product and instrument of growth the infant foreshadows the child; the child the youth; the youth the man.²⁷

Thus it would appear again that growth is still and always the key factor and ultimate explanation of the whole, the difference being in that: while at first (we will qualify later that statement, for growth is working on all fronts at once) the organism was trying to overcome and gradually extend his domination in a world of objects, it is now struggling to build up an independent self in the midst of what Gesell calls a culture. In fact it is in reference to culture that the term personality acquires meaning. But

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what is culture for Dr. Gesell?

Psychologically speaking, culture is also an organized body of behavior patterns built up through generations of group experience and mediated by folkways.²⁸

At this point Gesell feels that he is now in a position to offer an insight and perhaps a new solution to the everlasting problem of organism versus environment. Two entities face each other: on the one side, a growing organism in search of itself; on the other hand, an already prefabricated culture into which it must adjust itself. Although for the moment we are not particularly preoccupied with a critical evaluation of the organization and content of these cultural patterns, we cannot escape the fact that with a culture so structured we have a dual effect - active and passive - on the growth of the child.

It is active because "the organized body of behavior patterns built up through generations" will gradually surround the child as a spider's web, promoting and eliciting patterns

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of behavior from the new organisms. These patterns will develop as the child learns to survive in such an intricate and complex web of effects.

But if personality is, in the words of Gesell, to be "recognized as a growing tissue which both yields and resists",²⁹ it is equally obvious that personality growth will not be a one-way process. The active aspect of culture will have its counterpart in the action of the organism upon culture, with the result that in this case changes will occur in the patterns of culture, due to partial or complete resistance on the part of the organism. In doing so the infant switches the role and becomes active in his turn.

The infant contributes his mite to this vast cultural complex, because he becomes a focal point for the impacts of culture. As a youth, and an adult, he both continues and modifies the tradition. The tradition is transmitted by the process of social inheritance, which is only figuratively comparable to the racial inheritance that endows the child with a nervous system.³⁰

In such a perspective a question becomes of prime importance: when and how does the personal life of the infant begin?

Gesell is very much aware of the importance of that question.

But the answer is not simple. If we recall the previous description of the world of things as seen and understood by the child we realize that personality cannot be defined simply in terms of "dermatological envelope".

As a matter of fact it is because of his diffuse sensitivity that the child remains immersed in a cosmos from which he cannot at first differentiate himself. The first step forward will be found again in the development of the central nervous system.

It takes time, it takes complicated developments of the central nervous system, it takes the distance senses of sight and hearing to disengage him (the child) from the contexts to which he is so closely united.³¹

If one therefore wants to speak of the psychology of the newborn baby, it is primarily in an understanding of the vegetative forces at work that an answer must be.

The psychology of the self of a newborn baby must be largely confined to the mass of sensory impressions and feelings which arise from his lungs, his gastro-intestinal tract (many feet in length), his bodily movements, and his enveloping skin which

usually fits him quite neatly. The total area of this outer skin and the yet vaster mucous membranes or inner skin is very extensive indeed. His air hungers, his food hungers, his appreciation of warmth, cold, bodily discomfort, and of snugness constitute the core of his psyche. Here is the nucleus, so to speak, of a personal self which grows and elaborates with great rapidity during the first five years of life.³²

Transposed into other words: in the beginning the child is "all universality, or all ego". He is not one in relation to others. For such a relationship to develop, many months will have to pass. His perception of physical shapes of persons as well as of himself, will progress from generic to specific, from mass to parts, gradually integrated in a consistent whole.

Development is always a process of progressive differentiation. As the infant matures, his discernment of other persons becomes increasingly particularized. At the same time he learns to interpret the meaning of the nodding face, of the beaming eyes, the smiling mouth, the approaching hands, the glistening bottle, the cup, the spoon, the bib, the bonnet. Somehow or other the experience of these meanings, through the alchemy of growth, becomes organized into a complex of emotional reactions, which at last is sufficiently elaborate to be called a sense of another self.³³

Truly, then, the vision of the infant first, then the child, is not too much different from the discovery one makes of the world at daybreak. First the self sheds the

folds of darkness by which he was one with the other masses in the shroud of the night. Then the slow rising and indirect lighting of the sun gradually make the shapes of things emerge first as group, then as delineated figures standing more and more apart on a screen of light; up to the moment when the self stands amidst all things in relation to them.

VI. MENTAL GROWTH AND EMOTIONAL DEVELOPMENT

The process of growth in terms of acculturation which we have exposed is not to be considered however without its concomitant development, mainly that of emotions. Since the famous analysis made by Watson of the basic emotions of the infant and child, much has been written to support or discredit the theory. Gesell does not seem to be overly preoccupied with the problem. He neatly integrates emotions within the framework of his key concept.

To be sure the personality reactions are colored by emotions, by feelings of pleasure and pain, by

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by seekings and avoidances; but all this emotional life is organized and related to patterns of response.

Emotions are not free-lance qualities which attach themselves to behavior patterns; they are part and parcels of the patterns. Emotions grow and mature in the same sense that perceptions, judgments and concepts grow and mature."³⁴

Obviously Gesell is so bent upon the fitting of his key concept to all the possibilities of development that he does not find much value in a scrutiny of the foundations of emotional processes, much beyond the behavioristic approach. In the light of other theories we cannot, however, help wondering if he does not oversimplify the question.

While what he says is true, and also while one may be justified in considering the emotions from a purely developmental approach, we cannot help thinking that the whole problem is not solved. If it is equally true that in reference to the vegetative operations, and as long as the self has not emerged in opposition to others it seems difficult for the onlooker to make precise the value of emotions much beyond their outward physiological components; to visualize their evolution only in those original terms

is perhaps falling short of the goal.

For as we notice that the process of growth, with the multiform exercises which promote it, goes far beyond the order of sensori-motor comprehension, and as a matter of fact extends into a conceptual prehension of the universe. We may equally acknowledge that out of the common matrix come realizations on the emotional plane which transcend the limitations of sensori-motor exercises. We do not here intend to deny the so-often quoted basis of experiences on the sensory level. Gesell describes justly their importance:

These sensory experiences, - visual, tactile, wet, dry, still, moving, stop-go, palmar, touching and being touched, provide him with a medley of data. By gradual degrees he comes to realize that he has a hand which feels when it contacts (active touch), which feels when it moves (sense of motion, or kinaesthetic sense mediated by sensory and organs in muscles, joints and tendons). His ceaseless manipulation, therefore, acquaints him not only with the physical universe and the physical presence of other persons, but with the physical presence of himself."35

We simply do not want to leave aside the more complex forms of emotional patterns such as those which extend into the feelings of security, achievement and others. Again that

is not to say that Gesell ignores these issues, for, recognizing the linkage between the simple and the complex, he writes:

Every feeding whether by breast, bottle, spoon, by cup, by hand or otherwise makes a contribution to the growing sense of self and security.³⁶

For, if the hands and the mouth serve both as "avenues for information" within the framework of solitary discovery, soon the exchange between the milieu and the child becomes more complex, and other patterns of behavior are elicited.

Through the interchange of back and forth play the infant becomes more aware of himself and others. He sees how his actions can be attuned to those of others.

A ball is rolled to him. He anticipates the rolling ball. He receives; he reciprocates; he receives again and reciprocates again. It is more than a mere game, for it represents a mode of acculturation. Countless life situations day in and day out call for similar reciprocities. Through these situations the emotions are organized into patterns which correlate with cultural patterns."³⁷

Later on Gesell concludes his analysis:

Thus bit by bit, pattern by pattern, the personality of the young child takes on structure and design. It is constituted of an infinitude of patterns and attitudes. It is not some mysterious essence which takes hold of the culture and manipulates it to suit some dark subconscious goals. The personality of the young child is more like an organism which is shaped

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by what it feeds upon. Nature protects this growing organism normally from over-growth. A balance must be struck between self-effacement under cultural pressure and self-assertion under the compulsion of developmental urges."³⁸

To conclude, it seems that Gesell conceives the personality as the total sum of a certain number (infinite as it may be) of patterns and attitudes.

Personality, thus, is definitely considered as an end product; as a matter of fact, it should be visualized in Gesell's words as "a structured end product of the child's developmental past."³⁹ As such, it would be definitely related to the cultural patterns which have contributed to mold it. And as the family is the first natural "milieu," its influence would be, of course, the most durable.

The early impressions of the family life during the first five years leave the most fundamental and enduring imprint. Acculturation begins in the home and the influence of the larger social groups is limited by the trends initiated through the family. If the child grew up in a natural and not in a social world, he would still be able to achieve some of the fundamental adjustments to life. He would be able to adapt to the world of time and space, the world of things, but he would be almost devoid of personality because personality is constituted of an infinite number of reactions which are released in a socialized world."⁴⁰

Once more we find emphasized the developmental approach, the concept of growth applied to personality. In so many words Gesell says that he has "deliberately avoided a conjuring discussion of the more speculative and inaccessible aspects of the subject." It is his privilege; and we, in exposing his basic concepts, have no right to refuse him this stand; it may well be, in the final analysis, that as much truth can be found about the make-up of personality in the developmental approach than in any other.

VII. THE CHILD AS A TOTAL ENTITY

The foregoing analysis would not be complete without a few words about the child considered as a total entity.

Gesell is very close to Rousseau when he writes:

Infants are individuals. They are individuals from the moment of their birth. Indeed, many of their individual characteristics are laid down long before birth."⁴¹

What are then the factors which, in the eyes of Gesell go into the making up of an individual? First, on the physiological level Gesell seems to accept the Sheldonian

approach to the problem of individuality.

In the shape of his physique the newborn infant already gives token of what he is to be. Physical measurements may show which of the three body types he will most closely approximate as an adult; (1) round, soft body, short neck, small hands and feet; (2) square, firm body with rugged muscles; (3) spindly body, delicate in construction. Individual differences in physique are due to variations and mixtures of these bodily characteristics.⁴²

Then Gesell elaborates briefly on the relationship between temperament and physique:

There is a similar variety in temperaments, corresponding to differences in physique, and in biochemical and physiological peculiarities. Three traits or types of temperament have been distinguished. They combine in varying degrees in different individuals: viscerotonic, somatotonic and cerebrotonic. (Sheldon) The extreme viscerotonic has a good digestive tract. He is good natured, relaxed, sociable, communicative. The pronounced somatotonic is active, energetic, assertive, noisy and aggressive. The fragile cerebrotonic is restrained, inhibited, tense; he may prefer solitude to noise and company. He is sensitive and likely to have allergies.⁴³

In spite of this quotation, one should not draw the conclusion that Gesell is close to a strict determinism when it comes to evaluate a personality. As a matter of fact he takes a vigorous stand against one of the basic tenets of behaviorism as conceived in its rigid form by Watson, where every aspect of development was reduced to a question of conditioning.

In the hey-day of Behaviorism, there was a popular impression that all babies are very much alike at birth, and that the differences which become apparent as they mature are due to conditioned reflexes. The child's mind was said to consist of a complex bundle of conditioned reflexes, derived from environmental stimuli. According to this point of view, children resemble each other most while they are infants, - the younger, the more alike.

There is no evidence, however, that infants are not individuals to the same degree that adults are individuals.⁴⁴

The pendulum has thus swung towards the middle.

Gesell realizes, as we noted before, that there are limits to the influence of the environment.

Every child is born with a nature which colors and structures his experiences. The infant, to be sure, has great plasticity, great powers of learning; but there are lawful limits to his conditionability. He has constitutional traits and tendencies, largely inborn, which determine how, what, and to some extent, even when he will learn.⁴⁵

Thus, as we have two sets of factors at work at conception, the genes, the contribution of the father and the mother forming the basic nucleus, so we can again visualize the process of growth as involving two sets of traits, namely, those coming from the familial inheritance, and those coming from the racial inheritance.

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These traits are both racial and familial. The racial traits are those which are common to the whole human species. The familial traits are the distinctive endowment which he inherited from his parents and a long line of grandparents. The child comes into this double inheritance through an innate process of growth which we call maturation. He comes into the social "heritage" of culture, through a process of acculturation. These two processes interact and interfuse, but the process of maturation is most fundamental, - so fundamental that acculturation can never transcend maturation.⁴⁶

The importance of the subordinate relationship of these two processes can never be over-emphasized. While it is true as quoted above, that they "interfuse and interact", they are nonetheless distinct, first in time, for acculturation can never transcend nature, - and then in their contribution. For while under the process of acculturation individuality would tend to disappear and blend into uniformity, through maturation a force of resistance is at work to preserve the individuality. Of that Gesell is very much aware, for he writes:

We may be duly thankful for this degree of determinism. Did it not exist, the infant would be a victim of the malleability which behaviorists once ascribed to him. He is durable as well as docile.⁴⁷

The now famous co-twin control study of Gesell seems

Such a definite proof for this approach to development, that after a rapid survey of his work in this field he concludes:

Infants are individuals. When human behavior is organized in a cultural milieu, there is almost an infinitude of available environments; the organism selects from this infinitude in much the same way that a living cell may or may not select potassium from a fluid medium. The structure of the organism conceived in terms of biophysical waves or particles of stereo-chemistry, is attuned to what it selects and averse to what it rejects. For this reason it has been difficult to find pure cultural factors to explain the demonstrated differences in the life careers of Twin T. and Twin C. Twins are individuals.⁴⁸

Such are the basic concepts by which Gesell hopes to explain the development of the child. Under one form or another they are all centered around the key concept of growth. This represents definitely a bold attempt to explain every aspect of behavior, simple or complex, by a reduction to a single entity.

While it offers a definite advantage in its apparent simplicity and has the merit of limiting the number of hypotheses as well as maintaining a constant reference to a biological criterion, one cannot help wondering if its overall comprehension does not weaken its explicative value.

FOOTNOTES

- ¹Arnold Gesell and Frances L. Ilg, Infant and Child in the Culture of Today (New York: Harpers and Brothers, 1949 p. viii
- ²Ibid. xi
- ³Ibid. xi
- ⁴Ibid. p. 9
- ⁵Ibid. p. 9
- ⁶Ibid. p. 10
- ⁷Leonard Carmichael, Manual of Child Psychology (New York: John Wiley and Sons, second edition, 1954.) p. 335
- ⁸Arnold Gesell and Frances L. Ilg, Infant and Child in the Culture of Today (New York: Harpers and Brothers, 1949, p. 11
- ⁹Ibid. p. 11
- ¹⁰Ibid. p. 20
- ¹¹Ibid. p. 18
- ¹²Ibid. p. 16
- ¹³Ibid. pp. 18-19
- ¹⁴Ibid. p. 17
- ¹⁵Ibid. p. 19
- ¹⁶Ibid. p. 19
- ¹⁷Ibid. p. 20
- ¹⁸Ibid. p. 20
- ¹⁹Ibid. p. 22

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²⁰Arnold Gesell and Frances L. Ilg, Infant and Child in the Culture of Today (New York: Harpers and Brothers, 1949,

p. 22

²¹Ibid. p. 23

²²Ibid. p. 26

²³Ibid. p. x

²⁴Ibid. p. 27

²⁵Ibid. p. 29

²⁶Ibid. p. 29

²⁷Ibid. p. 30

²⁸Ibid. p. 29

²⁹Ibid. p. 30

³⁰Ibid. p. 29

³¹Ibid. p. 31

³²Ibid. p. 31

³³Ibid. p.32

³⁴Ibid. p.29

³⁵Ibid. p.33

³⁶Ibid. p.33

³⁷Ibid. p. 34

³⁸Ibid. p. 34

³⁹Ibid. p. 37

⁴⁰Ibid. p. 37

⁴¹Ibid. p. 39

⁴²Ibid. p. 39

⁴³Ibid. p. 39

⁴⁴Arnold Gesell and Frances L. Ilg, Infant and Child in the Culture of Today (New York: Harpers and Brothers, 1949)

p. 40

⁴⁵Ibid. p. 40

⁴⁶Ibid. p. 40

⁴⁷Ibid. p. 41

⁴⁸Ibid. p. 43

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CHAPTER II

PROFESSOR JEAN PIAGET'S BASIC CONCEPTS UNDERLYING
THE DEVELOPMENT OF THE SENSORI-MOTOR INTELLIGENCE

Since the publication of his findings on "Language and Thought" and "Judgment and Reasoning in Children" in 1927, it is quite obvious that Piaget had opened new vistas to the study of child's development. Many years, in fact some twenty years, were going to elapse before he completed his exhaustive research on the mental development of the child.

Today, when one looks at his series of works, which range from the first attempt to understand the child's mentality through language, including "The Child's Conception of the World", with the three basic studies "The Origins of Intelligence in Children", "The Construction of Reality in Children" and "Plays, Dreams and Imitation in Childhood", to the various experimental studies devoted to the formation of the various concepts of Space, Time, Quantity, Speed, and Moral Judgment, one cannot help taking

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notice of the monumental edifice thus constructed and wonder about its content.

But before we undertake to offer an exposition and a comparative evaluation of some of Piaget's findings, we would like first to familiarize the reader with some of the basic concepts which, so to speak are the corner stones of his psychology of the mental development of the child.

It is with the background of a training in the biological sciences that Piaget came to the study of the Child Psychology. And one could add immediately that the basic concepts by which he seeks to explain the mental development are, in more than one way, borrowed from biology.

His whole approach is far more analytical than Gesell's, and it hinges upon the understanding of four concepts, the meaning of which, we will try to explain in the following paragraphs.

I INTELLIGENCE - AN ADAPTIVE BEHAVIOR

The first of these concepts is that of ADAPTATION. All the sciences of life start from the basic premises of a

living organism and its milieu. Of necessity the organism seeks to survive, and to do so tries to adapt itself to the milieu by means of various modes of comportment. These comportments have a common aim: namely that of exchanges between the organism and its milieu, exchanges which terminate in reciprocal adjustment of one to the other.

Nature having endowed the living organism with a certain number of set mechanisms usually ready to function at birth, it is those, on the reflex level, for example, which are first at work in this movement towards adaptation. This pattern is equally found in living organisms, which, by other features, are neatly differentiated from what we commonly call the lower forms of life. A rapid survey of the hierarchy of living organisms establishes, however, clear cut differences in reference to the modes of adaptation, these being correlated primarily with the evolutive organization of the nervous system.¹

With the structuration of different organs called

senses, with specific cognitive functions, a "first system of signalization" can be developed. Then, among the superior vertebrates the processes of learning become increasingly more complex, enlarging the possibilities of adaptive structures definitely beyond the reflex level, although still within the limits of perceptual structuration allied with high motor coordination.

These organisms obviously still rely for their adaptation to the milieu upon the primitive reflexes; but also, in equal share, upon cognitive processes which enable them to dominate to a certain extent their environment.

When we graduate to the human organisms, the supremacy of the mental mechanisms as means of adaptation become clearly defined with the appearance of language which marks a plateau after the first two years of life. However, the mental organization, so characteristic of the human being, cannot be isolated from the over-all organization of the individual. It may be that such an organization represents

a culmination and more powerful adaptative structuration; but it cannot be disregarded or separated from its basic supports which are still those of neurological development and coordination on the reflex level. With these basic remarks in mind we are now ready to understand how Piaget incorporates intelligence in the total organization of the individual's development. In his own words:

Intelligence itself does not consist of a category which can be isolated and would be made of a discontinuous series of cognitive processes. It is not, properly speaking, a "structuration" among others; it is the form of equilibrium towards which tend all the structures whose formation is to be looked for, from the perception, the habit and the elementary sensori-motor mechanisms.

We must therefore understand that if intelligence is not a faculty, this negation implies with it a radical functional continuity between the superior forms of thought and the totality of the inferior types of motor or cognitive adaptation: intelligence again could only be the form of equilibrium towards which the latter tends.²

And he adds, as if to prevent some objections:

This naturally does not signify that reasoning consists in a coordination of structures of various perceptions, nor that to perceive is the same as to reason unconsciously, (although both these have been defended); for the functional continuity does not exclude in any way either the diversity or even the heterogeneity of the structures. Each structure is to be conceived as a particular form of equilibrium, more or less stable within its restricted boundaries,

and becoming unstable at the limits of the latter. But these structures, spaced at different levels, are to be considered as succeeding each other according to a law of evolution so that each structure insures a broader and more stable equilibrium to the processes which were already at work in the preceding structure. Intelligence thus is only a generic term designating superior forms of organization or equilibrium, of the cognitive structures.³

We have quoted this long text as a definitive synthesis of Piaget's views on intelligence. This conception of intelligence prevents him, again in his own words, "from delimiting intelligence as to its point of departure."⁴

INTELLIGENCE IS A POINT OF ARRIVAL. Within that viewpoint intelligence is therefore the most developed of all forms of adaptation, "the instrument indispensable for the exchanges between the subject and the universe, when the circuits are beyond the immediate and transitory contacts and extend into long range and stable relations."⁵

And thus Piaget concludes:

Its sources (the intelligence) are blended with those of the sensori-motor adaptation, as well as, beyond the latter, with the very sources of the biological adaptation itself.⁶

II. ASSIMILATION AND ACCOMMODATION

The work left then, is to trace the development of the structurations and various plateaus of equilibrium until the final stage is reached.

Two other concepts, namely those of ASSIMILATION and ACCOMMODATION can now be offered as the key formula to the various processes of adaptation. In other words, adaptation will be effected through the reciprocal actions of the mechanisms of assimilation and accommodation. Let us take these in turn.

How does assimilation work? When a living organism is in a milieu it is quite evident that from being entirely passive the former modifies the latter as it comes in contact with it. An obvious example is the absorption of foods which are transformed into the very nature of the organism. It is thus equally possible that the same thing takes place on the psychological level; here however we will be dealing with modifications in the functional rather

than the substantial order. These modifications will be the result of causes ranging from the most elementary, such as motricity, up to perception, including, on a higher level, the interplay of action realized or simply conceived as virtually possible.

Within such a framework the concept of assimilation applied to mental development implies the incorporation of the objects within the patterns of behavior. In Piaget's own words:

Taking the term in its broadest sense, assimilation may be used to describe the action of organisms on surrounding objects, in so far as this action depends on previous behavior involving the same or similar objects. In fact, every relation between a living being and its environment has this particular characteristic: the former, instead of submitting passively to the latter, modifies it by imposing on it a certain structure of its own. It is in this way that, physiologically, the organism absorbs substances and changes them into something compatible with its own substance. Now, psychologically, the same is true, except that the modification with which it is now concerned are no longer of a physico-chemical order, but entirely functional, and are determined by movements, perception, or the interplay of real or potential actions. Mental assimilation is thus the incorporation of objects into patterns of behavior, these patterns being none other than the whole gamut of actions capable of active repetition."

On the other hand we may consider the action of the

milieu upon the organism with the mechanism of accommodation. In this case we note that the cycle of assimilation described above is equally modified by the reactions of the surrounding milieu: the result being that of a certain movement on the part of the subject to meet the requirements and the challenges of the milieu made of things or persons. On the psychological level it is therefore obvious that the individual is not simply modified by the universe of things or persons, but rather that, in the process of incorporation of the surrounding reality, under whatever form it is conceived, the very actions of the organisms in so doing undergo certain modification. Again in Piaget's words:

Conversely, the environment acts on the organism and, following the practice of biologists, we can describe this converse action by the term "accommodation", it being understood that the individual never suffers the impact of surrounding stimuli as such, but they simply modify the assimilatory cycle by accommodating him to themselves. Psychologically, we again find the same process in the sense that the pressure of circumstances always leads, not to a passive submission to them, but to a simple modification of the action affecting them.

It is now possible to close the circuit and present the central function of adaptation as "equilibrium between assimilation and accommodation"; the former and the latter representing the keys to the exchanges between the individual and its milieu.

Our task is then to observe the moment when, although still related to the biological mechanisms and the most primitive forms of adaptation, "assimilation does not alter anymore in a physico-chemical manner the objects assimilated, but simply incorporates them in the structure of its own activity and when accommodation becomes restricted only to a modification of the activity."⁹

This moment would obviously represent the beginning of a psychic activity, which ulteriorly will develop on a plane where the spatio-temporal distances will be gradually conquered, to culminate into more and more complex forms of exchanges.

From the level of sensori-motor reactions to perception, including the organization of memory and superior forms of reasoning, we will find an assimilation and accommodation always in proportional relation to a distance constantly increased and equally dominated. This perspective of study, which Piaget calls the "genetic approach" has left behind the famous equation of "cause and effect" which for so long has plagued the psychological research. We now concentrate upon the organizational development of all the various structures, all tending towards a form of equilibrium. This approach to the problem intends to link, not to identify, the most elementary forms of adaptation to the highest, and thus span the continuum of mental development, and with it, the whole of human development.

Immediately related to this basic assumption--namely, the equilibrium of assimilation and accommodation--one finds the concept of organization which is presented by Piaget as inseparable from that of adaptation from the

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biological point of view. They are in fact two complementary processes of a single mechanism-organization being the internal aspect of the cycle while adaptation is the external aspect. Piaget describes the relationship as follows:

With regard to intelligence, in its reflective as well as in its practical form, this dual phenomenon of functional totality and interdependence between organization and adaptation is again found. Concerning the relationships between the parts and the whole which determine the organization, it is sufficiently well known that every intellectual operation is always related to all the others and that its own elements are controlled by the same law. Every schema is thus coordinated with all the other schemata and itself constitutes a totality with differentiated parts. Every act of intelligence presupposes a system of mutual implications and interconnected meanings. The relationships between this organization and adaptation are consequently the same as on the organic level. The principal "categories" which intelligence uses to adapt to the external world - - space and time, causality and substance, classification and number, etc. - - each of these corresponds to an aspect of reality, just as each organ of the body is related to a special quality of the environment but, besides their adaptation to things, they are involved in each other to such a degree that it is impossible to isolate them logically. The "accord of thought with things" and the "accord of thought with itself" express this dual functional invariant of adaptation and organization. These two aspects of thought are indissociable: It is by adapting to things that thought organizes itself and it is by organizing itself that it structures things.¹⁰

To complete this brief expose, we may add that the ultimate criterion of an intelligent pattern of comportment

will of necessity include an evaluation of the various movements back and forth between the subject and the object, and that the factor of "progressive composition" will then become the touchstone to determine the level of adaptation and consequently of equilibrium.

In other words, if perception involves only a simple relation, and if habit, in spite of the apparent complexity of its elements, reveals itself as an aggregate impossible to really decompose into its parts, an intelligent conduct on the contrary will reveal itself as composed of a determined number of so to speak movements in space and time.

In opposition to the forms of adaptation of the sensori-motor levels which can operate in one direction only, we find intelligence properly speaking characterized by what Piaget calls "reversible mobility"; that is, the capacity to move back and forth with the help of the various categorizations such as Time, Space, Speed and Quantity. From which he concludes:

To define intelligence by the progressive reversibility of the mobile structures which it constructs, it is therefore to say again, in a new and different way, that intelligence constitutes the state of equilibrium towards which tend all the successive adaptations on the sensori-motor and cognitive level, as well as all the assimilatory and accommodatory exchanges between the organism and the milieu.¹¹

III.

The reader of Piaget's studies cannot help being challenged by the wonderful systematization offered by the Swiss psychologist. It is quite obvious that Piaget is interested in one particular problem: mainly that of the development of intelligence, and that the purpose of his observations is to find an explanation, and a well constructed one.

At the same time the clear syntheses and the dialectical expositions presented by Piaget about his own observations, may give the reader the impression that a net is gradually woven around his own system of thinking, that he is so to speak led with thread of Ariadne through a labyrinth, with the expressed defense of looking around

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for something else than the development of intelligence through the various forms of behavior.

It would be false, however, to accuse Piaget--as it has been done--of entirely neglecting other aspects of the development. For the record we should mention that such a controversy occurred in France with Dr. Wallon, also an exponent of the genetic approach in child psychology.

In simple terms: Piaget was accused of turning his study of intelligence into pure intellectualism by arbitrarily isolating the function of intelligence and not acknowledging the relations between the intellectual life and affectivity. (1)

In lieu of an explanation we would like to offer the following remarks for consideration.

(1) During the academic year 1953-54, Professor Piaget gave a series of lectures at the Sorbonne to discuss the issue. cfr. BULLETIN DE PSYCHOLOGIE, Vol. VIII, Nos. 2, 3, 4, 6, 7, 9, 12. (Les relations entre l'intelligence et l'affectivite dans le developpement de l'enfant.)

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We readily admit that there are striking differences between the exposition of facts, at least in the method, between Piaget and Gesell. This is mainly in terms of omission, on the part of Piaget, of the discussion of the emotional factors and of the development of personality. But we maintain that it would certainly be an oversimplification of the problem to say Piaget is interested only in the mental development as it takes place in the WORLD OF THINGS.

The truth of the matter is that Piaget is very much aware of the existence of the affective life. But one could say that he sees the role of affectivity in function of intelligence, without however identifying it with a cognitive process. For he writes:

The affective life and the cognitive life are thus inseparable, although distinct. They are inseparable because all exchange with the milieu supposes at the same time a STRUCTURISATION and a VALORISATION; but they nevertheless remain distinct, for these two aspects of behavior cannot be reduced one to the other.

It is thus that one could not reason, even in pure mathematics, without having certain feelings, and that inversely, there are no affections without a minimum of comprehension or discrimination. Thus an act of intelligence supposes within itself an

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energetic regulation on the one hand internal, (interest, effort, facility etc.) and on the other external, (value of the solutions one tries to achieve, and of the objects which the research seeks to discover). But these two regulations of the activity belong to the realm of affectivity and remain comparable to all the other regulations of this order. In a reciprocal manner, the perceptual or intellectual elements which one recognizes in all the emotional manifestations are related to the cognitive life as any other perceptual or intellectual reaction.

That which the common sense refers to as "sentiments" and "intelligence", considering them as two faculties opposed one to the other, are simply the patterns of behavior related to the persons, and the ones related to the thoughts or the things. But in each of these patterns of behavior intervene the same cognitive and affective aspects of the action, aspects always united in reality and thus not being the characteristic of independent faculties.¹²

In the above statement, several points should retain our attention:

1. First, that Piaget acknowledges not only the existence of but also the importance of affective elements in human behavior.
2. Secondly, that the so often used division between types of behavior, in this case affective versus cognitive behavior, is for Piaget a useful, but also, to a certain extent fictitious one.
3. Thirdly, that any form of behavior is a unit, and

that as such it does not refer to a distinct faculty.

The action is in fact a blending of factors which can hardly be isolated.

In this analysis of the genetic development of intelligence according to Piaget, we have traced at some length the sequence of operations in sensori-motor processes, the organization of schemata of sensori-motor intelligence (these being the practical equivalent of concepts and relations as well as their coordination into spatial and temporal systems of objects and movements) though these are still in a practical and empirical form.

It is quite apparent that such sensori-motor groups simply constitute behavior patterns; i.e., a system of equilibrium formed by the various physical movements in near space, but which in no way attains the rank of instrument of thought.

It may be of interest here to insert a somewhat parenthetical paragraph, quoting Piaget's division of behavior

patterns:

If we divide behavior into three main systems organic hereditary structures (instinct), sensori-motor structures (which may be learned), and symbolic structures (which constitute thought), we may place the group of sensori-motor displacements at the apex of the second of these systems, while operational groups and grouping of a formal nature are at the top of the third.¹³

Piaget therefore contends that sensori-motor intelligence is the source of thought and that it continues to affect thought throughout life through perceptions and practical sets. This role of perception, even in the most highly developed thought, is important and may not be overlooked. It is the sole indicator of the constant influence of the early schemata.

In his inaugural lecture at the Sorbonne Piaget stated:

Three great factors may be distinguished in the mechanism of the mental development: the internal maturation of the organism, the influence of the physical milieu, and that of the social milieu. I would like to show briefly that all three, each independently and naturally also each in relation to the other, are subordinated to laws of equilibrium, and that, consequently, the language of equilibrium is the most adequate to provide a general instrument of analysis.¹⁴

It is thus evident that the same factors - internal maturation, influence of the physical milieu and social

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milieu - - although sometimes referred to by different names, are to be present in any explanation of the development of human behavior.

What the reader of Piaget should constantly bear in mind is the effort made by the author to organize a synthesis and an explanation of the whole of development in terms of laws, in this case the laws of equilibrium. This endeavor is certainly in line with the spirit of psychological investigation and can only result in bringing psychology closer to a goal which appears sometimes inaccessible, that of the reduction of human development and human behavior to a system of coherent laws.

FOOTNOTES

¹Youssef Mourad - l'Eveil de l'Intelligence; Etude de Psychologie Genetique et Comparee (Paris; Press es Universitaires) 1955.

²Jean Piaget: Psychologie de l'Intelligence. (Paris: Armand Colin) 1952 p. 11-12

³Ibid. p. 12

⁴Ibid. p. 12

⁵Ibid. p. 12

Jean Piaget: Psychologie de l'Intelligence (Paris: Armand Colin, 1952) p. 12

Ibid. p. 13

Ibid. p. 13-14

Ibid. p. 14

Jean Piaget: La Naissance de l'Intelligence Chez l'Enfant (Paris: Delachaux and Niestle S.A., 1948) p. 13-14

Jean Piaget: Psychologie de l'Intelligence (Paris: Armand Colin, 1952) p. 17

Ibid. p. 10-11

Ibid. p. 119

Jean Piaget: Bulletin de Psychologie, Decembre, 1952, Tome VI p. 5

Equilibre Et Structures D'Ensemble

S E C O N D P A R T

CHARTS OF THE STAGES OF DEVELOPMENT OF THE
SENSORI-MOTOR INTELLIGENCE ACCORDING TO
PIAGET AND GESELL

- A. Development of Intelligence.
- B. Development of Spatial Field.
- C. Development of the Notion of Object
- D. Stages of Development according to Gesell

st: Stage I: 0-1 month. STAGE OF THE REFLEX ACTIVITY.

The first stage is essentially that of the reflex, this being said with-
eliminating entirely some reactions involving certain activity of the cortex.

What is important here, for Piaget, is the fact that many reflexes of
new born play an important role in the construction of certain ulterior
forms of behavior. They lay the foundation for a more complex form of behavior
which will later transcend the reflex without ever doing away entirely with it.

He observes closely the reflex of sucking and concludes to the following
as in relation to his general framework of explanation:

1. In terms of accommodation, the reflex, (already present at birth)
achieves its own perfecting by practice, and coordination is
also greatly improved. With the contact of the proper object,
(in this case the breast or the bottle) a certain differentiation
is also achieved from the original indiscrimination of its prior
activity.
2. In terms of assimilation it is possible to discern what Piaget
calls a "motor recognition" which enables the child to incorporate
later on new objects within the well regulated activity of the
reflex, thus extending its functional activity. It becomes then
a scheme reflex, that is "action which can be repeated and can
also integrate new elements." For Piaget the sucking act of this
stage already constitutes psychic organization, because sooner or
later it reveals a meaning (sucking for its own sake, sucking as
a pacifier, sucking for food.) and also because it is accompanied
by direct searching for its proper object.

To be complete, one must add that Piaget is very much aware of the
limitation of this study; for some reflexes disappear without ever organizing
themselves, such as the Babinski reflex. Others have no influence whatsoever
on the mental development.

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STAGES IN THE DEVELOPMENT OF THE SPATIAL FIELD

: Stage I-II - 0;1 - - 0;4 (0;6)

SPACE CONSISTS OF HETEROGENEOUS AND PURELY PRACTICAL GROUPS; EACH PERCEPTUAL BUNDLE CONSTITUTES SPACE.

1. At this stage no conception of spatial relationship independent of acts.
2. Space is only a practical schemata of mouth or hands and not a property of the things themselves.
3. There are no permanent spatial relations among things any more than there are permanent things in space.
4. Even in simple accommodations to depth, binocular convergence is not systematic.
5. There may be a tactile depth due to movements of the hand in relation to objects felt or grasped. But this remains purely practical and does not correspond to any visual perception.
6. The foregoing is true also of auditory space, and even more so of postural space, that is, of the equilibrium of the body itself.

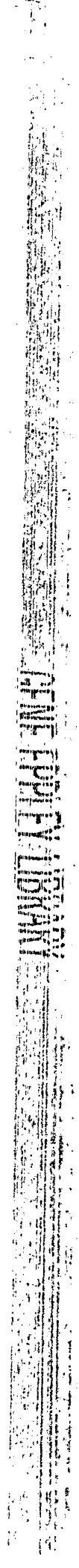
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DEVELOPMENT OF OBJECT-CONCEPT

get: Stage I and II 0;0 - 0;4

These first two stages, those of reflexes and earliest habits, are characterized by the fact that there is no special behavior related to vanished objects.

- a. The child quickly recognizes certain stable groups
- b. Either the image which disappears immediately sinks into oblivion, or it is regretted, desired, and again expected.
- c. The only behavior pattern utilized to rediscover it is the mere repetition of earlier accommodations.



Stage I: 0-1 month

STABILIZATION OF THE VEGETATIVE FUNCTIONS

Gesell speaks of the "physiological adjustment" as requiring at least six weeks time. Even at the end of that time, the lack of organization of the nervous network is still responsible for a certain instability in the comportment of the newborn. The development of the reflexes is definitely considered as a condition for the growth of the later patterns of behavior." On the motor system, Gesell is particularly interested in the tonic-neck-reflex, as "part of the total reaction system."

In terms of adaptive behavior, Gesell emphasizes the role and activity of the eyes and mouth muscles. It is true that a difficulty may arise when one tries to label these activities as "reflexive, deliberate or conscious." Whatever they may be, they still represent, in the eyes of Gesell a "form of adaptive behavior."

Of importance to Gesell is the development of the visual field which is gradually gained strength through periods of exercises involving "long spells of mobilization and fixation." At four weeks for Gesell, "the capacity of the eyes exceeds that of the hands." Ocular prehension precedes manual prehension." Equally a beginning of social reaction including primitive response to the voice or to the pleasure of being held in someone's arms.

The outlook of Gesell is definitely more global than the one of Piaget, as he obviously starts from the same point of departure: that is consideration of the neurophysiological maturation and utilization of the reflexes to achieve adaptive

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Stage II - End of first month up to 4½ months

FIRST ACQUIRED ADAPTATIONS AND PRIMARY CIRCULAR REACTIONS.

This period is characterized for Piaget by the beginning of stable meanings and of primary circular reactions. A primary circular reaction may be defined as an acquired functional exercise which prolongs the exercise and leads to the preservation or the rediscovery of new results. A circular reaction involves:

1. Accommodation: The hereditary reflex instrument achieves effective utilization in the course of exercise in which experience is a factor. Circular reaction is accommodation to the extent that it realizes a new coordination which is not present in the hereditary reflex mechanisms. Sucking the thumb is not a hereditary reflex.
2. Assimilation: At first the objects are assimilated to the activity, but functional assimilation gradually develops into objectivity. Circular reaction is assimilation to the extent that it constitutes a functional use prolonging the assimilation reflex. To suck the tongue or the thumb is to assimilate these objects to the very activity of sucking.

At this stage the visual schemata are organized among themselves and into more or less well-coordinated totalities. But the important coordination at this stage is the coordination of the visual schemata with other modalities: vision with hearing, vision with sucking, vision with prehension.

The final organization of this stage consists in a reciprocal adaptation of the schemata, with mutual accommodation and collateral assimilation.

B

1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960

1

Gesell: Stage II 0;1 - 0;9

Here we find an apparent difference between the lines of demarcation of Gesell and Piaget. Gesell would appear to include in one single stage the period extending from the first month to the ninth. Considered in its totality this stage would include the following features:

Intense exploration of the environment, at first primarily visual (until about six months) then tactile and manipulative. This of course implies a conquest, in the sitting position, of the immediate surrounding physical environment. The form of play which occurs is purely functional. We equally notice a broadening of the social exchanges.

We propose however that this stage be broken down into the following chronological subdivisions:

0;1 - 0;4

Sixteen weeks is a turning point. "It ushers in a period of rapid cortical organization which brings about important transformations and new correlations of sensori-motor behavior, particularly in the coordination of ocular and manual reaction."

Motor: Greater control and relationship between the arms, the hands, the eyes. "The dozen directing muscles of the eyes have made enormous gains in the preceding twelve weeks . . . the grosser muscles of posture and prehension are becoming obedient to them." He likes to look around.

Adaptive: Inspection of his own hands; looks intently at rattle; hand moves towards the rattle as to engage in manipulation.

VISUAL MOTOR COORDINATION

Beginning of secondary circular reactions; that is relative to manipulation of objects.

Beginning of the qualitative space coordination to the heterogeneous environment, but without inquiry about the objects that have disappeared; beginning of differentiation between purpose and means, but at the moment of acquiring a new conduct, the purposes are not yet foreseen by the subject.

The development of this stage is due:

1. To neurological maturation.
2. To exercise.

It includes: Localization in the visual field; infant bring object into focal range.
coordination of prehension and vision especially for close space relationship.

The secondary circular reactions are about the external objects. The infant picks up an object, brings it into the focal field, shakes it, grabs with one hand and hits it with the other, rubs it, pulls on hanging objects. The difference with the primary reactions is in the complexity of the reactions since they involve an effort of reproduction and repetition on the objects themselves.

SIGNINGS OF DIFFERENTIATION BETWEEN PURPOSE AND MEANS:

a. The repetition proper to the former stage knew how to make the machine function without distinguishing between the transitive terms and the final term of the act.

Now, the effort to rediscover a propitious gesture will lead the subject, after the event, to distinguish in his action the transitive terms of "means" and a final term or "end". It is from this time that we may speak of "intention" and of a reversal in acquiring consciousness of the act.

b. For Piaget the last patterns constitute a transition between habit and the act of intelligence. (in the intelligent act, there is a foreseen goal and research for the appropriate means; in the habit the subject does not differentiate between the goals and the means.)

However if these conducts announce intelligence they do not, in themselves constitute true acts of intelligence. For "to pull a chain, to shake an object is a higher pattern of behavior, than simply grasping an object one sees.

But, because the relations used to get the end have been discovered by chance, and because the process of repetition is sufficient to explain it without any further

COORDINATION OF DIFFERENT PRACTICAL GROUPS AMONG
THEMSELVES.

Buccal space coordinated with visual space

Visual space coordinated with tactile and kinesthetic space.

The essential factor in such coordination is the development of PREHENSION.

- a. First prehension is coordinated with space.
- b. Then tactile-kinesthetic space, visual and buccal space begin to form in aggregate, to which other forms of spatial accommodation will gradually be added.

Two essential acquisitions result from the development of PREHENSION:

1. Learning to use his hands to act upon things, the child begins to make use of the relationship of things among themselves in contrast to the simple relations of thing with the functioning of organs.
 - a. This is a definition of secondary circular reactions which dominate this stage.
 - b. It is important because it leads the subject to become interested in the spatial relationship which unite perceived objects to each other
2. Since through prehension the child intervenes in the detail of displacements and of spatial connections, he begins to watch himself act, he observes his hands, his arms, and the contacts of his hands with the objects grasped.
 - a. Henceforth he relates certain movements of his own to those of the environment.
 - b. A new repercussion of prehension on the group of displacements.

SECONDARY CIRCULAR REACTIONS

Behavior patterns are those which are observed between beginning of prehension of things seen and the beginning of active search for vanished objects.

Five types of behavior patterns manifested:

1. Visual accommodation to rapid movements which merely extends those of the second stage.
2. Interrupted prehension
3. Differed circular reaction.
 - a. Permanence peculiar to object at this stage is neither substantial nor truly spatial.
 - b. Permanence depends upon the action itself and the object merely constitutes that which is at the disposal of action.
4. The reconstruction of an invisible whole from a visible fraction.
5. The removal of obstacles preventing perception, which fulfills those of the fourth stage.

There is still inconsistency:

1. The child tends to attribute a certain visual permanence to images extending his accommodation of sight.
2. Yet he tends to rediscover what falls from his hands, and thus to form a sort of tactile object.
3. However he does not yet try to grasp an object that disappears from his visual field without having been in contact with his hands shortly before

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sell: 0;4 - 0;7th month (0;9)

tor: He sits alone; prehensory approach is less bilateral; ocular adjustments are more advanced than manual adjustments.

aptative: Eyes and hands function in close interaction, each reinforcing and guiding the other. Directly he sees a cube, he grasps it, senses surface and edges as he clenches it, brings it to his mouth, where he feels its qualities anew, withdraws it, looks at it on withdrawal, rotates it while he looks, looks while he rotates it, restores it to his mouth, withdraws it again for inspection.

Perceptual-manipulatory behavior is highly active . . it is dynamic activity, fused with exploitiveness. If you wish, it is intelligence.

SEARCH FOR AN APPROPRIATE MEANS TO REACH A GOAL DIFFERENTIATED AT THE BEGINNING.

In the preceding stage there was an attempt to repeat or prolong an effect discovered by chance; now there is the pursuit of an end not immediately attainable through the use of different intermediate means taken from familiar schemata.

There is a beginning of intelligence; the child tries to apply prior schemata to new situations, for example to reach a far away object, or an object separated from him by an obstacle. He either pushes the obstacles, or use the hand of the adult. There is thus a goal at the beginning, and search for negative means (suppression of obstacles) or positive means, (utilization of intermediaries)

We have here a beginning of relationship on the sensori-motor level, not conceptual.

It is the dissociation of means and ends, due to intervening objects, which creates intention. Means previously used, (after being discovered by chance) are applied to new and untried situations.

Herein lies the first acts of intelligence, in that they are adjusted to the goal by a special accommodation, and distinct from:

1. Primary circular reactions: which were mere single acts and pure repetition.
2. Secondary circular reactions: which were mere reproductions of results discovered by chance.
3. The "procedures" of stage III which had no precise connection with the effect sought after.

At this stage, behavior is the result of the coordination of two schemata which were, up to this time, independent. (for instance the schema of "pulling the ring" coordinated with the schema of "grasping")

The schemata become "mobile", not only dissociating themselves, but also regrouping themselves.

This is the beginning of representation, that is, of the capacity to confer upon things a meaning before the action which the meaning permits. Representation here does not mean the capacity yet to evoke an absent object, by means of signs and symbols.) There is an attempt at this point, by virtue of a sort of generalizing assimilations, to make new object enter into each habitual schemata one by one; in other words, there is an attempt to "understand" by practical assimilation, rather than by comprehension; by acts rather than by words.

Behavior patterns of this stage constitute the functional equivalent of "definitions through use" so important to a child's verbal intelligence.

get: Stage IV - 0;9 - 0;12

THE TRANSITION FROM SUBJECTIVE TO OBJECTIVE GROUPS
AND THE DISCOVERY OF REVERSIBLE OPERATIONS.

This stage is characterized by the discovery of reversible operations, of the constant size of solids, and the perspective of relations of depth.

Characteristic of this stage is the acquisition of the concept of the reverse side of the object, and consequently of its constant shape.

There is now a very definite differentiation of change of position and change of state; child no longer confuses movements of an object with his own movements.

Now that there is in "near space" a concept of objects located behind others, there follows the interpretation, even in "distant space", of certain partial or total disappearances as being due to a sequence of planes according to the third dimension.

As yet there is no understanding of the relationship between subjective movement and movement of objects; no capability of performing movements of the whole.

No concept of one object placed upon another.

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ACTIVE SEARCH FOR THE VANISHED OBJECT, WITHOUT
TAKING ACCOUNT OF THE SEQUENCE OF VISIBLE DIS-
PLACEMENTS.

The beginning of this stage is marked by an essential acquisition: the child is no longer content to search for the vanished object when it is found in the extension of accommodation movements.

He searches even outside the perceptual field - behind screens interposed between the subject and the image perceived.

The discovery arises from the fact that the child begins to study displacement of objects: grasping them, shaking them, hiding them and finding them.

Thus he begins to coordinate visual and tactile permanence.

1. These discoveries do not yet mark the definite advent of object concept.
2. Experiments show that when the object disappeared successively in two or more distinct places, the child still confers on it a sort of absolute position.
3. An object is not yet a substantial thing remaining in a place to which it was moved, but a thing at disposal in the place where the action has made use of it.

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11: Stage III 0;9 - 1;3

Here again we find an over-extension in the time element of this stage. For Gesell, it would start approximately at the onset of the fortieth week, the end of the ninth month.

The general features are the following:

Gradual extension of the field of experiences through the conquest of deambulation; sharpening of comprehension; discriminative capacity in manipulation. Imitative behavior and games with the possibility of reciprocity in the roles. Sensibility in the presence of others.

At this stage we feel justified again to present the following subdivisions: these divisions should help us to a better understanding of the positions described:

Stage 0;9 - 0;12

A. Forty weeks marks a transition in the eyes of Gesell.

Motor: The neurological maturation which has gradually progressed in the cephalocaudal fashion has now completed the integration of the legs, fingers and feet. Sitting equilibrium is mastered. Prehension shows refinement; the index finger is quite adequate for probing, poking and plucking.

Adaptive: Due to the refinement of the technique of mastication and manipulation the world is discovered in its third dimension. Strong digital and visual interest in details. Capable of reaction in a successive and combinative way to two details or two objects. A dim sense of twoness, top bottom, side to side, even cause and effect.

"His appreciation of these relationships is primitive, ambiguous, equivocal, embryonic. It is in no sense conceptual; but it is active and denotes a remarkable advance toward that later form of intelligence which goes by the name of intellect and judgment."

Social Behavior:

Tend to imitate gestures.
Shows responsiveness to his own name.
Even understands NO NO.

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aget: Stage V 1; - 1;6

"OBJECTIVE" GROUPS, MARKING AN ESSENTIAL ADVANCE
IN THE CONSTRUCTION OF THE SPATIAL FIELD.

Marked by success in noting the sequential displacements of the things he seeks.

Awareness of position and equilibrium is apparent at this stage.

This stage marks the beginning of the concept of the relation of contents to container.

By establishing relations of positions and displacements among objects, the child begins to gain awareness of his own movements as displacements of a whole.

- a. As yet he does not place himself in relation to other bodies in a system of reciprocal relationships.
- b. But he purposely displaces himself in the direction of desired objects, and thus acquires the ability to elaborate groups more complex than before, especially in regard to depth.

aget: Stage V. 1;- - 1;6

OBJECTS ARE PERMANENT, INDIVIDUAL SUBSTANCES; BUT
THE CHILD CANNOT TAKE ACCOUNT OF CHANGES OF
POSITION, OUTSIDE THE FIELD OF DIRECT PERCEPTION.

The child learns to take account of the sequential displacements perceived in the visual field:

- a. He no longer searches for the object in a special position.
- b. He seeks only in the position resulting from the last visible displacement.
 1. To the extent that they bear upon visible displacement they reveal nascent geometric rationalism.
 2. This constitutes the new element peculiar to them.

The child remains incapable of making allowance for invisible displacements.

: Stage III 1; - 1;3

At this point Gesell recognizes that the twelve months old child is acting patterns which came into the picture at forty weeks." Characteristics one-year old extending to the fifteen months old:

MOTOR: Great desire to walk; can cruise with support. Prehensory patterns approaching adult facility. Has almost the capacity of voluntary release.

ADAPTIVE: Specialized perceptivity for the round hole. Geometrization of space, and ability to bring momentarily one object above another. Sensitiveness to imitation.

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INVENTION OF NEW MEANS THROUGH MENTAL COMBINATIONS.

The plans begin to be interiorized and the solution of certain problems with the arrest of action and sudden comprehension. The "practical group of movements" is generalized, englobing non perceptible movements.

This type of behavior pattern characterizes systematic intelligence, a moment when the awareness of relationship is advanced to permit a reasoned decision.

Given this rhythm, invention is comparable to "the application of familiar means to new situations". It operates by creative deduction and partakes of the processes of acquisition of the discovery of new means through active experimentation.

Henceforth there exists invention and no longer mere discovery; representation and no longer only sensori-motor groping. Representation, from the point of view of meanings and of intelligence in general, is not only predicated on the invention of new means through mental combinations" but on a series of other behavior patterns bearing witness to the existence of representative images necessary for evocation of absent object.

Thus the behavior patterns of the sixth stage are:

Mental combination schemata with the possibility of deduction surpassing actual experimentation, invention, representation and evocation by image symbols, so many characteristics marking the completion of sensori-motor intelligence and marking it henceforth as capable of entering the framework of language, to be transformed, with the aid of the social group, into REFLEXIVE INTELLIGENCE.

Accommodation is directed by two kinds of assimilation: "initial" schemata and "auxiliary" schemata which give meaning to the products of experience as functions of the goal of action. v.g. the string was regarded as an extension of the object; the tick is regarded as an instrument. The command of this tool possibly occurs through sudden mental construction at the level of systematic intelligence. It might be achieved by means of groping and active experimentation.

Accommodation characteristic of the discovery of new means operates through a series of cumulative attempts assimilated to each other, entailing the formation of a schema which assimilates to itself the ensemble of the situation (including little by little, visual elements)

aget: Stage VI 1;6 - 2

"REPRESENTATIVE GROUPS."

The child becomes capable of rediscovering a hidden object after several sequential displacements, even if some of these are effected outside the visual field.

1. Therefore there is representation of movements.

Two factors mark the progress of the sixth stage:

1. Representation of spatial in errelations; invention of detours.
 - a. His detours involve representation of spatial relationship among objects.
 - b. They also involve the representation of movements of the whole of the body proper.
 - c. There, he imagines himself as being "in" space, instead of considering himself as a privilege center whose displacements remain absolute.

2. Representation of displacements of body itself.

The dual representation of spatial relationships between objects and one's displacements referred to above is manifested in the acts of orientation which merely extend the behavior pattern of detours.

1. He is aware of such terms as "in fron of", "behind"

Through spatial representation and the capacity to elaborate representative groups, space is constituted for the first time as a motionless environment in which the subject himself is located.

IMAGE OF ABSENT OBJECTS AND THEIR DISPLACEMENTS.

The child becomes capable of constructing objects when the displacements are visible.

- a. This does not signify that this discovery is immediately generalized to include the whole universe.
- b. It simply means that the child succeeds in resolving problems raised in the course of preceding experiments.
- c. They are resolved by a new method; that of representation.

CONCLUSION REGARDING OBJECT FORMATION:

The object is no longer merely the extension of various accommodations as it during the first four stages.

The object is not merely permanent body in motion, whose movements have become dependent of the self, but only to the extent to which they have been perceived, in the fifth stage.

Instead, the object is now definitely freed from perception and action.

It now obeys autonomous laws of displacement.

- a. The object has acquired a new and final degree of liberty.
- b. The object now remains identical to itself whatever may be its invisible displacement

True representation begins only from the moment when the vanished object is displaced according to an itinerary which the subject may deduce but perceive.

During this stage, progress beyond the behavior patterns of the second stage is merely quantitative.

1. That which the child rediscovers is still only his initial position related to the object.
2. It is not that of the objects themselves in relation to each other.

all: Stage IV 1;3 - 2;6

CONQUEST OF DEAMBULATION IMPOSING MOTOR
ACTIVITY CONQUEST OF LANGUAGE.

This stage is extending over a period of more than one year; and for this reason, in the perspective of Gesell includes many features which will try to break down in a further analysis.

The basic characteristics are the following: constructive manipulation; coordination between words and acts. The child "thinks". But as he approaches 2;6 limit, the above equilibrium disappears and a critical period characterized by the dawdling and contradiction. First crisis of independence.

We offer the following break-down of this stage:

Stage IV - (1;6 - 2;0)

MOTOR: Better command of the legs.
Manual dexterity; two-cube tower; release mechanism still exaggerated.

ADAPTIVE: Has mastered a great number of geometrical relationships in his physical environment.
Perception of things would appear more individualized;
He has passed the stage of mere blotches.
Scope of attention more mature.
Vigorous interest in aggregates, developmental prerequisite for higher mathematics.
He knows what he is doing, and when he is doing it.

LANGUAGE: He perceives in others and communicates to others a wide range of emotional states: distress, pleasure, fear, rage.
Much of his emotional expression is highly egocentric. Although he obeys simple commands, he still "only partially distinguishes between himself and the things in which he is interested."

PERSONAL-SOCIAL: The egocentricity of this age is related to the social immaturity.
His negativism is part of his developmental sequence.

age IV (2;0 - 2;6)

Elaborate version of 1;6. Two years old is giving evidence that he is coming a "thinking animal"

MOTOR: Delight in muscular activity. Greater domestic acculturation.

ADAPTIVE: Finer perceptual discrimination.

Identifies pictures.

Senses oneness versus many and more.

Interdependence of motor and mental development:

He seems to think with his muscles.

Two often talks while he acts, and he also acts what he talks.

His developmental problem seems to be not so much to suit the action to the word, as to get the word more fully separated from the action. By using them together he manages to put them more asunder. This is the ubiquitous process of disengagement or "individuation" operating at a psych-motor level.

At eighteen months he pushed a chair about and climbed into it; this was an end in itself; at 24 months it becomes a mean to an end. He is a deductive reasoner, at least on a massive-muscle plane.

LANGUAGE: With the same sentence he expresses intention and action. He is quite likely to soliloquize. He is quite confused between present and past tenses. His highest intellectual achievement is perhaps his ability to form a negative judgment A IS NOT B.

PERSONAL-SOCIAL: Use of word "mine" with definite meaning. Very much self-centered. Social contacts are brief. Has not yet made distinction complete between himself and the others.

THIRD PART

COMPARATIVE EVALUATION

In the following pages we would like to bring out the important points of comparison between Piaget and Gesell's studies of the sensori-motor development, as summarized in the enclosed charts.

1. GROWTH GRADIENT VERSUS STAGE

In our expose of Gesell's basic concepts we have emphasized the fact that his study of the child development intends definitely to encompass all aspects of the said development, so as to gain a complete outlook. But more fundamental than the division he makes use of to present his facts - specifically the grouping under the headings: motor characteristics, adaptive behavior, language and personal-social behavior - is the notion of GROWTH GRADIENT he introduces to break open the mechanism of development.

What is then a GROWTH GRADIENT?

"It is a series of stages or degrees of maturity by which the child progresses toward a higher level of behavior."¹

Since Gesell is definitely interested in the developmental sequence, the growth gradient will then be made of the series of steps which the infant or child has to pass through in order to achieve a determined form of behavior.

Gesell explains the growth gradient of the PREHENSORY BEHAVIOR in these terms:

For example during the first year of life a baby acquires the ability to pick up objects. This is a very important part of his behavior equipment. It takes a long time to mature the muscle and neuron connections necessary for prompt and precise prehension. We can test these growing powers of prehension by placing a little red cube before a baby. At first he can "pick up" the cube only with his eyes, but not with his hands. Reduced to simplest terms this growth gradient runs as follows:

- 1-12 weeks - looks at cube.
- 2-20 weeks - looks and approaches.
- 3-24 weeks - looks and crudely grasps with whole hand.
- 4-26 weeks - looks and deftly grasps with fingers.
- 5-52 weeks - looks, grasps with forefinger and thumb and deftly releases.
- 6-15 months - looks, grasps, and releases to build a tower of two cubes.²

Growth gradients can thus be used to explain other forms of behavior such as reading behavior, acquisitive behavior, locomotive behavior, etc.

At a first glance these gradients appear to be nothing else but a detailed sequence of development joining a chrono-

logical age with a certain pattern of behavior. But a close scrutiny of several growth gradients, as proposed by Gesell, reveals certain definite characteristics which could be set as a group of rules regulating the growth gradients themselves.

1. Within a growth gradient one can see that each new pattern ALWAYS GROWS OUT OF THE OLD, and yet retains a connection with the old. In the sequence of development, the final pattern is a condensed culmination of all the growth that went before.

2. All gradients are subject to individual variations, with respect to age values, but THE SEQUENCE OF A GRADIENT TENDS TO REMAIN THE SAME FOR ALL CHILDREN IN SPITE OF SUCH VARIATIONS.

3. Once established by careful observations, the growth gradient can fulfill two purposes: it first can define the developmental characteristics of childhood in general; secondly, it can be used in reference to an individual to

determine the level of maturity he has achieved for the trait investigated. In fact it is quite like a map: it tells us where we are and where we are going. In Gesell's own words:

A growth gradient may tell us where he (child) has arrived and whither he is tending. By applying several gradients to their several fields of behavior, we get a better view of his total maturity. We may even get an indication of his strongest assets, and his characteristic liabilities if he has any. We know that there are many entirely normal variations in the chronological age at which school abilities are attained. We know that every child has a unique pattern of growth. And just because basic development proceeds in sequences which are nearly universal, the growth gradients help us to discover and to describe that unique pattern.³

Piaget's presentation, on the other hand, is forever associated to the notion of STAGE. We will attempt in the following to compare briefly the stage to the growth gradient.

A STAGE could be defined as a moment of development, characterized by a group of features woven together in a definite structure and constituting a typical and consistent mentality of an age level, although itself of a transitory nature. About the stages, as he conceives, then Piaget offers the following clarifications:

1. THE ORDER OF SUCCESSION OF THE STAGES IS CONSTANT,

while on the other hand the mean age which characterizes their

chronology may be retarded or accelerated by experience acquired as a result of the physical milieu and especially as a result of the actions of the social milieu. (education)

2. The constancy of the order of succession is due to THE INTEGRATIVE CHARACTER OF THE STAGES; for the acquisitions proper to a given stage are incorporated in the ones of the following stage. As for instance, the scheme of the permanent object, as acquired on the sensori-motor level, will constitute one of the elements of the ulterior notions of conservation of matter.

3. A stage could not be characterized by a juxtaposition of independent acquisitions: the authentic criterion of a stage is THE GLOBAL STRUCTURATION which enable us to reduce the various acquisitions to a single and same total system of which they constitute the derivations.

4. Thus conceived, any stage of development constitutes simultaneously a LEVEL OF ACHIEVEMENT in relation to the preceding stages and a PHASE OF PREPARATION in relation

to the following ones.

5. But the preparation of ulterior acquisitions may extend over more than one stage and there are different degrees of stability in the achievements. Thus it becomes necessary to distinguish in any sequence of stages THE PROCESSES OF FORMATION or genesis, and THE FINAL FORMS OF EQUILIBRIUM.

The latter only constitute the GLOBAL STRUCTURATION mentioned in paragraph three. The formative processes, on the other hand, are nothing else but the aspects of successive differentiations of such structures. In other words, they represent the differentiation from the previous structure and the preparation of the following one.

With these remarks in mind a second look at the chart summarizing Piaget's findings offers to the reader six major STAGES of the sensori-motor development. (Column A) For greater precision of exposition the development of the SPATIAL FIELD (Column C) is also presented within the

framework of the six stages. The total development then, as viewed by Piaget, could be envisaged as a triple structured spiral, the outer core being Column A, with the central cores B and C. All of them however represent a single and unique pattern of development: that of the sensori-motor intelligence.

The above analysis should have convinced us that there are quite a number of similitudes between the GROWTH GRADIENTS as organized by Gesell, and the STAGES as conceived by Piaget.

1. First of all, whatever formula we choose to represent the developmental sequences, the fact of the CONSTANCY OF THEIR SUCCESSION is warranted in both cases. We may point out here that both authors realize clearly that either the stage or the gradient are means of immobilizing temporarily a moving reality - that is LIFE - and that fluctuations, especially chronological ones are to be considered within their relative proportion. Age is not the criterion of the stage or the gradient: rather the proper exercise of the function

at a given moment of development is what the observer looks for.

2. A second feature, common to both psychologists, is that they equally emphasize the INTEGRATIVE character of the functions included within either a definite stage or gradient.

We are dealing here with consolidated patterns of behavior, not with a mere conglomeration of esoteric patterns. For Piaget looks for a "global structuration" while Gesell speaks of the "final pattern as a condensed culmination of all the growth that went before."

3. Thirdly it is obvious that any step of development observed in the growth gradient may represent what Piaget calls a "level of achievement" and a "phase of preparation" to the next step, and that in both cases it could be possible to distinguish within the framework of the stage or growth gradient "processus of formation and final forms of equilibrium."

Is there however any fundamental difference between these two methods of measuring and organizing the sequences of development?

It seems to us that the notion of stage is in one way more comprehensive than the one of growth gradient. For one thing it does not fragment the patterning of behavior as the gradient does, and it attempts to provide a more constructed explanation of behavior than the growth gradient does. Since both concepts rely heavily upon clinical observations there is no doubt that they are equally close to the patterning of behavior, as close as an observer can get.

However it would seem to us that from a theoretical point of view, and we should underline the term theoretical, the notion of stage as understood and exposed by Piaget represents a better attempt to crystallize the moments of "global structuration."

But this perfection has its counterpart when one is interested in formulating a diagnosis either in terms of advancement or retardation: in that case the growth gradient

with its multiple articulations may prove to be more useful.

It seems in fact that this is the very intention of Gesell

in formulating the gradients. For he writes:

Here again we would emphasize that the gradients are always relative and not absolute. They are not offered as norms of absolute ability, but as approximate norms of developmental sequence. The gradients will become an aid to child guidance only if they are used to locate the position of a child with respect to certain aspects of behavior in the total growth.⁴

A last problem: how did we come to compare stages with gradients? It is obvious from the charts that we had to reduce the findings of both authors to a common denominator.

We chose the STAGE UNIT for two reasons: the first and most important is of course the fact that GROWTH GRADIENTS can offer only a series of parallel charts of development which in turn have to be blended if one is to obtain a total picture of development.

And secondly, we can truly add that Gesell himself does not appear to be opposed to the organization of his findings into possible and suggested stages, although he does not seem to be preoccupied to provide the reader with definite

clues beyond chronological landmarks.

In view of the preceeding it is clear that the apparent differences between the two psychologists, in terms of age limits within one stage, should not lead to a very hot debate. For if at first sight, Piaget offers six stages where Gesell has only four, a closer scrutiny reveals a closer proportion: for with the subdivisions of stages II, III, and IV of Gesell we come to a total of seven stages for Gesell, versus six for Piaget. This points out the fact that for Piaget as well as for Gesell, the important feature so far as the stages are concerned is their content rather than their span. The latter acquires a certain importance only in function of the various levels of maturation they present within the limits of their extension.

II.

We will now evaluate each of the stages in terms of similitudes and necessary differences in the findings or the conclusions.

STAGE ONE:

SIMILARITY: There is obviously a common agreement about the first stage, from the Point of view of content as well as for the length of time involved. For both extend the stage from 0 to four weeks of age, and both consider it as the stage of reflex activity.

DIFFERENCE: Piaget analyzes in detail the reflex of sucking with the hope of gaining through it an insight into the mechanism itself; that is an insight which would go beyond the external pattern of behavior. He succeeds in offering an interpretation which is directly in line with his future presentation of the development of intelligence. The patterning of the reflex itself is partially conclusive for him as being not only the foundation of ulterior behavior, but as showing an organization not altogether alien to that of higher processes of comprehension.

Gesell has a Global outlook, and although he also emphasizes the organization of behavior on the reflex level

one might say that he is not especially preoccupied with the task of finding a definite type or patterning in that organization. He appears to be satisfied with the fact that it takes place.

STAGE TWO:

We find here what may appear to be our first differences between Piaget's and Gesell's study of the sensori-motor intelligence, at least in terms of the presentation of their findings.

Piaget distinguishes two stages whereas Gesell sees only one: Piaget's stage II extends from the end of the first month until about the middle of the fourth. It is followed by stage III which extends from the fourth and a half month to the ninth month.

Viewed in its totality the stage II of Gesell covers the entire time of Piaget's stage II and III. But we felt justified, however, in terms of the content and maturation involved here, to break down Gesell's stage II into two

subdivisions. The result of such a division has the advantage of levelling off this apparent difference both in terms of content and in terms of age limits.

SIMILITUDE:

For both authors neurological maturation is the most important feature; it is really the key factor explaining the development occurring during these eight months. For both authors the cortical organization of the four month old baby is to be understood as the fundamental necessity behind the new patterning of behavior.

The introduction by Piaget of "primary and secondary circular reactions" should not confuse us, even if Gesell does not refer to them by words. For Gesell's description of the content of the patterns of behavior is about the same as Piaget's.

1. Visual and manual coordination (4-9 Piaget)
(4-7-9 Gesell)
2. Localization in the visual field.

Acknowledged by both.

Whereas Piaget speaks in the III stage of "beginnings of differentiation between the end and the means," Gesell describes the same in different words: "manipulatory behavior is highly active - it is dynamic activity fused with exploitiveness."

DIFFERENCE:

At the end of the ninth month Gesell seems to be inclined to discover already what is to be referred to as intelligence. After describing the activity of the child as quoted above he concludes: "If you wish, it is intelligence."

Piaget is more reticent; while he admits that the child has gone beyond the simple habit, and although he is willing to acknowledge the progress made, due to the interplay and integration of all the schemata involved, he does not think that the conducts of this age constitute in themselves true acts of intelligence. His argument is that a simpler explanation is in line; mainly the force of the process of repetition itself. But although Gesell does not elaborate upon what he

means exactly by intelligence at this point of the development we feel rather secure in thinking that his point of view is not significantly different from that of Piaget, and that the use of the verb "wish" in the sentence quoted stands rather for "futuraity" than actual presence.

STAGE III

With the organization of what Gesell seems to consider the third stage, the chronological overlapping starts to burst at the seams.

While Stage IV for Piaget extends from the ninth to the twelfth month, Gesell's Stage III extends from the ninth month to the fifteen month. And even with the proposed subdivision into 09 months - 12 months and 12 months to 15 months, we find that in order to compare the two authors the fifth stage of Piaget has to be included. But this age itself extends from the twelfth month to the eighteenth month, thus three months further in time than Gesell's whole third stage. We have mentioned this for the record, for the

similarities in content contribute to level these chronological differences.

Piaget IV 09: - 12

Beginning of intelligence. Sensori-motor types of relationships; not conceptual yet. Understanding of the sensori-motor level, within the limits of the schemata. Acquisition of the concept of the reverse side of the object with relation of depth and near space.

Gesell 09: - 12

Advance in development of intelligence; not conceptual but active. Sensori-motor types of relationships: bottom, side, oneness, cause and effect. "Remarkable advance towards that later form of intelligence which goes by the name of intellect.

Stage V 1 - 1;6

Mechanism of empirical intelligence. Object is detached from the activity, and exists of its own right. Successful in noting displacements of object and self.

Gesell: 1 - 1;3

Consider that period as a perfecting of earlier forms of development. Object is also independent from activity. Geometrization of space.

Here again we must point out the fact that differences, if there are any, would be more in the extend of the analysis of the patterning of behavior than is the content of the stages.

STAGE IV

We find here the same chronological overlapping as in stage III. Gesell extends his stage up to two years and six months, while Piaget stops at two. The reason for this difference may be in the fact that Piaget is concerned mainly with the development of the sensori-motor intelligence which reaches its peak at that time; while Gesell views the growth process as a total unit which carries him through the first five years of life.

So, in order to make the parallel easier we have subdivided Gesell's stage in two parts: the first from one year and three months up to two years old, the second extending from two years to two years and a half.

Within the limits of Gesell's first division which corresponds to Piaget's stage VI we find a close similarity

in their exposition of the child's development.

Piaget: 1;6 - 24

Gesell: 1;3 - 24

Systematic intelligence. "Aware-
ness of relation advanced to per-
mit a reasoned prevision. Cre-
ative deduction.

The child thinks; He shows
constructive manipulation.

He knows what he is doing
and when he is doing it.

He is a deductive reasoner,

at least on a massive plane.

This brief review of the six stages and their content should be sufficient to establish the fact that Piaget and Gesell, although sometimes using different expressions, speak the same language. The identity of their findings, as well as the more than accidental similarity in the stating of their conclusions, is a sufficient proof of it. It is quite true that their original preoccupations may not have been the same; and that for instance, from the moment he started, Piaget was bent upon unravelling the hidden mechanisms of early intelligent behavior. It remains that both observe the same develop-

ment and reach a high degree of concord in their conclusions even though Gesell was studying the growth process on all fronts at once.

FOOTNOTES

¹Arnold Gesell and Frances L. Ilg; The Child From Five to Ten.

(New York: Harper and Brothers, 1946) p. 20.

²Ibid. p. 21.

³Ibid. p. 29.

⁴Ibid. p. 6.

C O N C L U S I O N

In this thesis we have endeavored to present the basic concepts which underlie the approaches of Gesell and Piaget to child development.

We have pointed out that Gesell considers GROWTH to be definitely the key concept. It is the focal feature of his understanding of the child's gradual conquest of the world. Gesell's factual presentation of that development covers all fronts at once, and leaves the reader with a panoramic view which can hardly be equalled.

Piaget, on the other hand, considers development, and particularly the development of intelligence, as an adaptive function. He makes a definite effort to encircle the processes of intellectual development in the web of four concepts which are the core of his outlook on reality as a biologist: namely those of ADAPTATION achieved through the processes of ASSIMILATION and ACCOMMODATION to reality; which results in an overall ORGANIZATION. However because his analysis is mainly centered

on the development of intelligence, the reader cannot help thinking that some aspects of the human evolution have purposely been left aside.

In the second part of our study we have presented a series of charts offering the basic factual contents which the two authors have gathered from their observations of the first two years of life. These charts should unfold in a sweeping view the data necessary to the reader as he proceeds into the comparative evaluation of the material.

In the third part devoted to the evaluation of Piaget and Gesell's findings we have discussed the two standards of measurement - STAGE VERSUS GROWTH GRADIENT - and pointed out how they can fundamentally be reduced to a common denominator. However, we had to choose one unit of measurement. Thus, we have followed Piaget's notion of STAGE and tried to incorporate Gesell's findings into that framework. The reason for that attempt is, of course, the fact that the GROWTH GRADIENT as conceived and exposed by Gesell, although very adequate when applied to the development

of a single function - that of feeding or walking, for example - is, in our opinion less useful, when applied to the human development as a whole. We would like to add that although the age brackets are not as important as they may appear at first sight, we have made use of them so that the reader would have a second point of reference.

The comparative study of the stages one by one led us to discover a great number of similarities in the two authors. To those already mentioned we would like to add the following ones which in our mind constitutes the basic points on which both authors agree.

1. Both agree that NEUROLOGICAL MATURATION is definitely the fundamental underlying factor of all development during the first two years of life, for the stimulation of the environment can have a beneficial influence only if the organism develops according to the present pattern of the species.

2. The sequences of development, they both agree, take place through the gradual integration of various patterns of behavior (visual, prehensory, auditory, deambulatory) into complex

schemata which gradually encircle the whole of reality.

3. Both acknowledge that the various categories of Space, TIME, ONENESS, as well as the PROCESS OF OBJECTIVATION OF THE UNIVERSE are not "a Priori" but are gradually elaborated through the organization of more complex forms of sensori-motor activity, and are thus necessarily dependent upon the proper development and interplay of the various schemata - visual, prehensory, manipulatory, deambulatory.

4. Finally both recognize the existence of what they label SENSORI-MOTOR INTELLIGENCE, whose roots are those of life itself, but which gradually emerges, not as independent units pre-existing before any development, but as an ORGANIZING AND ORGANIZED factor whose extension will eventually encompass the totality of behavior.

We should add that such a form of intelligence is definitely on the practical level; the passage to conceptualization will involve a complete reorganization of the structures achieved without however implying their destruction.

However in spite of these fundamental agreements we cannot

overlook the following essential differences.

1. The preoccupations of Piaget are definitely centered on the development of intelligence while Gesell tries to encompass the whole of behavior. For instance, the development of social behavior in the early years is never considered formally by Piaget as it is done by Gesell.

2. The conceptual framework of Piaget is more closely knit than the single key concept of growth chosen by Gesell.

3. As a psychologist of intelligence Piaget gathers all of his observations and makes use of them to evaluate the various theories of intelligence as found in the last part of The Origins of Intelligence in Children. Gesell has no such synthesis.

We feel however that these differences do not seriously undermine the value of the results achieved by both authors; they should rather contribute to strengthen the validity of their basic concordance.

Omaha, Nebraska

June, 1958

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