> inconscient radical pour le situer dans un "univers", si pratique et si peu "réfléchi" que demeure ce dernier.[17]

Now just as the distinction between the two poles: self and the universe, grows more distinct, there still remains a certain degree of confusion surrounding each pole considered individually.

Within the self: action, representation, thought

Recall that the predominant characteristic of the preoperational period is that of representation. Representation, first in the form of play and imitation which will eventually result in the formation of a mental image during the intuitive period and secondly in the use of conventional language.[18] Now both of these provide the child with a certain capacity and a certain limitation in meeting reality.

In the early stages of the preoperational period (i.e., the symbolic period) the subject continues to tend toward activity. As a result play (an excess of assimilation) and imitation (an excess of accommodation) predominate. The symbols used by the child are often very personal. For example, a stone on a box may represent a cat on a wall, or a child might say "Look, I am a church".[19] However, it is precisely the ability to realize that one thing might symbolize another that indicates he is beginning to differentiate between simple practical activity and symbolic function. Thus representation at this period reaches its highest development in the formation of a mental image.[20] It is with this structure that the child faces reality.

---

[17] Ibid.

[18] The preoperational period (2 - 7 years) is sub-divided into two parts: the symbolic period (2 - 4 years) and the intuitive period (5 - 7 years).

[19] La formation du symbole, pp. 295-296.

[20] See Part II, Chapter 2, footnotes 49 and 50.

With the advent of language (i.e., the use of arbitrary signs based on convention[21]) the child is confronted with a certain domain wherein differentiation and coordination must again take place: his private world and the world of other men.[22] Granted that he has already distinguished, to some degree, between things and people and his own place in the world of things, yet he has never distinguished his point of view from that of another. Up to this time this area has remained global as can be shown by numerous experiments of which four shall be cited. First, Piaget presented a child with the following material — cardboard mountains, trees, river, etc., set upon a small square table. The child was asked to pick from a series of pictures the view the doll would have from such and such a point as the doll moved around the table.[23] The child, dominated by his own point of view, inevitably selected only the view that he saw even though he himself had made the actual tour of the table. Second, a child who walked daily to nursery school, a distance of a four or five minute walk, could tell the experimenter everything he saw along the way. But when presented with the same materials in miniature three-dimensional forms he was unable to reconstruct the situation.[24] Why? Because he could not liberate himself from his practical activity to reconstruct this activity in thought and hence take a step toward objectivity. The third example is drawn from the experience of children working or playing together. Each child takes his turn to speak but in reality it is only to himself since he

---

[21]For a discussion of index, signal, symbol, and sign see La formation du symbole, pp. 287 ff.; La psychologie de l'intelligence, pp. 148-150.

[22]La construction du réel, pp. 317-318.

[23]La psychologie de l'intelligence, p. 161; cf. La construction du réel, p. 320.

[24]La psychologie de l'enfant, p. 74.

is totally unaware that others are not listening. This phenomenon Piaget terms the "collective monologue"[25]. The last example to indicate that the young child cannot distinguish his view from another person's is represented in the way young children play games. There are no ground rules. Each child plays independently of all others.[26] Thus the child during this stage is not capable of social life since he cannot distinguish between the whole social group and himself and others forming integral parts.[27]

Return now to a consideration of the mental image, the most developed structure with which the preoperational child is equipped to face reality. The image is a static, particular, concrete representation of an object or a given situation. Piaget calls the image a preconcept for two reasons: absence of identity of a given individual on one hand, and the absence of a class on the other.[28] Thus the preconcept remains midway between an individual and the general class and oscillates continually between these two. The reason for such a situation is found in the fact that assimilation and accommodation have not as yet reached a state of equilibrium in this domain.

> ... le préconcept étant assimilation à un objet privilégié, sans accommodation généralisée à tous, l'accommodation à cet objet, lorsque la pensée porte sur les autres, se prolonge alors nécessairement en image, celle-ci intervenant à titre de

---

[25]Cf. La construction du réel, p. 318; cf. Six études de psychologie, p. 39.

[26]La formation du symbole, pp. 149 ff.

[27]Ibid., p. 238; cf. La construction du réel, p. 318.

[28]Ibid., p. 240.

> support nécessaire de l'assimilation, donc de signifiant privilégié et en partie de substitut.[29]

Because of the very nature of the structure with which he has to work the child cannot make the necessary distinctions which would solve the problems facing him. He finds it difficult to distinguish certain things from one another as in the case of number and the space occupied, as well as recognizing different aspects of the same reality (for example: quantity and configuration, length and position).[30] Likewise he is unable to integrate the whole and the part and to make an ordered series.

Now despite the limitations of this period there has been a certain reduction of globalism and confusion. Consider the following.

First, the subject begins to recognize the difference between practical activity and the mental image, but he has not, as yet, coordinated them perfectly since he is unable to reproduce in thought what has transpired in reality. Thus Piaget says the child is always more advanced in the logic of action than in the logic of thought.[31]

Secondly, the child has a certain grasp of his own efficient causality as distinct from external physical causality. However his notion is still limited since he attributes human qualities to all causes (i.e., a kind of "artificialisme"). For example, "Les adultes sont là pour 'nous soigner', les animaux pour nous rendre

---

[29] Ibid., p. 243.

[30] The distinction between the invariant and the conditions under which it may be found has been made by Dr. G. Noelting. Experiments revealing these areas of confusion shall be presented in the following section of this chapter when discussing the transition from confusion to differentiation and coordination.

[31] Six études de psychologie, p. 39.

service, les astres pour nous chauffer et nous éclairer" ... etc.[32] Together with this "artificialisme" corresponds an "animisme" "qui prête à toute chose la volonté de jouer son rôle, la force et la conscience juste nécessaires pour agir régulièrement".[33] The child, likewise, has difficulty distinguishing between efficient and final causality. Inevitably, when one asks a preoperational child to define he begins with the words "C'est pour ..."[34]

Thirdly, he is no longer primarily interested in establishing a relationship between his body and the milieu but in recognizing relationships between one thing and another or between various aspects of the same thing.

As the self sees the world: difference among things, different aspects of the same thing

If one claims that the reason for the child's inability to dispel the globalism and confusion surrounding things is due to the nature of the structure with which he has to work (i.e., the mental image), then the question immediately arises: whether the advent of concrete operations with its characteristic of reversibility and the notion of an invariant suffice to reduce all globalism and confusion to clarity and coordination. Piaget replies in the negative. Experimentation indicates that in some areas the child will be capable of coordination and differentiation while other areas escape him and remain to be resolved during the formal operational period.

The area of success is that area which was a major source of difficulty for the preoperational child. With the constitution of the invariant and the reversibility

---

[32]La construction du réel, p. 311.

[33]Ibid.

[34]Six études de psychologie, p. 39.

of an operation the child has the tools to establish equilibrium between the various aspects of the problem. He can distinguish between the transformations involved and the successive states resulting therefrom and can coordinate these parts into an organized and harmonious whole.

His grasp of number reveals that he is beginning to operate on an operation,[35] but not in the full formal perfection of the subsequent period. This is evident from the following experiment. A child was asked to arrange a certain group of elements into an ordered series from darkest to lightest (in color). The child accomplished the task quickly and efficiently. However when the same problem was transferred to a purely verbal plane (i.e., propositions were substituted for things) such as Edith is fairer than Suzanne, Edith is darker than Lily, who is the darkest of the three?[36], the child was totally incapable of solving the problem. Why? Because he was still manipulating concrete reality. Granted that he can unite, separate, and order, his point of departure is in the real; he works primarily on things and not on propositions. To push the observations even further the child has not distinguished the content from the form.

> En bref, les premières structures concrètes reposent toutes sur des opérations de classes et de relations (mais sans épuiser la logique des classes ni celle des relations) ... Leur fonction essentielle consiste à organiser, l'un après l'autre, les divers domaines de l'expérience, mais ... sans qu'il y ait encore de différentiation complète entre le contenu et la forme.[37]

---

[35] La psychologie de l'intelligence, p. 177 ff

[36] Ibid., p. 178.

[37] Six études de psychologie, pp. 142-143.

Thus, Piaget claims, the notion of the invariant applies only in certain areas and it will gradually "thaw-out"[38] so as to apply both in the real and the hypothetical order at the term of mental development. To illustrate: during the concrete operational period the child can distinguish number from plurality yet proportion escapes him; likewise he can distinguish and coordinate quantity and configuration, however weight and volume only appear later;[39] again, classification and seriation liberate the child from figurative collections while the notions of permutations and combinations are beyond his reach. The very fact that he still operates on concrete things prohibits him from grasping the logic of propositions and from formulating hypotheses.

The formal operational period marks the culmination of mental development. There is no longer any trace of globalism and confusion either on the side of the subject or in his view of reality. Operating on operations affords the possibility of harmonizing the real and the possible, of proceeding from hypotheses to experiential verification, of integrating all transformations in the real order under the original INRC model of Piaget. Having distinguished between content and form enables one to reflect on his own activity so that during this period "la raison présente à la fois une organisation formelle des notions qu'elle utilise et une adaptation de ces notions au réel – organisation et adaptation d'ailleurs inséparables".[40] It is a study of the rules which are followed once these ideas have been established that brings Piaget's

---

[38] La psychologie de l'intelligence, p. 166.

[39] Ibid., pp. 175-176; cf. Six études de psychologie, p. 140; La psychologie de l'enfant, p. 75.

[40] La naissance de l'intelligence, pp. 358-359.

theory into contact with modern symbolic logic. At this point, he claims, we are ready to investigate the axiomatics of reason, i.e., how these structures, which he has followed in their developmental stage, operate once they are fully established.

STEPS IN THE TRANSITION FROM CONFUSION TO DISTINCTNESS

This second section will discuss the general phases in the transition from globalism and confusion toward differentiation and correlative coordination. In the light of the foregoing it is not surprising that Piaget considers the preoperational, the concrete and formal operational periods as three phases of the overall process of differentiation and coordination. The passage begins with failure to resolve the situation (which Piaget terms the period of organization or preparation) through the transitional stage (i.e., the concrete operational period wherein some measure of differentiation and coordination is accomplished) to success (i.e., the formal operational period where all aspects, including the real and the possible, are differentiated and coordinated).

> Si nous envisageons ... la très longue période qui conduit de 2-3 à 11-12 ans, au lieu de séparer une période pré-opératoire jusque vers 7-8 ans de la période ultérieure des opérations concrètes, c'est que la première de ces deux grandes phases, tout en durant 4 ou 5 ans, n'est en fait qu'une période d'organisation et de préparation, ... tandis que la période de 7-8 à 11-12 ans est celle de l'achèvement des opérations concrètes. ... Après quoi seulement une nouvelle période opératoire, ... atteignant son point d'équilibre vers 14-15 ans, permet de parachever les constructions encore limitées et partiellement lacunaires propres aux opérations concrètes.[41]

---

[41] La psychologie de l'enfant, pp. 75-76.

Now these same three steps: failure, transition, success apply equally to the transition from any one period to another. Hence by focusing one's attention on the passage from one particular period to another should provide a better insight into the mechanisms involved. We have chosen to examine the passage from the pre-operational period to the concrete operational period for three reasons. First, it is universally recognized as the area wherein Piaget has done his greatest work.[42] Secondly, this period marks the transition from the level of action to the level of thought properly speaking. Thirdly, both the structural invariant (i.e., notion of conservation) and the functional invariant (i.e., a reversible operation) are developed at this time, which mark the very criterion for operational thought.[43] To this end four experiments shall be cited.

The first experiment concerns the formation of the most fundamental of all the invariants — quantity. Once this notion has been grasped the subject can recognize conservation in other areas which enables him to classify, put into series and to count. The experiment takes various steps. The young child (4-5 years old) is confronted with two balls (A and B) of plasticine of equal quantity.[44] Ball B is then transformed into a pancake before the child and he is then asked if Balls A and B have the same amount. He will reply in the negative by saying: "No, it (Ball B) has more because it is flatter" or "No, there is less here (Ball B) because it is thinner". Once B is refashioned into a ball the child will again affirm the equality of A and B.

---

[42] Thought in the Young Child, pp. 169-170.

[43] Traité, p. 119; La Psychologie de l'enfant, p. 77.

[44] The experiment is developed at length in Le développement des quantités chez l'enfant, p. 7-23.

Yet he will deny the equality when B is transformed into a sausage or divided into several small pieces.

Piaget makes the following observation upon such reasoning. Since the child has only a mental image with which to meet the situation it prohibits him from taking into account any transformations. In fact for the child at this period, any transformation modifies all the given data of a problem.[45] Since he is fixed on the successive states of the object as well as centering on one dimension or factor at a time, the child will unconsciously contradict himself. When B was refashioned into a ball one realizes that his judgment as to equality was based on a perceptional similarity only. Thus Piaget says, "l'intuition reste phénoméniste, parce qu'imitant les contours du réel sans les corriger, et égocentrique, parce que constamment centrée en fonction de l'action du moment."[46] Because of this,

> elle (i.e., intuitive thought) manque, de la sorte, l'équilibre entre l'assimilation des choses aux schèmes de la pensée, et l'accommodation de ceux-ci à la réalité.[47]

During the transition period the child recognizes different dimensions successively. He realizes that contradiction will ensue if he reasons on one dimension at a time, however he is unable to resolve the problem. It is precisely this transition from a single centering (on one dimension) to two successive centerings that heralds the beginning of operations.[48] Once he can reason with respect to

---

[45] Traité, p. 119.

[46] La psychologie de l'intelligence, p. 165.

[47] Ibid.

[48] Ibid., p. 156-157.

both simultaneously then he deduces conservation. Because the two relations are still seen alternatively a true operation is not present. During this period, "il n'intervient donc qu'une sorte de régulation intuitive et non pas un mécanisme proprement opératoire."[49] It is only when the child can decentralize (i.e., recognize and coordinate all dimensions) that the invariant is formed which remains constant amid the various transformations.

The second experiment deals again with discontinuous quantity.[50] A row of red counters is placed before the child. He in turn is asked to make a similar row using blue counters. The child (4 - 5 years) will put down a line of counters which begins and ends in accordance with the red counters but may have a greater number of elements or a fewer number of elements contained therein. Why? Because he confuses the elements with the space occupied. He sees that the beginning and the end are aligned and reasons that the two rows are identical.

During the transitional period the preoperational child will align the counters in a one-to-one correspondence with the red counters. However this is only an optical or perceptual correspondence. Once the blue counters are spread further apart or drawn very closely together the child will argue that in one instance there are more, in the other less. It is strange that he already has established the identity of an object during the sensorimotor period yet he has not established the identity of a collection.[51]

---

[49] Ibid., p. 157.

[50] Cf. Traité, p. 135; Six études de psychologie, p. 121 ff; La psychologie de l'intelligence, p. 157 ff.

[51] La psychologie de l'intelligence, p. 155.

The period of success or accomplishment (7 - 8 years) once again shows the ability to decentralize (in this case the elements are conceived of as something independent of the space occupied) so that the same quantity persists regardless of its organization in space. It is to be noted that the child can attain this notion of conservation without the notion of number because conservation is a logical concept, not a mathematical one.

Success in the third experiment, in a certain way, depends on the child's grasp of conservation. It concerns class inclusion. The child is asked to classify according to similarity or equivalence a certain number of elements (be they various animals into a total collection of animals, or variously colored squares, circles, triangles).

The young child (4 - 5 years) is asked to put together the things that belong together. In doing so he is dominated not by a logical notion but by a figural collection in space.[52] For instance in assembling all the squares, then all the circles, etc., he might stop and place a triangle over a square saying gleefully: "Look, here is a house". Or again in the case of classifying animals he may cease to classify and begin to tell a little story apropos to each animal.[53] Piaget says that they confuse similarity with elements that are usually found together (i.e., "resemblance" and "convenance").[54]

---

[52]This experiment is found in La genèse des structures logiques élémentaires, pp. 103-121. Cf. La psychologie de l'enfant, p. 81 ff. and Traité, p. 127.

[53]For example the child might say: "The sheep belongs with a shepherd; the dog in his doghouse; the tiger in the forest".

[54]Traité, pp. 126-127.

The transition period is marked by hesitation and fluctuation. The child recognizes the whole (group of animals) at one time and then he recognizes the part (the group of sheep), however he cannot integrate the two into a whole-part relationship. "Il y a donc à nouveau non-conservation du tout, faute de mobilité dans les centrations successives de la pensée."[55]

The child is successful the moment he sees the class and the sub-class as a whole and a part, each remaining constant and invariable yet united and integrated one with the other.

The last experiment is concerned with making a series.[56] The child is asked to put a series of little sticks in an orderly arrangement from smallest to largest. The preoperational child succeeds only in making little irregularly matched pairs (e.g., AD, BE, CF).

Trial and error predominate during the transitional stage. From a haphazard beginning he finally succeeds in interjecting all elements and attains the total series.

The conservation of series acquired during the operational period possesses an even greater characteristic of mobility than the preceding ones. To explain: the child proceeds systematically during this period by seeking a measure. He chooses the smallest of all elements A as the first in the series, then element B which is at one and the same time the smallest of all remaining elements and yet larger than A.

---

[55] La psychologie de l'intelligence, p. 154.

[56] Traité, p. 130; La psychologie de l'enfant, p. 80; La psychologie de l'intelligence, p. 160. A description of this experiment is found in La genèse des structures logiques élémentaires, pp. 251-263.

Not only is he able to form a simple additive asymetrical series but he can form multiple series as well, as in the case of aligning a row of dolls according to height, then the corresponding walking sticks and hats.[57]

A few concluding remarks are necessary before the mechanisms involved in these various stages are examined. First, the notion of "conservation" is a logical concept, not a mathematical one. It is a necessity demanded by the situation.

Secondly, the "reversement" of the transitional period (i.e., the need to have an empirical return to the starting point of the action before equality could be established) develops into "reversibility" (i.e., the child can conceive both the direct action and its reversal in thought without any need to actually see it accomplished).

Thirdly, the equilibrium established by "regulation" (i.e., an abrupt change of opinion) is replaced by an "operation" which is completely reversible and capable of uniting with others to form a group. Piaget claims that "l'opération n'est ainsi que la forme supérieure des régulations."[58]

Fourthly, the subject has passed from a state of centering (i.e., fixation on one dimension) to centering on the opposite dimension (which is equally static) to seeing the two simultaneously but oscillating between them to the final coordination and integration of the operational period.[59] The third step, that of seeing both dimensions and hesitating between choosing either, Piaget claims can lead to articulated intuition. That is to say by making the transformations very minimal the

---

[57] La psychologie de l'intelligence, p. 171.

[58] Traité, p. 117.

[59] Logique et équilibre, pp. 49 ff.

child will affirm conservation up to a point and then he will be unable to harmonize the situation. In such a procedure he confronts the situation even more acutely.[60]

Fifthly, a longitudinal study made by Dr. Gerald Noelting and Miss B. Inhelder revealed that the same child, over a period of several months, would pass from denying conservation to affirming its absolute necessity,[61] thus indicating that conservation is not something that is taught but something the child comes to realize and construct for himself.

Lastly, the ensemble of activities during the operational period take on some of the characteristics of a mathematical "group". Hence Piaget calls them "groupements".

> Le propre de ces structures, que nous appellerons "groupements", est de constituer des enchaînements progressifs, comportant des compositions d'opérations directes (par exemple une classe A réunie à sa complémentaire A' donne une classe totale B; puis B + B' = C, etc.), inverses (B - A' = A), identiques (+A -A = 0), tautologiques (A+A=A) et partiellement associatives: (A+A') + B' = A + (A'+B') mais (A + A) - A ≠ A +(A - A).[62]

The limitation of commutativity is due to the fact that the child is still working with the real order and not the hypothetical or purely formal order.

Terminating the discussion of the two previous sections concerning globalism and confusion on the one hand and strategies employed by the child in attempting

---

[60] La psychologie de l'intelligence, pp. 167 ff.

[61] Inhelder, B. and Noelting, G. "Etude longitudinale de l'intelligence de l'enfant de 4 à 15 ans, unpublished research, Genève, 1955-61. See also Traité, p. 120.

[62] La psychologie de l'enfant, p. 79 (underscoring mine).

to resolve difficulties, brings the reader to an examination of the actual mechanisms, invoked by the child, which meet with success in solving his problems.

MECHANISMS INVOLVED IN THE PASSAGE FROM ONE STAGE TO ANOTHER

Questioning the child in the form of an alternative followed by the inevitable: "why is that so", which is characteristic of the clinical method, not only forces him to make a judgment (rather than simply agreeing "yes" or "no") but reveals the reason why he thinks such is the case.

From the analysis of hundreds of samplings, Piaget finds three basic ways which the child employs in order to handle the situation successfully: by reversibility, by compensation and by identity. This part of the chapter will first analyze these three forms of argumentation, then examine the essential elements which underly each argument, namely, differentiation and coordination and then lastly view these factors in the light of the assimilation-accommodation-equilibrium model.

Analysis of justifications

By reversibility

When confronted with ball B transformed into a pancake the child may reply: "It is the same thing. You just made it into a pancake". Or again: "You only flattened it. If you put it back into a ball then they (i.e., A and B) would be the same". Piaget calls this type of reasoning reversibility (by conversion).[63] The child can retain the notion of the original state as well as the subsequent state and thus realizes that it is the same reality in question (in this instance – a given

---

[63] La psychologie de l'enfant, p. 77.

continuous quantity). Foreseeing in thought the reverse process, without it actually taking place, assures him of the identity of these two balls.

In analyzing this type of reply (reversibility by conversion) Piaget claims that the child is grasping the notion of object (i.e., the reality in question). He can distinguish between the object itself (which remains stable) and the different states in which it may appear (i.e., as a pancake, sausage, little pieces, etc.). Having distinguished between a thing and its various appearances the child has made a profound discovery: the identity of an object is independent of the various states it may assume. Such a distinction is equivalent to recognizing the difference between the substantial and the accidental order (i.e., the order of configuration). At one and the same time a child is sufficiently "decentered" to recognize the invariant amid the transformations and can coordinate these various appearances with the invariant in question.

By compensation

A second justification is the argument by compensation. Faced with the same problem (that of continuous quantity) the child may reply: "It is the same. It is longer but it is thinner"; or "There are more pieces but they are smaller and that makes them the same". Piaget calls this the argument by compensation (or of reversibility by reciprocity of relations).[64] The dominant factor in this mode of reasoning is no longer the object as such but the dimensions of the object in its original state and its transformed state. The child sees that there are two dimensions that must be reconciled in each instance. The ability to recognize these two and to

---

[64] Ibid.

realize that one compensates for the other provides him with the reason for declaring that the quantity remains unaltered. Again his capacity to "decentralize" has given him the power to move from one dimension to another and coordinate them accordingly. Each dimension plays a role. The child is aware of this and can differentiate and coordinate simultaneously.

An analysis of this mode of justification reveals that the child has grasped certain changes in the accidental or configurational order which do not alter the quantity as such in any way. Here again is an indication of the profound distinction made by the child: the notion of quantity is independent of any given form. Correlatively, he is putting two elements or dimensions into a proper relationship.[65]

By identity

The third form of justification is found in the argumentation from identity. A child may reply to the demand for justification by saying: "You haven't added anything", or "You haven't taken anything away. It is just a sausage", or "It was a ball; now it is in little pieces". Once again the child seizes and harmonizes another aspect of the problem.

In such an argument the child recognizes the transformations which completely escaped the preoperational child. Not only does he recognize transformations but he can distinguish between a transformation which would involve a radical change (i.e., to add something or to take something away) and a transformation that only involves an accidental change (i.e., made into a pancake, or a sausage, etc.). Such a

---

[65]Recall again that the child on the concrete operational level can master two dimensions; however his knowledge is still, in a certain way, global because he neither recognizes nor distinguishes weight and volume as such. See La psychologie de l'enfant, p. 78.

distinction enables him to see that the change in the form and figure of the quantity is independent of the changes in quantity as such. The correlative is equally true: the variations of quantity are independent of the variations in form.

Hence these three types of reasoning by: reversibility, compensation and identity attest to the fact that the child has reached the concrete operational level. These arguments may not all be given by any one child; however any one argument is sufficient to determine his attainment of the operational level. It often happens that having arrived at one or other of the justifications, the experimenter can, by asking precise questions, bring the child to the awareness of the other forms of justification. The ability to see the various aspects of the problem, to distinguish and coordinate them so that his knowledge and reality are, once again, in a state of equilibrium is what Piaget means when he says that the child "constructs" these notions.

Differentiation and Coordination

Reasoning in such a fashion implies that the child can discriminate between two fundamental areas of reality: the substantial and the configurational. By the substantial area is meant that which persists and endures beneath accidental transformations. By the configurational area is meant any extrinsic change that alters the appearance of the reality in question while leaving what it is in itself intact. Now an analysis of the justifications reveal that both these areas are viewed under four aspects: transformations, object, notion and dimensions. The child can distinguish between: accidental and substantial changes, the object as such and the various states it may assume, the notion in question and its appearances, the dimensions of

a given reality in relation to the dimensions of a subsequent state. These eight elements, essential to the formation of the notion of conservation of quantity, were found by Dr. G. Noelting in the analysis of the spontaneous justifications of children. He calls them the "structure d'ensemble" with respect to the notion of conservation.

The argument from identity reveals that the child has grasped the notion of transformation on both levels: substantial and accidental. He can distinguish between a change that merely alters the external form (e.g., "You made it into a sausage") and one that alters the very reality itself (e.g., "You have not added anything" or "You haven't taken anything away"). Having distinguished between these two systems and seeing in what respect they can both apply to the same object liberates him from thinking that a change in shape is equivalent to a quantitative addition and a remaking into the original shape equivalent to a quantitative diminution. Correlative to this distinction of transformation is the distinction that concerns the object and the various states it may assume (e.g., "If I put it in any shape whatever they will be the same because they were the same in the beginning").

Similarly the argument from reversibility serves to distinguish the notion of quantity as such from its various forms or appearances. The child is often heard to say: "It is the same amount; it is just in a different shape".

The argument from compensation introduces the various dimensions in question. The child is capable of discriminating and coordinating the dimensions of the original object, discriminating and coordinating the dimensions of the new form the object assumes and then coordinates the two, realizing that they compensate for one another.

At this point the writer takes the liberty of making the following observation.

Does not reflection upon these eight factors lead to the recognition of a certain parallel between them and the categories of Aristotle? Piaget maintains that the first notion constructed is that of quantity. Aristotle maintains that the proper sensible (i.e., color, sound, texture), which are the first to affect our senses, are rooted in quantity as their base and support.[66] The distinction between the two types of transformations could lead to the categories of action and passion (e.g., "You have made it into a sausage" or "It has become a sausage"; or again "Nothing has been added to it", or "You have not added anything more to it."). The compensation of dimensions introduces the area of relations. The distinction between the notion of quantity and its various configurations indicates the difference between quantity and quality. But more profoundly, it bears a likeness or similitude to the fundamental distinction between substance and accident.[67] By turning to other experiments one can find parallels with the remaining accidents. For example, the classification of counters is based on quality, so likewise with the series of sticks arranged according to size; the experiments involving the construction of the tower[68] demands the awareness of place and position; lastly, the experiments concerning speed and distance travelled by certain objects introduce the child to the notion of time.

This writer does not claim that Piaget deliberately set out to find the categories of Aristotle, nor that the fact that he has constitutes the inherent value of his thought. Rather the writer wishes to point out that if one seeks to understand reality, or, as Piaget would say, to construct structures that provide a certain degree of

---

[66]Saint Thomas, I, q. 78, a. 3, ad 2.

[67]See Part II, ch. 2, footnote 57.

[68]"How children learn mathematical concepts", p. 3.

equilibrium between one's thought and reality, then all knowledge falls within a certain frame of reference which, upon examination, is equivalent to Aristotle's categories. Their similarity on this point is rooted in the fact that both Aristotle and Piaget examine the same world. They both sought to explain how man understands this world.

These remarks shall suffice for the present. In Part III there shall be a detailed discussion both as to their points of similarity and of difference.

Differentiation and coordination in the light of the assimilation-accommodation-equilibrium model

Returning now to the eight elements, one can place them in the wider context of Piaget's thought, that is to say, as situated around the two poles between which all activity takes place, namely, the self and the world.

The ability of the child to "decentralize" ("décentrer") indicates his awareness of the various dimensions involved in a given problem. Reversibility in thought both reflects and anticipates transformations in the real order. The distinction between the notion and its various configurations parallels the distinction between the invariant and the variable in the real order.[69] Lastly the notion of identity or conservation indicates the child's ability to distinguish between reality and appearance.

Moving into an even wider context one may ask: what, if any, are the similarities between these foregoing factors and the original assimilation-accommodation model?

---

[69]Dr. Gerald Noelting has called this distinction between the variant and the invariant "dédoublement notionnel", and the distinction between dimensions "différenciation dimensionnelle".

The first observation that can be made is that there is always an interplay of differentiation and coordination. Differentiation implies that the subject has become aware of the various factors that must be recognized as distinct and yet somehow related to one another. In other words, differentiation implies accommodation, that is to say, one must accommodate himself to the exigencies of the situations. Prior to this ability a twofold accommodation was at work which tended to distort the situation. On one side there was "centralization" ("centrer") i.e., the subject was fixed on one aspect to the exclusion of its complement. On the other side there was "fragmentation" ("morcellement") i.e., various aspects were seen successively without any attempt to coordinate or integrate them. Two mechanisms rectify the situation, namely, the "dédoublement notionnel" and "différentiation dimensionnelle". In the first instance ("dédoublement notionnel") a notion which was global (or "syncrétique") is viewed as having complementary components and the transformations worked on each compenent are seen as autonomous. For example, once the child has grasped the notion of quantity the original global idea of "largeness" is separated into two components: the quantity of matter and the form the object may take. Likewise the transformation involving quantity as such (i.e., increase and decrease) is independent of the transformations involving the change of shape and form.

"Différenciation dimensionnelle" is attained when one dimension is recognized as being distinct from another, yet their variations are corresponding inverses. For example, width and length are differentiated when the child recognizes that ball B may increase in length but decrease in width.

Turning now to the second aspect, that of the complementary activity of

differentiation which is coordination, one finds a twofold mechanism also at work. Coordination is the activity whereby the differences are integrated into a whole that possess a certain harmony or equilibrium. Prior to this capacity to coordinate (or assimilate) all factors into a united and balanced whole the child possesses a twofold assimilation process that deforms the situation rather than establishes a state of equilibrium. The deformation occurs either by way of confusion or by way of globalism (syncrétisme). Confusion prevails when the subject attempts to use the same scheme or structure for different realities, for instance when either height or width is used as the only measure or surface. Globalism prevails when too much of reality has been incorporated into a given structure. For example, the preconcept "largeness" includes both the quantity involved and its disposition in space. With the ability to coordinate (ie., to assimilate or integrate all elements into an organized whole) these two difficulties are resolved. Coordination properly speaking has a double aspect: first, to coordinate all the parts; secondly, to integrate the parts into a whole. The first of these coordinations, wherein certain factors previously grasped in isolation are recognized as concomitant variations of one another, parallels the "différenciation dimensionnelle" on the side of accommodation. The second coordination of the parts into an integrated whole (i.e., that length and width are both indispensable factors insuring the conservation of quantity) parallels the "dédoublement notionnelle" on the side of accommodation.

Miss B. Inhelder, in a recent article, points out that this coexistence of parts which are distinct and original on one hand and a whole or ensemble which is autonomous on the other is not to be identified with the equilibrium found on the physical-chemical level.

> Or, un système dans lequel le tout et les parties se conservent mutuellement est autre chose que des forces agissant en sens contraire et suppose donc des régulations en un cycle d'ensemble.[70]

Thus a proper notion of the process of equilibrium is crucial to understanding the theory of Piaget. He describes this process very succinctly in Logique et équilibre:

> Or, tout le développement conduisant aux structures logiques et toute évolution de celles-ci des plus concrètes aux plus formelles, peut être caractérisé par de tels changements d'échelle et une telle poursuite d'un meilleur équilibre. En passant à la perception primaire aux activités perceptives, de celles-ci aux activités sensorimotrices intéressant la préhension et les mouvements du corps entier, de celles-ci aux représentations préopératoires dont les régulations aboutissent aux opérations concrètes et de celles-ci aux structures formelles, on retrouve en chaque passage d'une échelle à la suivante un même élargissement du champs de l'équilibre, un même assouplissement dans le sens de la mobilité et une même recherche de formes d'équilibre stables et permanentes. Mais dans chaque cas aussi, ces progrès de l'équilibration se caractérisent par une abstraction plus grande des structures élaborées.[71]

It is precisely this process that plays the causal role between genesis and structure. Miss Inhelder cites La filiation des structures, written by Piaget, to confirm this point.

> Sans le recours à l'équilibration, nous ne serions en présence que des structures comme telles et de leurs filiations abstraites de telle sorte que le développement au sens génétique serait instantané et se confondrait avec la déduction formelle.

---

[70] Inhelder, B. "Développement, régulation et apprentissage", cited in Psychologie et épistémologie génétiques, Bresson et Montmollin (eds.), p. 178.

[71] Logique et équilibre, pp. 112-113.

> En d'autres termes, l'équilibration représente la dimension causale indispensable à l'analyse génétique, par opposition à l'analyse structurale des états d'équilibre, qui rejoint l'analyse formelle ou logique.[72]

The principal mechanisms which effect this state of equilibrium are differentiation and coordination. In the very early stages the mechanism was the result of a certain natural rhythm or interchange between accommodation and assimilation. Then during the preoperational period these mechanisms were governed by regulations (i.e., abrupt changes from a lack of equilibrium to a state of equilibrium). Finally during the operational period the mechanisms reach a state of equilibrium by means of auto-regulation since the child is capable of handling the accommodation and assimilation aspects. Because of this constant interplay of differentiation and coordination many people have said that Piaget's theory could best be explained in terms of the whole and the part.

CONCLUSION

Piaget insists that the state of globalism and confusion diminishes progressively between the sensorimotor period and the formal operational period. Limited though the distinction be between self and the external world on the sensorimotor level, it marks the beginning of the first interplay of the assimilation-accommodation process. From thence all subsequent distinctions revolve around these two poles. With regard to the self: the child gradually distinguishes and coordinates practical activity and representation; representation and abstract thought,

---

[72]Inhelder, B. "Développement, régulation et apprentissage", cited in Psychologie et épistémologie génétique, Bresson et Montmollin (eds.), Dunod: 1966, p. 180.

his point of view and that of others. With regard to the external world: the child distinguishes realities one from another as well as different aspects of the same reality. The reduction of globalism and confusion is completed when the child can differentiate and coordinate the real and the possible on the formal operational level.

The passage from globalism and confusion toward differentiation and coordination follows the same pattern whether it be studied between one period and another or whether the overall process from the preoperation to the formal operational period be considered. In both instances there are three phases: failure, transition, success. In the period marked by failure the child neither recognizes nor distinguishes the elements that would provide a solution. The transition period is characterized by confusion, ambiguity and contradiction. The child recognizes all the factors involved but only successively; hence he is unable to establish any form of equilibrium. The period of success is marked precisely by this state of equilibrium wherein all factors are differentiated and coordinated.

The mechanisms invoked were discovered by an analysis of the three forms of justification: compensation, reversibility and identity. In every instance the child could differentiate and coordinate the two factors involved, be they accidental or substantial transformations; the object and its successive states; the notion as distinct from its various dispositions in space or the complementary dimensions. This ability to see and structure the situation for himself has led Piaget to say that,

> Equilibration ... is thus an active process. It's a process of self-regulation. I think of self-regulation as a fundamental factor in development. I use this term in the sense in which it is used in cybernetics, i.e., in the sense of a process with "feedback" and "feed forward", of processes which regulate

themselves by a progressive compensation of systems.[73]

A comment on the significance of Piaget's theory, found in Thought in the Young Child, is worth quoting:

> Forty years have passed since Piaget reported his first observations on the way in which children construct the world. Since that time, he has added to our knowledge more facts about cognitive development than any other investigation. ... The Geneva school has told man more about the child's knowledge of the physical world than any other researcher or school.[74]

Similarly, Dr. R. Tuddenham in a paper entitled "Jean Piaget and the World of the Child" says,

> I could not better conclude this appreciation of Piaget than by quoting from William James (1890) who wrote 75 years ago in his famous Principles of Psychology as follows: "To the infant, sounds, sights, touches and pains form probably one unanalyzed bloom of confusion (p. 496)". We can now go beyond the philosopher's speculation and describe in some detail how the unanalyzed "bloom of confusion" of the infant becomes the world of the child, in which not only objects, but time, space causality and the rest acquire a coherent organization and we owe this achievement in large measure to the analyses of Jean Piaget.[75]

With these remarks we terminate the discussion of the principle which governs the movement from one period to another, namely, from vagueness and confusion to differentiation and coordination.

Now having presented Aristotle's teaching on the common mode of human

---

[73]Piaget Rediscovered, p. 14. Que sais-je, p. 124.

[74]Thought in the Young Child, pp. 169-170.

[75]Tuddenham, R. "Jean Piaget and the World of the Child", American Psychologist, Vol. 21, No. 3 (March 1966), p. 217.

knowing in Part I and having examined Piaget's genetic theory of cognitive development in Part II, reflections concerning a rapport between the two positions becomes the immediate concern of Part III.

PART THREE

SOME RESULTS OF THIS INVESTIGATION

Chapter 1

A COMPARISON BETWEEN ARISTOTLE AND PIAGET

I. PIAGET AND THE FACULTY-THEORY OF INTELLIGENCE

A. Argumentation based on his own experimentation

B. Argumentation based on his critique of intellectualism

C. Presuppositions underlying Piaget's position

D. Critical remarks concerning Piaget's position

II. COMPARISON BETWEEN ARISTOTLE AND PIAGET

A. Two general areas of agreement

B. Particular point of agreement resulting from this study

PART THREE

Chapter 1

COMPARISON BETWEEN ARISTOTLE AND PIAGET

The original intent of this thesis was twofold. The first purpose was to present the doctrine of Aristotle on the common mode of procedure that is characteristic of the human intellect. The second purpose was to determine if and in what measure a rapport could be established between this doctrine and a theory drawn from modern experimental psychology, namely, the genetic psychology of Jean Piaget. The precise area upon which we focused our attention with the hope of establishing a rapport between Aristotle's doctrine and Piaget's theory was the role played by vague and confused knowledge within the knowing process in their respective positions.

In order to accomplish this twofold task the thesis was divided into three parts. Part I presented the fundamental principles upon which Aristotle's doctrine rests. Part II explored the basic principles of Piaget's genetic theory of cognition. Now in Part III we are ready to address ourselves to the question of the rapport itself. To accomplish this task the following plan will be employed. First, there will be a discussion concerning the areas wherein Aristotle and Piaget differ most profoundly.

Such a discussion will bring to the fore certain difficulties which seem to arise in Piaget's system. Secondly, we will attempt to show that despite this profound difference there is, in a certain respect, grounds for a rapport between the two thinkers.

The profound difference between Aristotle and Piaget resides in their conceptions of the nature of the intellect. Piaget's position is diametrically opposed to that of Aristotle since he refuses to accept a faculty-theory of intelligence. To focus on this difference the first part of the chapter will be subdivided into five parts. First, a general consideration of Piaget's reaction to a faculty-theory of intelligence will be described. Secondly, it will be shown how he argues to his own position from his own experimentation. Thirdly, how he arrives at this position from his critique of intellectualism. Fourthly, we will point out the presuppositions underlying Piaget's position. Fifthly, we will make a few critical remarks on Piaget's position. However, no attempt will be made to resolve perfectly the difficulties, since such an endeavor would take us beyond the scope of this paper.

The second part of the chapter, concerning the rapport we are attempting to establish, will likewise be sub-divided. The first part will point out two very general areas of agreement between Aristotle and Piaget. The second part will focus on the particular point of agreement which results from this study, namely, that principle governing the acquisition of knowledge which indicates that man always proceeds from vague and confused knowledge to clear and distinct knowledge.

DIFFERENCE BETWEEN ARISTOTLE AND PIAGET

Piaget and the faculty-theory of intelligence

Both Aristotle and Piaget are interested in explaining the nature of intellectual activity. However, the conclusions which they draw with respect to the nature of the intellect itself vary considerably. Aristotle argued from the characteristics of intellectual operations to the nature of the intellect as power or faculty. He defined the intellect as a power capable of recognizing the intelligibility of reality. Likewise, he distinguished between the nature of the intellect as such and its gradual manifestation or appearance in the life of a given individual. Such a distinction is based on the difference between the order of nature and the order of operation or exercise. That is to say, Aristotle would argue that any human being has the initial capacity, power or faculty, of intellection from birth even though this power only manifests its operation progressively. Saint Thomas makes this explicit in the following passage:

> Cum igitur puer sit intelligens potentia, etsi non intelligat in actu, oportet quod sit in eo aliqua potentia qua sit potens intelligere. Haec autem potentia est intellectus possibilis. ... ipse intellectus possibilis inest homini a principio sicut aliquid ejus.[1]

Piaget, on the contrary, refuses to accept a faculty-theory. He insists that such a doctrine on the nature of the intellect is but the logical outcome of a non-genetic approach and that should one argue from a genetic approach the nature of the intellect is radically different. In attempting to present Piaget's view on

---

[1]Saint Thomas, Summa Contra Gentiles, II, c. 60.

this issue a broader perspective will be taken than that found in Part II of this thesis. In Part II we remained, we might say, within the confines of genetic psychology: we attempted to view the nature of intellectual activity through his eyes by accepting his starting point, following his experimentation and subsequent interpretations. At this time we will step back a little from his doctrine in order to see the implications concerning the nature of the intellect which results from such a view.

Argumentation based on his own experimentation

Let us begin by recalling certain basic ideas of Piaget's doctrine which were presented in the previous chapter. Piaget set out to establish a theory of genetic epistemology by investigating the psychology of thinking. He says:

> Venant de la biologie, nous nous sommes posé dès le départ le problème de l'épistémologie génétique et nous avons fait de psychologie de l'enfant que dans ce but.[2]

He maintains a sharp distinction between logic and the psychology of thinking. Logic, he claims, is that science which axiomatizes the concepts and operations of the intelligence after they have been formed[3], while the psychology of thinking is the corresponding experimental science since it aims at understanding how these concepts come to be.

> On peut dire sans équivoque aucune que la logistique est une axiomatisation des opérations de la pensée, et que la

---

[2] Etudes d'épistémologie génétique, I, p. 19.

[3] La psychologie de l'intelligence, p. 31.

> science réele correspondante, i.e., celle qui étudie le même objet mais sans l'axiomatiser, n'est autre que la psychologie de ces opérations, i.e., la partie spéciale de la psychologie de la pensée qui s'occupe des formes d'équilibre et des modes d'organisation des opérations.[4]

It is the study of how concepts develop that marks the genetic approach. Piaget is convinced that one can only understand mental activity in the adult if one has examined how these concepts develop in children. This is the essence of the genetic approach: to discover empirically the origins of concepts.

Piaget approaches the psychology of thinking from a biological viewpoint. He saw the child as a "living organism" whose intellectual as well as organic development follows an assimilation-accommodation-adaptation process. "Toute conduite qu'il s'agisse d'un acte déployé à l'extérieur, ou intériorisé en pensée, se présente comme une adaptation, ou, pour mieux dire, comme une réadaptation."[5] This leads him to say in La naissance de l'intelligence that "le fait premier de la vie mentale, c'est l'assimilation."[6] Let us recall, however, that he marks a clear distinction between an assimilation process that is purely biological and one that is psychological.

> Or, dans le cas de l'adaptation organique, ces échanges, étant de nature matérielle, supposent une inter-pénétration entre telle partie du corps vivant et tel secteur du milieu extérieur. La vie psychologique débute au contraire, nous l'avons vu, avec les échanges fonctionnels, c'est-à-dire au

---

[4]Epistémologie génétique, III, p. 154.

[5]La psychologie de l'intelligence, p. 8.

[6]La naissance de l'intelligence, p. 43.

> point où l'assimilation n'altère plus de façon physico-chimique les objets assimilés, mais les incorpore simplement dans les formes de l'activité propre (et où l'accommodation modifie seulement cette activité). On comprend alors que, à l'interpénétration directe de l'organisme et du milieu, se superposent, avec la vie mentale, des échanges médiats entre le sujet et les objets, s'effectuant à des distances spatio-temporelles toujours plus grandes et selon des trajets toujours plus complexes.[7]

During each period of development certain structures are formed which serve as the basis for determining the four major periods of intellectual development. Each period is characterized by certain concepts or structures which enable the child to establish a degree of equilibrium between his thought and a particular aspect of reality.

Now the question arises: from such a genetic approach how does Piaget regard the nature of intellectual activity and ultimately of the intellect itself? According to Piaget, intellectual activity is essentially organization.

> Dire que l'intelligence est un cas particulier de l'adaptation biologique, c'est donc supposer qu'elle est essentiellement une organisation et que sa fonction est de structurer l'univers comme l'organisme structure le milieu immediat.[8]

Again, citing the same reference we find this passage.

> Or si l'intelligence prolonge ainsi une adaptation organique qui lui est antérieure, le progrès de la raison consiste sans doute en une prise de conscience toujours plus poussée de l'activité organisatrice inhérente à la vie elle-même et les stades primitifs du développement psychologique

---

[7] La psychologie de l'intelligence, p. 14.

[8] La naissance de l'intelligence, p. 12.

> constituent seulement les prises de conscience les plus superficielles de ce travail d'organisation.[9]

To define intellectual activity in terms of organization or equilibrium ultimately leads to defining intelligence or the intellect itself in terms of equilibrium. Piaget maintains that intelligence is not just a particular instance of equilibrium but rather that toward which all other forms tend. He says,

> Elle est la forme d'équilibre vers laquelle tendent toutes les structures dont la formation est à chercher des la perception, l'habitude, et les mécanismes sensori-moteurs élémentaires.[10]

Or again, "elle (l'intelligence) est essentiellement un système d'opérations vivantes et agissantes".[11] Defining intelligence in this manner, as the direction toward which all development is turned, Piaget was aware of the objection which might be raised: how does one distinguish intellectual activity from any other form of organization, be it sensori-motor or even biological? He answers this objection in the following way:

> Il reste cependant possible de définir l'intelligence par la direction dans laquelle est orienté son développement, sans insister sur les questions de frontières, qui deviennent affaire de stades ou de formes successives d'équilibre. On peut alors se placer simultanément aux points de vue de la situation fonctionnelle et du mécanisme structural. Du premier de ces points de vue, on peut dire qu'une conduite est d'autant plus "intelligente" que les trajectoires entre le sujet et les objets de son action cessent d'être simples et nécessitent une composition progressive. La perception ne comporte ainsi que

---

[9] Ibid., p. 28.

[10] La naissance de l'intelligence, p. 11.

[11] Ibid., p. 12.

> des trajets simples, même l'objet perçu est très éloigné. Une habitude pourrait sembler plus complexe, mais ses articulations spatio-temporelles sont soudées en un tout unique, sans parties indépendantes ni composables séparément. Au contraire, un acte d'intelligence, tel que de retrouver un objet caché ou la signification d'une image, suppose un certain nombre de trajets (dans l'espace et dans le temps), à la fois isolables et susceptibles de compositions. Du point de vue du mécanisme structural, par consequent, les adaptations sensori-motrices élémentaires sont à la fois rigides et à sens unique, tandis que l'intelligence s'engage dans la directions de la mobilité réversible. C'est même là, verrons-nous, le caractère essentiel des opérations qui caractérisent la logique vivante, en action. ... Definir l'intelligence par la réversibilité progressive des structures mobiles qu'elle construit, c'est donc redire, sous une nouvelle forme, que l'intelligence constitute l'état d'équilibre vers laquelle tendent toutes les adaptations successives d'ordre sensori-moteur et cognitif, ainsi que tous les échanges assimilateurs et accommodateurs entre l'organisme et le milieu.[12]

Thus intelligence for Piaget becomes a generic term or symbol of the superior forms of organization and the final state of equilibrium of all cognitive structures. "L'intelligence n'est ainsi qu'un terme générique désignant les formes supérieures d'organisation ou d'équilibre des structurations cognitives."[13]

Such a position as this precludes the notion of the intellect as a faculty in the philosophic sense. Likewise it would seem to prohibit one from distinguishing man from animal on the basis of this faculty. Piaget recognizes this difficulty and does admit that there is a certain specific heredity which distinguishes man from monkey, however the roots of this heredity are found in the "general heredity"

---

[12] La psychologie de l'intelligence, pp. 16-17.

[13] Ibid., p. 12

of the living organism itself. He states his case in this fashion:

> Quant à l'hérédité de l'intelligence comme telle, nous retrouvons la même distinction. D'une part, une question de structure: l "hérédité spéciale" de l'espèce humaine et de ses "lignées" particulières comporte certains niveaux d'intelligence, supérieurs à celui des singes, etc. Mais, d'autre part l'activité fonctionnelle de la raison (l'ipse intellectus qui ne vient pas de l'expérience) est évidemment liée à l' "hérédité" générale" de l'organisation vitale elle-même.[14]

Then he continues to explain how this link is established:

> de même que l'organisme ne saurait s'adapter aux variations ambiantes s'il n'était pas déjá organisé, de même l'intelligence ne pourrait appréhender aucune donnée extérieure sans certaines fonctions de cohérence (dont le terme ultime est le principe de non-contradiction), de mise en relations, etc., qui sont communes à toute organisation intellectuelle.[15]

Again, further on in the same work he reaffirms this position that intellectual activity is a special case of adaptation, when he says:

> Elle (l'intelligence) n'apparaît donc pas comme une puissance de réflexion indépendante de la situation particulière qu'occupe l'organisme dans l'univers, mais elle est liée, dès l'abord, par des a priori biologiques: elle n'a rien d'un absolu indépendante, mais est une relation parmi d'autres, entre l'organisme et les choses.[16]

Now Piaget sees this specific heredity as the invariant mechanism or

---

[14] La naissance de l'intelligence, p. 10.

[15] Ibid.

[16] Ibid., p. 28.

process that persists at all levels of activity rather than the activity of a certain faculty or power ready-made from the beginning. He says,

> Si vraiment, en effet, il existe un noyau fonctionnel de l'organisation intellectuelle qui procède de l'organisation biologique dans ce qu'elle a de plus general, il est évident que cet invariant orientera l'ensemble des structures successives que la raison va élaborer dans son contact avec le réel ...[17]

This functional invariant would, then, play the role which certain philosophers previously assigned to the a priori. The only difference would be that they maintained the a priori consisted of certain structures ready-made from the beginning while he maintains that the functional invariants tend to impress themselves little by little on the consciousness due to the elaboration of structures. Continuing his reasoning, he says:

> il jouera ainsi le rôle que les philosophes ont attribué à l'a priori, c'est-à-dire qu'il imposera aux structures certaines conditions nécessaires et irréductibles d'existence. Seulement on a eu parfois le tort de regarder l'a priori comme consistant en structures toutes faites et données dès le début du développement, tandis que si l'invariant fonctionnel de la pensée est à l'oeuvre dès les stades les plus primitifs, ce n'est que peu à peu qu'il s'impose à la conscience grâce à l'élaboration de structures toujours plus adaptées au fonctionnement lui-même.[18]

And hence he concludes by saying that the a priori only appears to consciousness at the end of the evolution of mental concepts rather than at the beginning.

---

[17] Ibid., p. 11.

[18] Ibid.

> Des lors l'a priori ne se présente sous forme de structures nécessaires qu'au terme de l'évolution des notions et non pas à leur début.[19]

With these remarks we terminate his position on the nature of the intellect which results from his own experimentation.

Argumentation based on his critique of intellectualism

Piaget saw the child in the beginning incapable of performing rational operations but who, upon reaching adolescence, was fully capable of doing so. Thus he claimed that the concepts as well as the capacity for rational operations found in the adult are neither innate in the child nor do they arise spontaneously upon observing reality or reflecting upon self. Rather they develop over a long period of time. Thus the assimilation-accommodation-adaptation process served as an adequate description of the progressive development of intellectual activity. Only gradually is the child able to respond intelligently to the situation confronting him. That is to say, the activity of the child and the demands of the external world play complementary roles. By attempting to resolve the problem confronting him, the child gradually constructs the intellectual tools which he needs to organize the universe into an intelligible whole.

In contrast to this position, according to Piaget, is a faculty-theory of intelligence which he rejects for two reasons. First, the intellect is held to be a faculty, "c'est-à-dire comme un mécanisme tout monté en sa structure et en son fonctionnement",[20] without any prior period of development. This, Piaget

---

[19] Ibid., p. 11.

[20] Ibid., p. 373.

claims, is an unwarranted assumption. Secondly, the external world is held to be something "ready-made" or intelligible so that knowing consists simply in passively registering (or "making copies") of things. Such a position, says Piaget seems to belittle the intellectual capacity of man. He claims that a faculty-theory of intelligence has not adequately answered the difficulty facing it: resolving the dichotomy between a faculty ready to operate and the external world to be known.

J. P. Desbiens points out that Piaget, in criticizing this position, uses the terms "intellectualism" and "realism" interchangeably.

> Pour lui, l'intellectualisme signifie d'abord et avant tout une théorie psychologique non-génétique, où l'on explique le fait du développement par l'influence de facteurs externes; une théorie où l'on conçoit le monde extérieur comme "tout fait" et la connaissance, comme une copie passive de cette réalité. Voilà pourquoi il dira assez indifféremment intellectualisme ou réalisme.[21]

Then Desbiens continues to summarize Piaget's reaction to intellectualism in these words:

> Une théorie sera intellectualiste dès lors qu'elle recourra aux facultés comme principes de la connaissance. Mais alors, les facultés sont considérées comme des "entités" données dès le départ au lieu de résulter d'une construction progressive, et le progrès de la connaissance est une juxtaposition d'informations sans cesse plus nombreuses et plus compréhensives, mais toujours enregistrées passivement, d'une part, et offertes à l'état achevé, d'autre part.[22]

---

[21] Desbiens, J.P., Introduction à un examen philosophique de la psychologie de l'intelligence chez Jean Piaget (Québec, P.U.L., 1968), pp. 91-92.

[22] Ibid.

Piaget claims that such a position bears a certain correlation to a particular biological position – vitalism. In fact, he maintains that "il existe un parallélisme, et même assez étroit, entre les grandes doctrines biologiques de la variation évolutive et les théories restreintes de l'intelligence..."[23]

He also maintains that the faculty-theory, or a non-genetic theory of intelligence, although rejected in the early days of experimental psychology, has been re-introduced of late through two channels: neo-vitalism in biology and neo-Thomism in philosophy.[24] However, he readily admits that this is a viable position if one does not hold a genetic approach since one attempts to avoid two extremes: making the intellect merely the sum of traces made by the milieu, or making intellectual activity purely associationism.

> Si tant est que l'intelligence n'est pas une sommation de traces déposées par le milieu ni d'associations imposées par la pression des choses, la solution la plus simple consiste dès lors à en faire une force d'organisation ou une faculté inhérénte à l'esprit humain et même à tout vie animale quelle qu'elle soit.[25]

In fact he furnishes two reasons which would favor such a position. First, such a position provides a definition of intelligence rooted in something other than that of its organization. Second, this position is most useful. Piaget states this case

---

[23] La psychologie de l'intelligence, p. 17. For a detailed discussion of the various interpretations of intelligence based on biological theories, see p. 17 ff.

[24] La naissance de l'intelligence, p. 370-371. J. P. Desbiens claims that this text is the only explicit reference to Thomism which he has found in reading Piaget's works. Cf. Introduction à un examen ..., p. 91, footnote 59.

[25] Ibid.

in this fashion:

> Or il est indéniable que l'hypothèse à ses mérites et que les raisons mêmes, qui militent en faveur du vitalisme en biologie, sont de nature à favoriser l'intellectualisme en psychologie de l'intelligence.
>
> .....
>
> Ces raisons sont au nombre deux au moins. La première tient à la difficulté de rendre compte de l'intelligence, une fois achevée, par autre chose que par sa propre organisation, considérée comme une totalité se suffisant à elle-même. L'intelligence en action est, en effet, irréductible à tout ce qui n'est pas elle, d'autre part, elle apparaît comme un système total dont on ne saurait concevoir une partie sans faire intervenir l'ensemble. De là à faire de l'intelligence un pouvoir sui generis il n'y a qu'un pas.[26]

J. P. Desbiens sums up the second reason, that of utility, by saying:

> Si l'on pose, au départ, un "pouvoir" non pas pleinement développé et articulé, mais immanent au développement lui-même et lui assurant, pour ainsi dire, un support infiniment souple et accueillant, on se facilite la tâche d'intelliger ce développement lui-même. Utilité de l'intelligence-faculté: telle est la deuxième raison qui milite en faveur de l'intellectualisme.[27]

Despite the aforementioned advantages, Piaget refuses to accept the argumentation in favor of a faculty-theory because he claims that the argumentation in support of it is invalid. He says that the argument moves from the fact of intellection to the conclusion that a reality exists which is the source of this activity.

---

[26] La naissance de l'intelligence, p. 371.

[27] Desbiens, Introduction à un examen ..., p. 95.

> Or, l'intellectualisme prétend précisément tirer du fait de l'intellection la conclusion qu'il existe une faculté psychique simple de connaître, laquelle serait l'intelligence elle-même. Ce n'est donc pas l'intellection comme telle que cette doctrine pose comme irréductible, c'est une certaine reification de cet acte, sous forme d'un mécanisme donne à l'état tout constitué.[28]

This is the error according to Piaget: to argue from the reality of an operation or an activity to the existence of a power or reality in which this activity resides. He insists that

> Elle (l'intelligence) n'apparaît donc pas comme une puissance de réflexion indépendante de la situation particulière qu'occupe l'organisme dans l'univers, mais elle est liée, des l'abord, par des a priori biologiques: elle n'a rien d'un absolu indépendant, mais est une relation parmi d'autres, entre l'organisme et les choses.[29]

No one would question the undeniable continuity between life and intelligence since a living being achieves knowledge and a child is one day destined to master knowledge. However a question can be raised: in what does this continuity consist? Piaget, as we have pointed out, answers by saying that it is the process of adaptation which persists since, on the intellectual level, it has become a more conscious awareness or realization of the organizing power inherent in all life. Recall the passage already cited.

> Or si l'intelligence prolonge ainsi une adaptation organique qui lui est antérieure, le progrès de la raison consiste sans doute en une prise de conscience toujours plus poussée de l'activité organisatrice inhérénte à la vie elle-même et les

---

[28] La naissance de l'intelligence, p. 373.

[29] Ibid., p. 28 (content of the parenthesis mine).

> stades primitifs du développement psychologique constituent seulement les prises de conscience les plus superficielles de ce travail d'organisation.[30]

Piaget insists that it is the function of the intellect (rather than any structures) which is common to different stages of development and which provides the link between organic life and intellectual life.

> La solution à laquelle conduisent nos observations est que seules les fonctions de l'intellect (par opposition aux structures) sont communes aux différents stades, et par consequent servent de trait d'union entre la vie de l'organisme et celle de l'intelligence.[31]

This then is his argument against a faculty theory: one cannot argue from the permanence of a function to the existence of a structure of a "faculty". "Mais il est évident que l'on ne saurait tirer de cette permanence du fonctionnement la preuve de l'existence d'une idéntité des structures"[32]. Or again: "admettre qu'il existe un fonctionnement intellectuel permanent ce n'est en aucune manière préjuger de l'existence d'un mécanisme structural invariant"[33]. At best he maintains that you can only argue to the following:

> Peut-être exist-t-il, de même qu'un système circulatoire est nécessaire à la circulation. Mais peut-être aussi l'intelligence se confond-elle avec l'ensemble de la conduite ou avec l'un de ses aspects généraux sans qu'il soit

---

[30] Ibid.

[31] Ibid., p. 374.

[32] Ibid.

[33] Ibid., p. 375.

> besoin de l'isoler sous la forme d'un organe particulier doué de pouvoirs et de conservation. D'autre part, si elle caractérise la conduite dans son ensemble, il n'est pas nécessaire pour autant d'en faire une faculté ou l'émanation d'une âme substantielle, et cela pour les mêmes raisons.[34]

At this point we will terminate the discussion of Piaget's attitude toward a faculty-theory of intelligence in order to determine the underlying presuppositions of both his own position and his critique of intellectualism.

Presuppositions underlying Piaget's position

Fundamental to his entire position is a premise which may be formulated as follows: experimental science is the only valid means of attaining knowledge. One need only recall two passages already cited as grounds for such a statement. They refer to the difference between knowledge acquired through philosophy and that acquired through experimental science. He says,

> ...certes féconde et même indispensable à titre d'introduction heuristique à toute recherche, elle (la reflexion speculative) ne peut conduire qu'à élaborer des hypothèses, aussi larges soient-elles mais tant qu'on ne recherche pas la vérification par un ensemble de faits établis expérimentalement ou par une déduction réglée selon un algorithme précis (comme en logique), le critère de vérite n'en peut que demeurer subjectif, sous les formes d'une satisfaction intuitives, d'un 'évidence'...[35]

Or again, he says that

---

[34] Ibid., pp. 375-376.

[35] Sagesse et illusions de la philosophie, pp. 20-21.

> la philosophie...constitue une "sagesse", indispensable aux êtres rationnels pour coordonner les diverses activités de l'homme, mais qu'elle n'atteint pas un savoir proprement dit, pourvu des garanties et des modes de contrôle caractérisant ce qu'on appelle la "connaissance"[36].

Not only is the field of experimental science the only valid avenue to knowledge; Piaget insists further that the genetic method (be it used in biology, psychology, or epistemology) is the only valid method to be used. In his Esquisse d'autobiographie intellectuelle, he writes "Seule la genèse des idées explique leur structure finale"[37]. Going even further he says that the genetic method ultimately provides the only scientific knowledge of the intellect itself.

Having presented his thought on the nature of the intellect, both from his own experimentation and his critique of intellectualism, together with exposing the presuppositions at the root of his thinking, we are now ready to make a few critical remarks on his genetic theory of cognition.

Critical remarks

To do justice to Piaget the following remarks must be twofold. First, we must stress the positive aspects of his thought, then subsequently point out those aspects which give rise to certain difficulties.

Let us begin with the positive aspects. First, insofar as he remains within the domain of genetic psychology we must admit that he has made a unique

---

[36] Ibid., p. 1.

[37] Esquisse d'autobiographie intellectuelle, p. 9, cited in J. P. Desbiens, Introduction à un examen..., p. 184.

and valuable contribution to the field of experimental psychology. He has adequately accomplished the task he has set for himself, which Desbiens has summarized in the following way:

> La visée principale de la psychologie génétique n'est pas tant de déterminer quand l'enfant devient en mesure d'enregistrer l'existence des divers rapports d'ordre logique, mais plutôt à travers quel processus il parvient à construire de tels rapports.[38]

Then Desbiens enumerates the three steps Piaget used to accomplish this goal.

> a) à déterminer le comment du passage d'une structure simple à une structure plus complexe;
>
> b) à déterminer les causes de ces transformations structurales;
>
> c) à déterminer les resemblances et les différences entre la vie psychologique de l'enfant et celle de l'adulte.[39]

To reaffirm the value of the contribution which Piaget has made to the field of psychology one need only recall one of the concluding remarks made at the Dedham Conference.

> Forty years have passed since Piaget reported his first observations on the way in which children construct the world. Since that time, he has added to our knowledge more facts about cognitive development than any other investigations...The Geneva School has told us more about the child's knowledge of the physical world than any other researcher or school.[40]

---

[38]Introduction à un examen..., p. 25.

[39]Ibid.

[40]Thought in the Young Child, p. 169-170.

Hence in this area we shall be indebted to Piaget for the unique and lasting contributions he has made to knowledge theory.

However, in the measure in which Piaget claims that the science of genetic psychology is sufficient not only to explain the nature of intellectual activity and even of the nature of the intellect itself but that it alone is the only valid science that can be used in this area, then one has grounds for taking issue with him. It is to this issue that we wish to address ourselves at this time. The following remarks will, in turn, lead to problems the solutions to which would take us beyond the scope of this paper. These remarks will be made, however, in order to acquaint the reader with certain difficulties which seem to arise in Piaget's thought and which would offer fruitful areas of investigation.

The first of these critical remarks will be directed against Piaget's insistence on the genetic method as the only valid approach to the study of intelligence. As we will see it is this insistence on the exclusive value of this method that accounts for the difficulties inherent in his thought. In fact, his preoccupation with this method led him to reject the idea of the intellect as a faculty which pre-exists its operations. One would not object to this mode of acquisition of knowledge; to the contrary, this mode has much to offer even in the area of discovering the nature of intellectual activity. However, one could take issue with his view that it is the only method which affords accurate, reliable, and scientific knowledge.

The problem emerging from this critical reflection could be formulated as follows: can a complete knowledge of the nature of any given reality be found if one relies uniquely on one method and one experimental science? This question

leads to another which is even more basic: does Piaget's insistence on the fact that knowledge can only be attained through controlled experimentation and scientific verification reveal that he supports a position of positivism?

The second of these critical remarks can be made concerning a specific point of doctrine which Piaget holds. Observing that he speaks of the intellect as something which develops, as something toward which all other activity tends, and which comes into existence at the terminal point of a long series of developments, one might ask if he is placing "becoming" in the very nature of the intellect itself. That is to say, is he actually maintaining that the intellect comes to be over a gradual period of development and not simply that its operation or exercise comes to be or is perfected during a gradual period of development? To state the problem in a more fundamental way we might say: does one need to distinguish the ontological order, that is, the order of nature, from the order of operation or exercise? Or again, is there a difference between what a thing is, how and when its presence is manifested and then the gradual perfection of its operation?

A third critical remark arises as a result of Piaget's insistence on biological continuity as a fundamental factor in his theory. Does such a position remove any criterion for distinguishing between man and animal? In respect to this observation J. P. Desbiens makes a few incisive comments.

> En vérité, le système de Piaget ne fournit aucun moyen de distinguer entre l'homme et animal, sinon a posteriori et de façon extrinsèque. ...Mais ce qu'il faut, c'est un critère pour distinguer, dès les premiers instants de l'existence, le nouveau-né de l'homme et la brute, laquelle, à ce moment, est mieux équipée de beaucoup que l'enfant naissant. On n'acquiert pas une nature en cours de route. Constater que l'enfant dépasse

> rapidement le chimpanzé sitôt l'apparition du langage, est à la portée de n'importe qui; il faut expliquer cette supériorité, indiscutable après coup; de façon à pouvoir la lire avant qu'elle ne se manifeste. Autrement on condamne l'enfant à vivre à crédit d'humanité pendant les quelque 20 ou 30 premiers mois de son existence.[41]

Again one might question the validity of Piaget's statement that one cannot argue from a certain operation to a power or faculty responsible for the operation or in which the capacity resides. Such a position seems entirely contradictory to St. Thomas' position, following Aristotle, when he says that acts are specified by their objects and faculties or powers are known by their acts.

> Quod potentia, secundum illud quod est potentia, ordinatur ad actum. Unde oportet rationem potentiae accipi ex actu ad quem ordinatur; et per consequens oportet quod ratio potentiae diversificetur, ut diversificatur ratio actus. Ratio autem actus diversificatur secundum diversam rationem objecti.[42]

The fourth and last criticism leveled against Piaget strikes at the very heart of his theory. The criticism may be formulated as follows: despite Piaget's claim that genetic psychology is the only science which can provide a scientific knowledge of the intellect, his writings fail to exhibit a clear and distinct knowledge of the intellect. In fact, it is in this area that genetic psychology is least satisfying. Recall how Piaget defines the intellect.

> Elle est la forme d'équilibre vers laquelle tendent toutes les structures dont la formation est à chercher des la

---

[41]Desbiens, Introduction à un examen..., p. 154-155.

[42]St. Thomas, I, q. 77, a. 3c.

> perception, l'habitude, et les mécanismes sensori-moteurs élémentaires.[43]

Or again,

> L'intelligence n'est ainsi qu'un terme générique designant les formes supérieures d'organisation ou d'équilibre des structurations cognitives.[44]

Such statements leave it difficult to distinguish the nature of the intellect from any other form of cognitive "structures", be it of memory, imagination, etc.

In the course of this discussion we will attempt to show that genetic psychology of itself cannot provide the kind of knowledge which Piaget claims it can provide. In fact, we will attempt to show that the claim Piaget makes is too great, that it exceeds the limits of his own science. To accomplish this task let us recall briefly an order of procedure which Aristotle maintains should be followed in the science of the soul in order to attain a clear knowledge of the powers or faculties of the soul and even of the nature of the soul itself. A very lucid presentation of this order is found in Saint Thomas' commentary in the following passage:

> Ostendit quo ordine determinandum sit de partibus animae. Et assignat ordinem, quantum ad duo. Primo quantum ad hoc, quod ille qui debet de partibus animae perscrutari, primo debet accipere unumquodque horum, quid est: et postea debet considerare de habitis, idest consequentibus partibus, et de aliis quae sunt consideranda circa partes

---

[43] La naissance de l'intelligence, p. 11.

[44] La psychologie de l'intelligence, p. 12.

> animae et circa ipsa animata, sicut de organis, et de aliis huiusmodi. Et iste ordo necessarius est, quia si simul de omnibus determinaretur, esset confusa doctrina.[45]

Thus, according to the principle stated above, it is necessary, in order to avoid confusion with respect to the knowledge of the powers of the soul, to begin by considering each one of the powers in itself with a view to manifesting its nature before undertaking a study of these powers in their relations (habitibus), be it those of organic determinations or according to any other consideration.

It is in accordance with this principle that Aristotle, in his treatise on the soul, after having defined the soul in general, proceeds to a study of the various powers of the soul — vegetative, sensitive, intellective, appetitive and motor powers. Such a procedure, that of distinguishing the powers one from another thus manifesting their proper nature (quid sit) by considering their proper objects, is in accord with a principle Aristotle sets forth in the beginning of chapter IV of Book II of the De Anima.

> Si autem oportet dicere, quid unumquodque ipsorum, ut quid intellectivum, aut sensitivum, aut vegetativum, prius adhuc dicendum, quid sit intelligere, quid sentire. Priores enim potentiis, actus et operationes secundum rationem sunt. Si autem sic, adhuc his priora opposita considerare, de illis primum utique oportebit determinare, propter eamdem causam, ut alimento, et sensibili, et intelligibili.[46]

It is in this manner that Aristotle proceeds in De Anima III in order to

---

[45]Saint Thomas, In II De Anima, l. 6, n. 303.

[46]Ibid., l. 6, caput. (Aristotle, Physics, II, ch. 4, 415a, 16-24).

reveal the nature of intelligence. According to this principle as set forth by Saint Thomas, the primary objective of Aristotle in engaging in the study of the soul was to manifest, in a very distinct way, its proper nature. To accomplish this goal he first concerns himself with the task of showing very clearly in what way the powers of the soul are essentially different from the senses, particularly the internal senses, especially that of imagination with which it can so easily be confused. Saint Thomas points out that such confusion was frequently the case among the first philosophers.[47] Basing his argumentation on the fact that the intellect can know all things, Aristotle proceeds to show in Chapter IV that the intelligence, contrary to the senses, is a faculty that is inorganic and spiritual.

Hence philosophy, by means of the science of the soul, furnishes us with a distinct knowledge of the nature of the intellect which we would search for in vain in the experimental sciences. Is this to say then that genetic psychology would have nothing to add to the knowledge of the nature of the intellect which was acquired by a philosopher's investigation into the nature of the soul? No, not at all. However, in order to show in what way genetic psychology contributes to a knowledge of intelligence we must examine another aspect of the science of the soul which is contained in the De Anima – namely, the incompleteness of the science of the soul contained therein. Important, basic and sound as this knowledge of the soul and its powers may be, it in itself does not furnish a knowledge that is total and complete in any absolute sense. Saint Thomas points this out in

---

[47] Saint Thomas, In III De Anima, l. 1, n. 564.

the very beginning of his commentary by explaining in what sense we are to understand what Aristotle meant when he said that this treatise was to be considered the "history of the soul".

> Et dicit "historiam", quia in quadam summa tractat de anima, non perveniendo ad finalem inquisitionem omnium quae pertinent ad ipsam animam, in hoc tractatu.[48]

This same idea appears even more clearly in the beginning of Saint Thomas' commentary on De Sensu et Sensato. He claims that if the treatise on the soul only provides an incomplete knowledge it is because it is limited by being too abstract. In fact the treatises of Aristotle which follow the De Anima have, as their objective, to continue the study of the powers of the soul in a more concrete manner. Or as Saint Thomas says: per modum concretionis ad corpus.

> Unde et scientiam naturalem incipit tradere ab his quae sunt communissima omnibus naturalibus, quae sunt motus et principium motus; et demum processit per modum concretionis, sive applicationis principiorum communium, ad quaedam determinata mobilia, quorum quaedam sunt corpora viventia circa quae etiam simili modo processit distinguens hanc considerationem in tres partes. Nam primo quidem consideravit de anima secundum se, quasi in quadam abstractione. Secundo considerationem facit de his, quae sunt animae secundum quamdam concretionem, sive applicationem ad corpus, sed in generali. Tertio considerationem facit applicando amnia haec ad singulas species animalium et plantarum, determinando quid sit unicuique speciei.[49]

However, this position raises a special problem with respect to the

---

[48]Saint Thomas, In I De Anima, l. 1, n. 6.

[49]Saint Thomas, De Sensu et Sensato, l. 1, n. 1.

intelligence. In the light of this procedure it does not seem possible for one to progress further in the study of the soul, as is the case with the other powers of the soul, because the intelligence, since it is an inorganic power (as demonstrated in De Anima III), the study per modum concretionis ad corpus would not seem to apply. Are we to conclude then that the study of the intelligence has been completed with the De Anima? If there is anything to be added to this knowledge would it be only the task of metaphysics which is the science, par excellence, of the intelligence? From this perspective is there any role to be played by genetic psychology in the study of intelligence?

First of all it is necessary to note that if anything could be added to the knowledge of the intelligence contained in the De Anima, as genetic psychology seems to have done, then it would not be, as in the case of the other powers, per modum concretionis ad corpus. It is rather in an entirely different way that genetic psychology makes a contribution to the knowledge of intelligence. Once the proper nature of intelligence has been clarified by philosophy through the science of the soul then one could begin re-examining the intelligence with a view to obtaining a more perfect knowledge in the sense in which genetic psychology proceeds to explore the actual steps in the development and exercise of the intellect. Experience teaches us that the intelligence of each individual progresses toward its perfection consequent upon the development of the sense faculties. Hence in addition to the knowledge of the intelligence in itself one could also investigate the actual steps in its concrete development, unfolding or exercise. It is in this area that genetic psychology has made a great contribution. Hence, even if this science does not

furnish a knowledge of the nature of intelligence as such, it does serve to perfect and complete the knowledge which one has arrived at by means of philosophy in its study of the soul.

RAPPORT BETWEEN ARISTOTLE AND PIAGET

The aim of this section of our chapter is to propose certain notions which serve as a basis for agreement between the two, despite their profoundly divergent viewpoints regarding the nature of the intellect. Two such notions have gradually emerged during the course of this study. It is to these that we wish to direct the attention of the reader at this time. First, in both the doctrine of Aristotle and the theory of Piaget we see a singular value accorded to the intellect. Secondly, in each view the role of development plays a significant part. To these two a third will be added as the direct outcome of this investigation, namely, the place of vague and confused knowledge in man's acquisition of knowledge or science. These general areas of agreement must be seen as underlying the specific interpretations given by either Aristotle or Piaget.

Two areas of general agreement

The first area of agreement will be stated in this fashion: both Aristotle and Piaget accord to reason an ultimate and absolute value. One need not pause to cite passages to confirm Aristotle's position in this regard since, for him, reason was the distinct and unique characteristic of man. To complement this affirmation of the supreme value of reason we cite the following passage from a recent address given by Piaget.

> Pour nous, déclarons-le...nous croyons à la valeur irréductible et sui generis de la raison et nous pensons qu'aucun argument tiré de l'expérience ne pourra jamais faire douter de cette valeur propre à l'activité rationnelle, puisque toute expérience est toujours relative à une telle activité.[50]

Let us recall however that though they both affirm reason as a supreme value in itself, yet they do not have the same notion in mind when they speak of reason or intelligence. Piaget's conception of the nature of intelligence, as we have seen, is entirely different from that of Aristotle's because of his conviction that the genetic approach is the only valid approach to the study of the intellect. Be that as it may, one cannot gainsay that he has not recognized the ultimate value of intellect, however partial and vague one may see his knowledge of the intellect to be. The point we wish to make at this time is not to accentuate the divergence of their views with respect to the nature of the intellect but rather to show that these two thinkers, from different epochs, working in different sciences have concurred in declaring that the intellect is an ultimate value in man.

The second area of similarity resides in the recognition by each man of the role played by development in the acquisition of knowledge. Piaget's entire theory manifests the progressive development of intellectual activity in young children. Aristotle's doctrine holds that potentiality is a basis of man's acquisition of knowledge. Aristotle and Saint Thomas both recognized that the intellect only progressively attained its perfection in the order of knowledge. Such a gradual

---

[50]Piaget, 3e semaine internationale de synthèse, pp. 68-69, cited in Desbiens, Introduction à un examen ..., p. 181.

development in knowledge, they maintained, is the normal mode of procedure for the human being. Piaget, likewise, recognized a gradual development with respect to the perfection of intellectual activity. However, over and above this development in the order of exercise or operation, Piaget maintains that the intellect itself comes to be or develops in the process. Again we must pause and distinguish in order not to exceed the proper limits in attempting to indicate a measure of agreement. Both thinkers recognized the role of development in relation to intellectual operation and hence in the measure in which each affirms this, there is accord. However, since Piaget made no distinction between the order of nature and the order of exercise, he holds that there is a development within the intellect itself, and not just in its operation.

Having examined these two areas of similarity we again are in a position to remark on the distinctive contribution Piaget has made to knowledge theory: the emphasis on the genetic aspect of the psychology of thinking as an integral part in revealing the process of thinking. This genetic aspect was recognized but not developed by the ancients. Evidence for such a statement is found in Aristotle's position with regard to our knowledge of things. He says that things which become are more perfectly known by their end than by their becoming.[51] However, even though knowledge through final cause holds a privileged place, he recognized that a knowledge of things in their genesis or becoming provides a more perfect knowledge in the sense of being complete or comprehensive.[52]

---

[51] Ibid., p. 183.

[52] Ibid.

Viewing Piaget's work from this optic, we see that he has made a decided contribution to the understanding of the nature of intellectual activity by exploring the genetic aspect. Desbiens states very succinctly the contribution and the limitation in Piaget's theory when he says:

> Au fond, ... les deux types de connaissance, la connaissance par la fin et la connaissance par le fieri ne sont pas trop pour éclairer l'ambiguité de la condition humaine. Chez Piaget toutefois ce qui prime, c'est la connaissance par le fieri.[53]

Thus in order to re-emphasize Piaget's leaning toward the genetic approach as being the primary and most important, Desbiens terminates his remarks with the passage from the Esquisse d'autobiographie intellectuelle: "Seule la genèse des idées explique leur structure finale."[54]

With these remarks concerning the value of the intellect and the notion of development as two common areas of agreement between Piaget and Aristotle, we terminate this section of the chapter and proceed to a presentation of a particular point of agreement which results from this investigation, namely, the consideration of the role played by vague and confused knowledge in the acquisition of human knowledge.

Particular point of agreement resulting from this study

At this point in the chapter we reach the culmination of the second phase of our thesis: to draw some conclusion concerning the degree of rapport

---

[53]Ibid., p. 184.

[54]Ibid.

between Aristotle and Piaget based on the principle that man proceeds from vagueness and confusion toward clarity and distinctness in the acquisition of knowledge. To do justice to our position, that is to say, neither to overstep proper limits nor to oversimplify, we have followed a very definite plan in this chapter. The reader has been alerted to a very basic and profound difference between Aristotle and Piaget concerning the nature of the intellect, then from a very broad perspective certain parallels between the two positions were pointed out. However to situate the rapport we are proposing demands that we return, so to speak, to the interior of their respective positions. In so doing we will attempt to show that the same principle has been recognized by both Aristotle and Piaget, thus giving us the ground for maintaining such a rapport and secondly providing us with the basis for determining the nature of the rapport.

As we have seen in Part I, chapter 2, of this thesis, Aristotle held this principle as operative whether one was acquiring knowledge of an integral whole or of a universal whole, to use his terminology.[55] He maintained that one always began with a common conception (certain with respect to existence but vague and confused with respect to the precise nature of the reality) and terminated with a clear and distinct knowledge. Hence according to Aristotle whether one is acquiring knowledge of an integral whole or of a universal whole, the same principle is operative; that man proceeds from a certain vagueness and confusion to a certain degree of clarity and distinctness.

---

[55]Cf. Part I, chapter 2, pp. 57 ff.

Turn now to Piaget's theory which concerns the formation or genesis of concepts in children. In its widest dimensions he stated the process in terms of "genesis", "structure" and "equilibrium". That is to say: every structure has a genesis and every genesis occurs between an inferior structure and a superior structure. At each stage of intellectual development a given structure is kept in balance by a state of "mobile" equilibrium. During the actual steps in the formation of a concept Piaget maintains that the child passes through three stages: failure, in the sense that he is incapable of recognizing the elements which need to be differentiated and coordinated; transition, characterized by hesitation, confusion and ambiguity, since the child sees the elements of a solution successively and hence he is unable to coordinate them into an integrated whole; and success, attained when the child simultaneously differentiates and coordinates all elements of the situation. It is evident that vagueness and confusion persist until the child is able to distinguish and then coordinate all factors involved in any given concept. The originality of Piaget's thought lies in the fact that he has actually shown experimentally the steps in the formation of a particular concept which provides the child with certain kinds of "operational" knowledge, to use Piaget's terminology. In doing so he has shown in this area where globalism and confusion reside and the reasons which account for the presence of these factors and the process by which they are dissipated.

Having made the above statements with respect to both positions the writer claims sufficient ground has been established to maintain that Piaget and Aristotle recognize the same principle governing growth in knowledge, albeit from

different optics of the knowing process.

Now one may ask: granted that they both recognize this principle, how do they stand in relationship to one another? This question will be answered within the context of the first purpose of our thesis: what relationship does genetic psychology bear to Aristotle's doctrine on the common mode of procedure characteristic of the human intellect? Recall again that in the Physics Aristotle used three signs as examples to illustrate the validity of the principle he was invoking: one drawn from sense perception; a second from the mode of defining and a third drawn from observing children. However, when we studied the explanation of the principle according to Saint Thomas[56], we realized that the signs found in the Physics were, in reality, whole domains wherein the principle applied, thus indicating the universality of the principle. Saint Thomas pointed out that this principle was applicable whether one sought knowledge of a sensible or of an intelligible whole.

Hence let us look at the theory of Piaget from the perspective of Aristotle and then from that of Saint Thomas. Piaget's theory, examined in the light of Aristotle's perspective in the Physics, would be considered as another sign (i.e., one drawn from genetic psychology) which further establishes the validity of the principle Aristotle was manifesting. Piaget's theory, examined from the viewpoint of Saint Thomas, indicates that genetic psychology as such constitutes an area not specifically mentioned by Saint Thomas but one wherein the principle is also applicable.

---

[56] Ia. q 85, a. 3.

Hence the ground or basis for the rapport has been established by showing the role played by the movement from vagueness and confusion to clarity and distinctness in the respective positions. Likewise the nature of the rapport has been established in a twofold way. In one instance Piaget's findings confirm the validity of the principle set forth by Aristotle; in the other instance it reveals another area wherein the principle is applicable.

CONCLUSION

The complete cycle of this investigation, that is, the goal established at the outset, has now been accomplished. That goal was twofold: first, to set forth Aristotle's doctrine on the common mode of procedure that is characteristic of the human intellect; second, to explore the genetic psychology of Jean Piaget in order to determine if and in what measure grounds might be established for a comparison between his theory and Aristotle's doctrine. Four remarks will encapsule the results of the foregoing investigation and will serve as a conclusion to our study.

The first of these remarks concerns the second goal of the investigation, namely, to answer the question: is there any basis for a rapport between Piaget's genetic theory and Aristotle's doctrine on the intellect's mode of procedure? The answer is affirmative. As the thought of each man was presented it became evident that they recognized the same principle as operative in the context within which they were working. Aristotle understood this principle in its widest dimensions since he saw it governing the common or basic mode of procedure of the human intellect. Piaget saw this principle governing the origin and development of concepts in children.

The second remark relates to the question: does genetic psychology add anything to Aristotle's doctrine? Again the answer is affirmative. The

genetic findings of Piaget reveal the mode of procedure of the human intellect in a very concrete manner by showing the actual steps through which a child passes during the period of formation and development of concepts.

Just as it was maintained that Piaget's theory contributed to Aristotle's doctrine on the human mode of knowing, now let us ask the question: how does Piaget's theory stand in respect to Aristotle's doctrine? The answer is found by recalling Aristotle's intent in Physics I and then Saint Thomas' exposition in the Summa. In the Physics I Aristotle used three examples as signs to manifest the validity of the principle he was invoking. Recall that it was one of these signs which provoked this investigation of Jean Piaget's work. In the light of Physics I, Piaget's theory would stand as a sign of the validity of the principle. If his theory is related to Saint Thomas' exposition of the principle found in the Summa, I, q. 85, a. 3, then his theory represents another area, not specifically mentioned by Saint Thomas, wherein the principle applies. Hence the third remark may be thus formulated: in relation to this doctrine of Aristotle, the genetic psychology of Jean Piaget stands as an experimental confirmation of the principle governing the common mode of procedure that is characteristic of the human intelligence.

The fourth and final remark underscores the basic criticism leveled against Piaget in this study, namely, that genetic psychology of itself can never be, as Piaget maintains, the science of the intelligence. To provide a clear and distinct knowledge of the intellect surpasses the limits of genetic psychology. In the light of the order presented by Aristotle, one would have to admit that no

matter how valuable the knowledge of the intelligence found in genetic psychology, this science can never be considered the science of the intelligence. Its domain is limited and circumscribed since it concerns the manifestation of the intellect in its concrete operations, rather than the very nature of intelligence itself.

Radical as the foregoing criticism may be, in terminating this thesis, the following points must be reaffirmed: first, insofar as Piaget remains within the field of genetic psychology, he has made an original and valuable contribution to knowledge theory; second, genetic psychology stands as an experimental confirmation of the principle which Aristotle recognized as governing the common mode of procedure of the human intellect.

BIBLIOGRAPHY

I. PRIMARY SOURCES:

ARISTOTLE:

The Basic Works of Aristotle, edited with an introduction by Richard McKeon, New York: Random House, 1941.

De Anima, translated by R. D. Hicks, cited in Foundations of Western Thought edited by James G. Clapp, Morris Philipson, Henry Rosenthal, New York: Knopf, 1962.

S. THOMAS AQUINAS:

In Aristotelis Librum De Anima Commentarium, cura M. Pirotta. Taurini, Marietti, 1936.

In Duodecim Libros Metaphysicorum Aristotelis Expositio, cura M. Spiazzi. Taurini, Marietti, 1949.

In Octo Libros Physicorum Aristotelis Expositio, cura M. Naggiolo. Taurini, Marietti, 1949.

Quaestiones Disputatae: De Veritate, cura M. Spiazzi. Taurini, Marietti, 1949.

Summa Theologica, 4 vol., cura M. Caramello. Taurini, Marietti, 1950.

In Libros Aristotelis De Caelo et Mundo Expositio, cura M. Spiazzi. Taurini, Marietti, 1952.

Opuscula Theologica, 2 vols., cura M. Verardo. Taurini, Marietti, 1954.

In Aristotelis Libros Posteriorum Analyticorum Expositio, cura M. Spiazzi. Taurini, Marietti, 1955.

De Sensu et Sensato, Opera Omnia, ed. Parmae, Vol. 20.

Expositio in Librum Boetii De Trinitate, Leiden, Brill, 1959.

Summa Contra Gentiles, 3 vol., ed. Pira et al. Taurini, Marietti, 1961.

DESCARTES:

Oeuvres et lettres. Paris; Bibliothèque de la Pléiade, 1953.

JEAN PIAGET:

Le jugement et le raisonnement chez l'enfant, Neuchâtel: Delachaux et Niestlé, 1924. (2e éd. 1930; 3e éd. 1947; 4e éd. 1948; 5e éd. 1963).

La représentation du monde chez l'enfant, Paris, Alcan, 1926. (2e éd. 1938; Nouv. éd Paris. P.U.F., 1947).

La naissance de l'intelligence. Neuchâtel: Delachaux et Niestlé, 1936.

Translation:
-- The Origins of Intelligence in Children. (trad. M. Cook) New York; International Universities Press, 1952.

La construction du réel chez l'enfant. Neuchâtel: Delachaux et Niestlé, 1937.

Translation:
-- The Construction of Reality in the Child. (trad. M. Cook) New York: Basic Books, 1954.

La genèse du nombre chez l'enfant. Neuchâtel: Delachaux et Niestlé, 1941.

(avec Inhelder, B.) Le développement des quantités chez l'enfant. Neuchâtel: Delachaux et Niestlé, 1941. (2e éd. 1950; 3e éd. 1965).

La formation du symbole chez l'enfant. Neuchâtel: Delachaux et Niestlé, 1946.

La psychologie de l'intelligence. Paris: Colin, 1947. (Rééd. 1947, 1949, 1952, 1956, 1961, 1962, 1964, 1965).

Translation;
-- Psychology of Intelligence. (trad. M. Piercey et D. E. Berlyne), London: Routledge and Kegan Paul, 1950. (Reprint: New Jersey, Patterson, Littlefield, Adams, 1960).

Introduction à l'épistémologie génétique. 3 Vol., Paris: P.U.F., 1950.

"Psychologie génétique à l'épistémologie", Diogène, 1952, (Nov.), Vol. 1, pp. 38-54.

"Genetic Psychology and Epistemology", Diogenes, 1953, pp. 43-63.

Logic and Psychology, New York; Basic Books, Inc., 1957.

"How Children Form Mathematical Concepts", Scientific American, Nov. 1953.

La logique de l'enfant à la logique de l'adolescent. Paris: P.U.F., 1955.

Translation:
-- Growth in Logical Thinking from Childhood to Adolescence. (trad. A. Parsons and S. Milgram), New York: Basic Books Inc., 1958.

(avec Beth, W. E. et Mays, W.) Epistémologie génétique et recherche psychologique. ETUDES D'EPISTEMOLOGIE GENETIQUE, Vol. I., Paris: P.U.F., 1957.

(avec Apostel, L. et Mandelbrot, B.) Logique et équilibre. ETUDES D'EPISTEMOLOGIE GENETIQUE, Vol. II., Paris: P.U.F., 1957.

(avec Inhelder, B.) La genèse des structures logiques élémentaires. Neuchâtel: Delachaux et Niestlé, 1959.

(avec Fraisse, P.). Traité de psychologie expérimentale: Vol. VII. Intelligence. Paris: P.U.F., 1963.

Cognitive Development in Children (Development and Learning; The development of mental imagery; Mother structures and the notion of number; Relations between the notions of time and space). In: Piaget Rediscovered. Report of the Conference on Cognitive Studies and Curriculum Development. Cornell University. (R. Ripple and V. Rockcastle eds.), 1964.

Six études de psychologie, Genève: éditions Gonthier, 1964.

"Genèse et structure en psychologie", en Entretiens sur les notions de 'genèse' et 'structure'. CONGRES ET COLLOQUES, Vol. 8, La Haye-Paris, Mouton et Cie, 1964.

Sagesse et illusions de la philosophie. Paris: P.U.F., 1966.

(avec Inhelder, B.). La psychologie de l'enfant. Collection "Que sais-je?", Paris: P.U.F., 1966.

"La psychologie et les relations interdisciplinaires", Bulletin de Psychologie. Dec. 1966, Vol. XX, n. 254. (Conference given at Moscow for the Eighteenth International Congress of Psychology, August 4-11, 1966).

Biologie et connaissance. Paris: Gallimard, 1967.

SPINOZA:

Ethics. (translated by A. Boyle). Collection: Everyman's Library, London: C.P. Dutton and Co. Inc., 1st edition, 1910.

II. SECONDARY SOURCES

Bresson, F. et M. de Montmollin eds. Psychologie et épistémologie génétique. Paris: Dunod, 1966.

Bruner, J. "Inhelder and Piaget's The Growth of Logical Thinking: a psychologist's point of view", British Journal of Psychology, 1959, 50, pp. 363-370.

De Koninck, Charles. "Abstraction from Matter". Laval Théologique et Philosophique, Vol. XIII, 1957, n. 2; XVI, 1960, n. 2.

--- "Introduction à l'étude de l'âme". Laval Théologique et Philosophique, Vol. III, 1947, n. 1.

--- "Three Sources of Philosophy", Proceedings of the American Catholic Philosophical Association, Washington, D.C. 1964, (reprint).

--- "Sedeo, Ergo Sum", Laval Théologique et Philosophique. Vol. VI, 1950, n. 3.

Desbiens, Jean-Paul. Introduction à un examen philosophique de la psychologie de l'intelligence chez Jean Piaget, Québec: P.U.L., 1968.

Flavell, John. The Developmental Psychology of Jean Piaget. Princeton, New Jersey: D. VanNostrand Co. Inc., 1963.

--- "Historical and Biographical Note" in Thought in the Young Child. Monographs for the Society for Research in Child Development. Vol. 27, n. 2, 1962.

Heisenberg, Werner. Philosophy and Physics. New York: Harper and Bros., 1962.

Inhelder, Barbel (with B. Metalon). "The Study of Problem-solving and Thinking", in the Handbook of Research Methods in Child Development, edited by P. Mussen, New York: John Wiley and Sons, Inc., 1960.

--- "Développement, régulation et apprentissage", in Psychologie et épistémologie génétique, edited by Bresson, F. et M. de Montmollin.

--- (avec Piaget). La psychologie de l'enfant. collection "Que sais-je?", Paris: P.U.F., 1966.

--- (avec Noelting, G.). Etude longitudinale de l'intelligence de l'enfant de 4 à 15 ans. Unpublished research, Genève, 1955-61.

--- "Some Aspects of Piaget's Genetic Approach to Cognition." cited in Thought in the Young Child. Monographs for the Society for Research in Child Development. Yellow Springs, Ohio: The Antioch Press, Vol. 27, no. 2, 1962.

Isaacs, Nathan. "The Significance of Piaget". London: Information Service of the National Froebel Foundation, 1958, Vol. 34, pp. 67 ff.

Jennings, Frank. "Notes on Learning", Saturday Review, May 20, 1967.

Kessen, William and Kuhlman, Clementia (eds.). Thought in the Young Child. Monographs for the Society for Research in Child Development. Yellow Springs, Ohio: The Antioch Press, Vol. 27, no. 2, 1962.

Lunzer, E. A. Recent Studies in Britain Based on the Work of Jean Piaget. London: The National Foundation for Educational Research in England and Wales, 1960.

--- (with Isaacs, N.). Some Aspects of Piaget's Work. London: The National Froebel Foundation, 1955, pp. 32-45.

Maurer, Armand. Division and Method of the Sciences. Translation of the De Veritate, QQ. 5 and 6. Toronto: Pontifical Institute of Mediaeval Studies, 3e ed. 1963.

McArthur, Ronald. A Study of the Universal in praedicando and in causando. Unpublished doctoral dissertation, Université Laval, 1952.

Noelting, Gerald. Notes de cours. Université Laval, 1965, 1966.

--- (avec B. Inhelder). "Etudes longitudinale de l'intelligence de l'enfant de 4 à 15 ans", unpublished research, Genève, 1955-61.

Parsons, Charles. "Inhelder and Piaget's Growth in Logical Thinking: a logician's point of view", British Journal of Psychology. 1960, 51, pp. 75-84.

Ripple, R. and Rockcastle, V. eds. Piaget Rediscovered. Report of the Conference on Cognitive Studies and Curriculum Development. Cornell University, 1964.

Tuddenham, Read. "Jean Piaget and the World of the Child". American Psychologist, Vol. 21, no. 3 (March 1966) pp. 207-211.

Vinh-Bang. "La methode clinique et la recherche en psychologie de l'enfant", in Psychologie et épistémologie génétique. Bresson, F. et M. de Montomollin eds. pp. 67 ff.

Wébert, J. "La pensée humaine", Somme Théologique. Editions de la Revue des jeunes, Paris: Desclée et Cie., 1954.

--- "La connaissance confuse" dans la Revue des Sciences Philosophiques et Théologique, juill., 1928.

Werner, Heinz. Comparative Psychology of Mental Development. New York: International Universities Press, 2nd edition, 1957.

PROPOSITIONS

Nomen autem rationis est ab inquisitione et discursu.

Magister est minister naturae.

Nomina enim imponuntur a nobis secundum quod nos intelligimus.

Contrairement à ce que croit Descartes, les certitudes acquises "per modum rationis" présupposent des certitudes acquises "per modum naturae".

Selon Marx: "les représentations, la pensée, le commerce intellectuel des hommes apparaissent ... comme l'émanation de leur comportement matériel".