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tended to clearly intended acts). Piaget's six stages of sensorimotor development could be reread in this way, from reflex activity as a prototypical instance of reactive, unintended behavior, to the Stage VI capacity for communicating one's intentions symbolically as a prototypical instance of intentional action. Lewis's five levels in the development of intention could be reread in this way as well, except for his belief that it is necessary to postulate the existence of intention from the beginning. His sequence of levels adds much to Piaget's stages of sensorimotor development, especially with regard to emotion. But I believe that, in addition to confusing intention with Intentionality and avoiding the problem of novelty, his equation of all goal-directedness with intention is unreasonable insofar as it entails the subsumption of fairly prototypical instances of unintentional behavior (e.g., reflexes, tropisms, the behavior of servomechanisms) as positive instances of the concept. I sympathize with the desire to trace the commonalities between such phenomena and human mental life, but I believe this goal should be accomplished by developing new concepts which connect the prototypical intentional and unintentional instances rather than by stretching the concept of intention beyond the bounds of its usual meaning. As I have argued elsewhere (Chapman, 1988), Piaget's constructivism can be interpreted as such an attempt to trace the evolutionary and developmental con-

tinuity between the Intentional, knowing mind and the objective reality that is known. To what extent he succeeded in doing so is an open question. Theories of development are rarely debated in such terms. Although I disagree with Michael Lewis's specific proposals, I believe his article is valuable in calling attention to such important and unavoidable issues in the development of mind.

#### Note

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## Consciousness as a Necessary Transitional Phenomenon in Cognitive Development

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Michael Lewis tackles two monsters of psychology—intentionality and consciousness—and I congratulate him for his courageous attempt which has forced me to make the very salutary effort of reflection and clarification.

His thesis consists in completely dissociating intentionality and consciousness. Behaviors are intentional from the beginning of the sensorimotor stage whereas reflexive consciousness does not appear until the end of this stage, that is, around 18 months. He thus radically opposes the Piagetian thesis according to which consciousness and intentionality are in close solidarity and progressively emerge in the course of the sensorimotor stage and give rise to human intelligence (psychic or mental activities). Lewis describes the development of intentionality in the sensorimotor stage in five levels closely related to emotional development.

The major target aimed at by Lewis in his article is Piaget. Now to start with, I have to declare my disagreement with his interpretation of the Piagetian theses. Therefore, I am bound to make explicit my own interpretation of Piaget for general as well as for specific issues raised by the article, and to initiate a first confrontation between Lewis and Piaget, which will unfortunately strongly overload my commentary. Finally, I present my own critical position which consists in considering consciousness as a necessary transitional phenomenon for cognitive development and more precisely for

redefining behavior determinants (i.e., for the genesis of new means of action planning and control).

#### Prolegomenon

Piaget's general project was to use psychogenesis to solve or understand the epistemological problem of the emergence of new forms or structures of thinking or reasoning. His study of sensorimotor intelligence is placed in this framework and his focus was mainly oriented toward what he has called *structural discontinuity*. As far as early stages of development are concerned, he attempted in a like manner to explain the acquisition of new structures, the sensorimotor schemes, on the basis of other structures defined by inherited reflex schemes (isolated, heterogeneous). In this connection, how could Lewis have read Piaget so as to consider his theses as an attempt to explain development as "going from no structure to structure"? Nevertheless, it is true that if we qualify the structures as mental or psychic, the sensorimotor stage reveals truly for Piaget the emergence of mental structures. Previously, there would be, according to him, only biological structures inherent in functioning, as we see later. From this point of view, it is possible to say that for Piaget, the newborn goes from the absence of mental states to their presence, as Lewis mentions it elsewhere in his text.

Moreover, this first developmental stage assumed for Piaget another major interest. He was trying to demonstrate, following Baldwin and in the same spirit as Freud, the *functional continuity* between adaptative structures from biology to psychology, from material to functional assimilation. (Human intelligence is only the most sophisticated adaptative means, because in Piaget's terms logical operations, or the general coordinations of action, produce perfect corrections or compensations of certain classes of transformation or disturbance, in opposition to approximate compensations made possible by other types of behavioral organizations such as instinctive, reflex, or perceptual behaviors.)

Now this opposition between structural discontinuity and functional continuity is basic for discussing the Piagetian theses related to sensorimotor development and more precisely the issues of intentionality and consciousness. From the point of view of functional continuity, Piaget had no difficulty in admitting, for example, that infant behaviors could be described at all sensorimotor stages as revealing various types of object permanence and, consequently, various types of intentionality. (The connection between permanence and intentionality seems obvious to me because behaviors revealing object permanence are explicitly goal-directed behaviors.) By means of the newborn's reflexive behaviors at the first stage, he or she defines invariants (the breast for example) or a first variety of object permanence: "The precocious searching of the child in contact with the breast . . . is a remarkable thing. Such searching . . . must be conceived . . . as the first manifestation of a duality of desire and satisfaction" (Piaget, 1936/1977, p. 40, French/52, English; cf. also Piaget, 1937/1968, pp. 94–100/106–113). With regard to structural discontinuity, however, Piaget qualifies this permanence or the structures that determine it as *practical* because they only characterize a functioning. They do not exist consciously from the subject's point of view but only from the observer's point of view. It may be useful to recall that for Piaget there is a primary consciousness, or consciousness of "it is desirable," "it is painful" (Piaget, 1926/1967, p. 112/127). *Subjective* permanence (Stages 3 and 4) will succeed to the practical one; it begins to exist for the subject thanks to his or her consciousness and eventually leads to *objective* permanence (Stages 5 and 6). This last one is later retermed *practical* by Piaget himself. As we see later, such a change creates other kinds of problems (Piaget, 1947; for a discussion, see Mounoud, 1979). By introducing the distinction between the subject's and the observer's points of view, Piaget tries to reconcile the aspects of functional and structural discontinuity. This distinction corresponds to the opposition that he later sets up between biological or neurophysiological *structures inherent in a functioning* and mental *structures produced by this functioning* (or resulting from this functioning; Piaget, 1967/1971, p. 257/222). (I do not consider these distinctions relevant for qualifying structures. It is one of the arguments that has led me to postulate structural preformation; see Mounoud, 1979.)

As we have just seen with object permanence, it is difficult but nevertheless necessary to find ways to contrast and compare different achievement levels within a given behavioral category. Lewis considers this problem in detail in the section entitled "Levels of Meaning." Referring to Werner, he warns against falling prey to a "constancy fallacy" by equating behaviors at different ontogenetic or phylogenetic levels.

He even concludes that functionally similar behaviors "may be controlled by different processes" (Piaget would have said different structures). He takes imitative behaviors as an example. But if imitation corresponds to a behavioral category, it is not so for intentionality. Lewis states that intentionality is present at all levels of sensorimotor development, without providing behavioral criteria to identify it. Moreover, Lewis does not discuss the criteria generally used by authors such as Bruner (1973a, p. 248; 1973b), Wellman (1977), and Harding (1982), in addition to the ones adopted by Piaget (1936/1977) as recorded and analyzed by Willatts (1989).

### Lewis–Piaget Controversy

#### Lewis's Thesis

The central thesis of Lewis's article is the claim that intentionality is a property of all goal-directed systems that have desires (emotions). I do not think that such a general statement can elicit many debates. Lewis's formulation is sometimes more radical, for instance, when he ascribes intentionality to all goal-directed systems including inanimate ones. With such an extreme formulation, he renders explicit his hypothesis of total independence between intentionality and consciousness. I nevertheless consider that the thesis discussed in the article is limited to systems having desires or emotions.

Simultaneously, Lewis claims that reflexive consciousness (also called objective self-awareness) does not appear before his fifth stage—that is to say, around 18 months (Lewis, 1990). The role of consciousness is limited to explaining the emergence of two new classes of emotions (the ones related to objective self-awareness and to self-conscious evaluative emotions). Lewis dissociates completely the problem of intentionality from that of consciousness. Indeed, awareness or subjective self-awareness emerges as early as his third level, but in fact he speaks less of awareness than of representation. The novelty of his third level is the emergence of representation ("At some point, representations . . . are established").

Thus, the levels of consciousness distinguished by Lewis do not play any role as far as the development of intentionality is concerned and seem to proceed from the general progress of cognitive development.

#### Piaget's Thesis

Concerning relations between intentionality and consciousness, the basic Piagetian thesis is that there is no intentionality without consciousness. Intentionality results from grasps of consciousness or from consciousness phenomena. On the other hand, consciousness comes from *disadaptations*, the action being defined as a response to a need. Finally, needs are conceived as the manifestation of a *desequilibrium*, of a *disadaptation*. "Need must not be conceived as being independent of global functioning of which it is only an indication" (Piaget, 1936/1977, p. 45/58).

According to Piaget, the following connections are present at the beginning of sensorimotor development: Need state → *desequilibrium* or *disadaptation* → response or action → grasps of consciousness.

These relations would be subsequently transformed in the following way: consciousness of *desequilibrium* (of a prob-

lem, of a goal to be reached) → implicative relations between means and goal (intentionality) → action.

For Piaget, intentional behaviors (i.e., those based on relations of implication in a broad sense) can therefore only proceed, ontogenetically, to the grasps of consciousness. Intentionality and consciousness develop progressively from the very beginning. However, they do not reach the true status of consciousness and intentionality until the fourth stage with means–ends coordination corresponding, we might say, to the emergence of well-formed relations of implication. Instead of means–ends coordination it may be more appropriate from my point of view to speak of the dissociation or decomposition of initial global schemes, wherein it is not possible to distinguish means and ends (desires and means to satisfy them); they define what Piaget called a global functioning. “The basic fact is not need as such but rather the act of assimilation, which embodies in one whole functional need, repetition and that coordination between subject and object which foretells discrepancy [the correct translation would be *implication*] and judgment” (Piaget, 1936/1977, p. 46/59).

### Lewis Versus Piaget

As far as Lewis’s central thesis is concerned (presence of intentional behaviors as early as during the first stage of sensorimotor development), Piaget’s position is difficult to define because it is *two-sided* depending on which point of view he adopts between functional continuity or structural discontinuity. Thus, Piaget (1936/1977) wrote:

In a sense [in the sense of functional continuity], there is therefore only a difference of degree between the elementary adaptations and the intentional adaptations. The intentional act is only a more complex totality. . . . This division is artificial. (p. 133/170)

But in another sense [in the sense of structural discontinuity], intention involves a reversing in the data of consciousness: it is henceforth the influence of recurrent consciousness of direction impressed on the action or no longer only on its result. Consciousness arises from disadaptation . . . this influence of consciousness sui generis determines intention. (p. 133/170)

But this functional continuity in no way excludes a transformation of the structures being on an equal footing with the *actual reversal of perspective in the subject’s consciousness*. (p. 137/175, my emphasis)

It is this distinction of means and ends which sets intention free and so reverses the act’s direction. (p. 138/176)

For Piaget functionally equivalent behaviors—practical, subjective, or objective object permanence, including all the research activities and types or degrees of intentionality—can be controlled by different processes or structures due in particular to the emergence of conscious phenomena. These conscious phenomena generate the elaboration of new meanings and new connections between meanings which correspond to what Piaget has called *implication* in a broad sense (among which inferential implication is a particular case; see Piaget, 1963/1968). Thus, invariants from the first two sensorimotor stages, or practical permanence, are due to biolog-

ical structures or structures described as inherent in a functioning in opposition to invariants from the last two sensorimotor stages, or objective permanence, which are due to mental implicative structures resulting from the subject’s functioning itself. Between these two levels there is for Piaget no transmission of any particular structure, but only transmission of a functioning “that is capable of going far and learning almost limitlessly” (Piaget, 1967/1971, p. 297/257). I clarify my disagreement with this thesis later on.

Let us now examine which processes postulated by Lewis are needed to account for functionally equivalent behaviors belonging to the five levels of intentionality. But first we must briefly introduce these levels constituting the essential part of his argument.

In the first two levels (the first 6 or 7 weeks), there is *adaptive* intention—that is, an intention bound to adaptive survival functions of the organism. At the first level, only two emotional states (feeling good and feeling bad) are connected to desire. Approach or avoidance of these states are qualified as intentional. We have already seen why such a formula only partially contradicts Piaget, who maintains that at the very beginning of development, needs and means to satisfy them are functional totalities which cannot be dissociated.

Intention becomes *cognitive* (third and fourth levels) when representations have been constructed and associated to desires; then these representations and the desires constitute goals. These representations become independent from environmental context. As mentioned by Lewis, his description is strongly inspired by Piaget. About the shift from the second to the third level, Lewis speaks about the reversal of the direction of effect: Whereas at the second level infants react to external events, at the third level they act on external events. I assume that Lewis is referring to the change described by Piaget from the causal order of action to the implicative order of conscious phenomena. This shift constitutes the turning point in the Piagetian explanation, as we have seen. Now Lewis, after having declared that his third level is “the most problematic,” the one during which the infant’s goals “become independent of environmental context for their activation,” tells us that there is no evidence to differentiate his third level from the second. As I have already mentioned, he establishes no connections with consciousness. Therefore it becomes obvious that Lewis has not understood the fundamental change introduced by consciousness in Piaget’s thesis.

Finally, at the fifth level, intention becomes *conscious*. Thus, from 18 months on, the infant, after the diversification of goals produced by the differentiation of desires (emotions), is able to take into account various goals simultaneously; the diversification of means enables him or her to utilize alternatives.

There are basically two kinds of processes postulated by Lewis to explain this genesis: emotional and cognitive. These levels are determined partly by the development of emotions (considered as equivalent to desires). He views emotional development in the light of the traditional model proposed by Bridges, which is based on a differentiation process going from simple to complex: “The differentiation of [the desire] system is important for our understanding of the intentional system because as desires (goals) differentiate, the intentional system expands.” This development is also considered closely linked to the development of com-

prehension and causality and consequently to the general development of knowledge, which is itself determined by the emergence of representational abilities and by the growth of mnemonic capacities.

### Summary

To conclude this part, I attempt to synthesize the positions adopted by Lewis and Piaget.

For Lewis, the existence of equivalent functioning at the different levels of the sensorimotor period (or functional continuity) is certified by the intentional behaviors. What is it then that differentiates for him what we could call the discontinuity or the change in the processes between his first and his fifth level? It could be the emergence of consciousness (or awareness), which is absent from the two first levels. However, consciousness does not play any role for him; it cannot therefore be a process. There are two other possible candidates: memory and representation. As for memory, it is mainly a matter of growth, which can be supposed as continuous; it does not seem to constitute a qualitative change in the process. Representation, on the other hand, does not appear until his third level in conjunction with subject self-awareness. So we are confronted with what Lewis calls a mixed developmental model, that is, a model going from the absence to the presence of a given characteristic or component. For Lewis, the mixed model concerns representation whereas Piaget's model (in Lewis's version) concerns intentionality. In the end, the article seems a long detour to replace the absence of intentionality with the absence of representation, having lost on the way the essence of the Piagetian interpretation.

Piaget, as I understand him, tries to explain the transition from biological structures inherent in a functioning to mental structures produced by this functioning, the sensorimotor structures defining the emergence of consciousness, of intentionality, of intelligence, of psychism, of mental processes. This emergence has been situated during the fourth sensorimotor stage in a partially arbitrary way, as Piaget has emphasized many times (see in particular Piaget, 1947). But simultaneously, with respect to functional continuity, from the very beginning, the infant's behavior can be described from the observer's point of view as intentional and as exhibiting invariants or practical object permanence. What strikes me most about Piaget's position is the following: The emergence of conscious meanings, of mental structures producing relations of implication, does not depend on any type of representation. Nevertheless, he spoke about consciousness as producing an internal translation (Piaget, 1937/1968, p. 185/212). Indeed for Piaget these conscious meanings are inherent in sensorimotor schemes and their coordinations. It is well known that for him representations appear only at the sixth sensorimotor stage and result, at least partly, from the interiorization of imitative actions (Piaget, 1945). Piaget's position proceeds from an attempt to reconcile idealist or spiritualist theses with materialist ones.

Amazingly, Piaget has repeated this attempt in two books published 38 years after *The Origins of Intelligence in Children* (1936/1977): *The Grasp of Consciousness* (1974a/1977) and *Success and Understanding* (1974b/1978). In these two books, Piaget presents a thesis very close to the one I have just described. But this time, he opposes sensorimotor intelligence (retermed *practical* intelligence) to representa-

tive intelligence (or discursive or conceptual; strictly defined thinking for Piaget). The sensorimotor intelligence (from conscious or mental in 1936) has become the first level (role played by the reflex structures in 1936)—“the biological level with its automatic coordinations and its automatic control networks, ensuring the material conditions for behavior,” as Hauert (1990, p. 8) sums it up. “The second level is the conceptual level where the construction of conscious cognition is realized” (Hauert, 1990, p. 8). Together with Hauert, I have criticized this second Piagetian thesis of 1974 in different places (Hauert, 1980, 1990; Mounoud & Hauert, 1982a, 1982b).

However, Piaget's main contribution is to have conceded a major role to these conscious phenomena and to the implicative relations as opposed to the organization of causal relations related to action. A partially comparable opposition has been reintroduced by Marcel (1983) between conscious and unconscious perception (see also Marcel & Bisiach, 1988).

### My Own Position

My own attempt to reconcile continuous and discontinuous aspects of the cognitive and motor development is based on the concept of representation as an internal organization of contents (Mounoud, 1979).

The exceptional abilities of humans to modify behavioral determinants during development could be explained by the emergence at various periods and in particular at birth of new coding capacities. These new capacities would force the organism to retranslate, redefine, reinterpret, and rethemize some of the information accessed, that is to say to construct new representations, new frames of reference, new categories. The construction of these representations would be made through a relatively slow and complex process requiring a few years. I have described several times and again recently this construction process, so I do not present it here (see Mounoud, 1984, 1986a, 1986b, 1988; see also Vinter, 1990). This process goes along with grasps of consciousness which consist of implicative or inferential links or meaning relations as defined by Piaget. However, these phenomena would be *transitional* and these representations could be qualified as *declarative*. One particularity of the model is its recursive character. Consequently no stage, including birth, begins with the absence of representations.

In this perspective, the newborn's exceptional competencies are explained by preformed representations qualified as sensorial or sensorimotor. These representations would be above all *procedural* in nature (an article written by Bresson, 1987, has encouraged me to introduce the opposition between procedural and declarative representations). They account for the intersensorimotor coordinations that characterize the newborn's behavior. During their first weeks, infants behave in certain situations as if the surrounding world were intelligible: Numerous stimuli constitute for them organized patterns of information in response to which they produce organized action patterns (e.g., early prehension, imitation). This initial organization (which depends on phylogenesis and embryogenesis) ensures an initial perceptive and behavioral unity that need not be explained at the level of ontogenesis or, at least, its explanation should be facilitated. But more or less simultaneously, infants behave as if the situations they confront constitute “polymorphous

sets" or a "confusing and ambiguous universe" without precise functional meaning, as, for example, in their awkward attempts to reach for an object between the 2nd and 5th months (from approximately the 6th to the 20th week) or in their unskillful attempts to retrieve a hidden object (the A-non-B error) between the 8th and 10th months. Thus, infants need several months to be able to recategorize situations and reorganize or replan their actions. It is not before 6 months that they become able to grasp in a partly adapted manner a visually perceived object, not before 1 year that they succeed in regulating or in accurately planning in advance the orientation and the shaping of the hand as a function of the size and orientation of the object, not before the age of 16 to 18 months for their grasp to be regulated as a function of the object weight inferred from its size and/or texture, and not before 20 to 24 months for their prehension to adjust to reciprocal orientation between two objects (cf. in particular Hofsten, 1989; Lockman, 1990; Mounoud, 1983).

It seems as if the infant possesses at birth action procedures (or procedural sensorimotor representations) adapted to a set of situations. These representations would be by nature unconscious or relating to a nonreflexive consciousness (cf. Marcel, 1983). The emergence of new coding capacities enables (and constrains) the infant to elaborate new representations which I have called *perceptive* and which go along with reflexive consciousness; these representations would be declarative and would correspond to what Piaget called the implication relations related to the consciousness phenomena. They are new meaning links between objects and the infant's actions, between objects or between parts of objects, between actions or between various phases or segments of a complex action. On the basis of these perceptive representations, new action procedures or procedural perceptuomotor representations will be elaborated.

Another way of expressing the same story would be to say that infants, in the course of their development, construct knowledge (or concepts) which must lead them to construct new know-how. Development would therefore be a matter of shifting not only from practical (biological) know-how to conceptual or mental (psychic) knowledge (as argued by Piaget), but also, and in an equally large extent, from conceptual knowledge to new, unconscious know-how. It is in this way that new know-how, new skills are learned and automatized (prehension, walking, imitation, localization, etc).

As it is at birth, every time that we are dealing with constituted know-how, we are dealing with adapted behaviors which manifest a satisfying integration in relation with one or several econiche(s). These behaviors do not necessarily demand reflexive consciousness, intentionality, or subject-object differentiation. These behaviors can be qualified as "direct" or "immediate"—which does not mean for me that the behavior is defined by the structure of information, but much rather that there is an optimal adequacy between the organization or the structure of stimulations accessed and the organization of the action procedures (or procedural representations) of the subject. As I have stated elsewhere (Mounoud, 1990):

If one studies the *adapted* functioning of an organism in his ecological niche, as Gibson did (1966), it is possible to speak without prejudice of direct perception because, in this case, there is an optimal coupling

between the organism and its environment. . . . On the other hand, in the Gibsonian view, it is not possible to analyse the process of development. (p. 404)

To conclude, it is possible to consider development as an alternation between (a) periods of adaptation (adaptations in the different domains are more or less optimal according to the experiences realized) and (b) periods of reorganization. Periods of adaptation are characterized by automatized behaviors that can be described as reactive or as interactive; periods of reorganization are characterized by transitional grasps of consciousness (mental or psychic conscious activities) which give to the infant's behavior an active and intentional character.

This last remark brings us back to Lewis's introduction in which he opposes two types of theories of psychological development, called, respectively, active and reactive. It seems to me that such an opposition would be more fruitful in characterizing periods, levels of development, or, even better, functioning modes of the subject, modes that can either succeed each other or coexist. These functioning modes depend on subjects' planning abilities and vary as a function of their developmental level and the situations confronting them.

#### Notes

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## Intension, Intention, and Early Precursors of Will: Constructive Epistemological Remarks on Lewis's Research Paradigm

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Michael Lewis's inquiry into the ontogenesis of intentionality, and of Piaget's construal of it, has two distinct aspects, one psychological, the other epistemological. Not surprisingly—coming from a distinguished developmentalist—the psychological aspect is deeper and more important than the epistemological one. But to discuss with clarity psychological issues opened by Lewis's inquiry I must address one epistemological point that his article leaves obscure.

This point concerns two different senses of the concept intentionality (or intention)—senses that are clearly distinct, but often are not differentiated. Lewis himself does not seem to distinguish them, although their distinction is, in my view, necessary to study the development of conscious intentionality. The first sense, which I shall call *referential intentionality*, is conveyed in an utterance such as “I do not see the intention of this painting!” The second sense, which I shall call *conative intentionality*, is conveyed in the utterance “I have the intention to go to the art gallery.”

Referential intentionality is the disposition of a symbol (or a signal) to be always directed, informed by, or addressed to a referent. A referent is the real entity or true idea that a symbol represents or stands for under the appropriate interpretation (or *sense*). This is the sense of intentionality that Husserl (1954/1970) made popular. Consider as an example Picasso's famous painting *Guernica*. The referential intention of this painting is to represent both the destruction of the town of Guernica by the first-ever air-raid bombardment and the suffering and wounds inflicted on innocent people, and on humanity, by this brutal new form of warfare. The painting also symbolizes this new form of warfare which invades the intimacy of homes to suddenly destroy everything and everybody—destroying people the way horses (innocent victims) are destroyed by bulls in a bullfight. Picasso's painting is a configural or *iconic* symbol, in Peirce's (1955) intended meaning of iconic, because the very form of the painting epistemologically reflects (*epireflects*) the form of the complex intended referent.