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What is it like to be conscious? The ontogenesis of consciousness

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ABSTRACT *In recent years, numerous studies have tried to highlight, from a naturalistic point of view, the apparent mysteries of consciousness. Many authors concentrated their efforts on explaining the phylogenetic origins of consciousness. Paradoxically, comments on the ontogenesis of consciousness are almost nonexistent. By crossing the results of psychology of development with a philosophical analysis, this paper aims to make up for this omission. After having characterized the different conceptual aspects of consciousness, we combine these, with observations made by developmental psychologists, to trace the empirical development of consciousness during the first months of life. This combination leads to a theoretical proposal: the intentional characteristics of consciousness, namely, aboutness and purposefulness, depend on the phenomenal properties of conscious states. From this perspective, the phenomenal aspect of conscious states (the "what it is like" effect) is therefore far from being an epiphenomenon.*

1. Introduction

There is a knack or skill involved in detecting deep philosophical problems. The notions that define them are embedded in our daily behavior. But, as soon as we are asked to be precise about what is in question, we become embarrassed. Consciousness is this kind of phenomenon. It is used every day without any difficulty in expressions, such as, "I wasn't conscious of having hurt their feelings," "he regained consciousness before the doctor arrived," or even "love of freedom runs deep in the national consciousness." Looking more closely, however, each of these utterances expresses a different aspect of a rather indeterminate notion. In the first example, we could speak of a mental state, in the second, of a kind of awareness, and the third—which seems to belong to a different sphere—refers to a shared mentality. In each case, it is far from obvious how to clarify each of these meanings. In this paper, our purpose is to dwell on the exact sense of the everyday experience of being conscious. What do all the mental processes, which may be said to be conscious, have in common [1]?

For a long period, this question was essentially the province of philosophers,

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and some of their contributions are very useful. Scientists were reluctant to tackle this problematic because consciousness is a subjective phenomenon and science is designed to deal with objective phenomena. Recently, however, the status quo was shaken by scientists who could no longer accept that such an important subject continues to be banished from their domains of investigation (Crick, 1994; Crick & Koch, 1990; Damasio, 1999; Edelman, 1989; Hobson, 1999; Llinàs, 2001, Schacter, 1993; Varela *et al.*, 1991). As a result, their work reawakened the philosophical field and a certain number of authors attempted to put some conceptual order to the growing scientific investigations (Baars, 1988, 1997; Block, 1995; Carruthers, 2000; Chalmers, 1996; Dennett, 1991; Flanagan, 1997; McGinn, 1991; Searle, 1997, 1998).

Block (1995) gives one of the most interesting philosophical contributions. He highlights conceptual distinctions, which are often blurred in the usual comprehension of consciousness, and distinguishes four different meanings for consciousness: (1) by "phenomenal-consciousness" (P-consciousness), he designates the experiential properties, or the "what it is like" of a conscious state; (2) "access-consciousness" (A-consciousness) is used to refer to a state in which representations of its content is (a) poised for use as a premise of reasoning, (b) poised for rational control of action, and (c) poised for rational control of speech; (3) by "self-consciousness," Block means the possession of the concept of the self and the ability to use it in thinking about oneself; and finally, (4) by the notion of "monitoring-consciousness," he highlights the idea that consciousness may also be described by the internal process of reflecting about one's own thinking (Block, 1995).

In this paper, the conceptual map proposed by Block will be first used as a way to navigate the complex land of consciousness. But we also want to address these distinctions in a more empirical way. We think that the precise observations done by developmental psychologists can be used to propose a description of the way the different aspects of consciousness are intertwined. By focusing on the emergence of consciousness in the beginning of the child's life, we think that we can get a more detailed and precise description of its components and their articulation. We will particularly insist on the phenomenal- versus access-consciousness. Contrary to an opinion largely defended in the cognitive sciences, we will show that these two aspects of consciousness are far from being independent. We will instead hypothesize that phenomenal-consciousness constitutes the indispensable "gate" to the kind of properties attributed to access-consciousness.

First, we will briefly present the philosophical puzzle posed by consciousness. A developmental survey will occupy the central part of our discussion. The distinctions proposed by Block will be put in parallel with the early steps of development. We will put forward a certain number of observations that indicate the presence of phenomenal-consciousness at a very early age. The second move will be to show that the development of access-consciousness is possible only through the "what it is like" effects peculiar to phenomenal-consciousness. For this demonstration, we will use developmental researches that have highlighted the intentional properties of consciousness by dwelling on the elaboration of mental objects and the emergence of purposes.

By launching into this developmental approach, we will be able to show that phenomenal-consciousness is an indispensable precondition for access-consciousness. Our position will therefore banish the "zombie" perspective that sometimes inhabits the mind of a cognitive scientist [2]. In our conclusion, we will propose to get back to the question that constitutes our title: what is it like to be conscious?

2. The strange nature of consciousness

Nowadays, there is a standard procedure for studying the nature of things. Once the boundaries of what you want to know are defined, a scientific procedure serves as a guide for gathering and interpreting the data that lead to a better comprehension of the studied fact. But, for the phenomena of consciousness, the scientific approach seems not entirely suitable. This is why philosophy of mind plays an important role in the field of cognitive sciences, the traditional function of philosophy being the clarification of the concepts used to describe the nature of things.

Consciousness belongs to the kind of notions that used to delight Socrates, who liked to show how hard it is to define precisely a concept, even if it is easy to find concrete realizations of it. At first, it seems easy to delimit what consciousness is about. As Searle (1997, p. 5) writes: "'consciousness' refers to those states of sentience and awareness that typically begin when we awake from a dreamless sleep and continue until we go to sleep again, or fall into a coma or die or otherwise become 'unconscious'." The validity of this common sense definition seems indisputable, but it says nothing about what is actually shared by all these states. At the same time, it is legitimate to begin with such a formulation. It then becomes possible to circumscribe the kind of "entities" covered by this notion. The question is: how to go further in the discovery of the nature of consciousness?

At this point, we hit a metaphysical wall. Consciousness is, by far, not an object like any other. To recruit a certain number of researchers in sophisticated laboratories to study it is not sufficient. Conscious phenomena are subjective states. In other words, conscious states are sensible only from an inside point of view, depending on what could be called a "first-person ontology" (Searle, 1998, p. 42). When philosophers insist on this dimension of consciousness, they tend to use the broader expression "phenomenal-consciousness" (from Greek *phainomenon*, from *phainesthai*, to appear). This notion is connected to the "what it is like" aspect of our mental life, a property often denoted by the term "qualia." Given this essential subjective characteristic, emphasized by these different philosophical notions, it is difficult to imagine how an assembly of scientists, as gifted as they may be, could fully determine the nature of consciousness. Scientists are indeed the specialists of the third-person ontology, required for the kind of verification that validates the results of their researches. Confronted with this dilemma, three principal positions can be envisaged: (a) to "forget" the phenomenological aspect of consciousness, (b) to abandon its scientific study, and (c) to find a way of dealing with that difficulty. Let us briefly comment on these three options.

The first strategy, to say it crudely, is widely accepted among cognitive scientists. In view of the tricky situation described above, the idea is to go no further than the usual models and procedures of science. The knack consists in slightly modifying the basic question in order to study it objectively. Instead of an effort to grab directly the "what is it like to be conscious" question, the scientists turn their attention to a "what is consciousness for" or a "how does it work" question. Many authors who work on the functions of consciousness tend to agree on a certain number of points, highlighted by Schacter's (1993) hypothesis. He proposes that the activation of the "Conscious Awareness System" is a mechanism for integration of the multiple types of information, which are computed in parallel. The Consciousness Awareness System sends its output to the executive system, which in turn triggers an action. Within this framework, consciousness plays a mere functional role in allowing the information represented in different parts of the brain to be used in rational procedures. From this perspective, consciousness appears as a "global workplace": "Consciousness seems to be the publicity organ of the brain. It is a facility for accessing, disseminating, and exchanging information, and for exercising global coordination and control" (Baars, 1997, p. 7; 1988). To denote these aspects of consciousness, Block (1995) proposed the notions of "access-consciousness," and of "monitoring-consciousness." From the closely related "how does it work" perspective, intensive researches are done for knowing how consciousness is able to carry out its functional role. Some insist on the neuronal cooperation that enables the integration of information (Crick & Koch, 1990), others on the feedback mechanisms that encode the higher-level representations (Edelman, 1989). In spite of their differences, all the researchers belonging to this first category have in common the same stance toward the phenomenon of consciousness. That is, by studying it from an objective point of view, they do not really address the "what it is like" effect that characterizes conscious experience. As a result, the phenomenal aspect of consciousness has not only left the scene; qualia seem unnecessary for the good functioning of the organism. A zombie—someone or something physically identical to a conscious being but deprived of phenomenal experiences—is therefore conceivable (Chalmers, 1996, p. 96). The strict scientific approach, by pushing the qualia aside for methodological reasons, ends up legitimating the irrelevance of phenomenal-consciousness.

We will not be long on the second option, because it is a pessimistic vision that does not enable us to go further in the scientific study of consciousness. The reasoning is clear-cut and we can summarize it briefly. Insofar as consciousness is subjective in nature, we can only access it "from the inside," by means of introspection. So, its knowledge differs radically from the knowledge of the physical world, which is grasped through the faculty of perception. Furthermore, the relation between brain and mind belongs to a micro level, which is accessible neither by introspection nor by direct observation. Therefore, consciousness is beyond our cognitive capacities (McGinn, 1991). That position, which claims that our own biology impedes us from ever having a grip on the true nature of consciousness, is often called "mysterianism." This option is hopeless for anyone who refuses to give

up so quickly in front of what could eventually prove to be a biological human limitation, the human brain being unable to understand one of its own features.

The rough preceding overview tends to show that the study of every aspect of consciousness, including its phenomenal quality, needs to find a third way of inquiry. Actually, some researchers are now trying to tackle this problem with new and interesting insights. One of the trends is to approach consciousness "from the side," using phenomena which could enlighten the nature of the "what it is like" effect. Hobson (1999), for example, uses studies that skillfully compare sleeping, dreaming and waking states to study the components and the biological making of consciousness. In another context, in this case the study of cerebral damage, Damasio (1999) uses the "breakdowns" of consciousness in order to explain how "the feeling of what happens" is implemented in the brain or emerges from the particular organization of the brain. A completely different and very original solution is proposed by Varela (1996). He pertinently reminds us that we are not completely devoid of method for analyzing the phenomenal aspect of consciousness. As a matter of fact, a very important philosophical tradition, phenomenology, is precisely devoted to this kind of analysis. According to Husserl (1917/1981), phenomenology aims for the analysis of the mental structures involved in the perception of particular types of objects, describing in detail the way the experience appears to us. Varela proposes to combine this descriptive phenomenological method with the use of sophisticated brain scanning devices in order to address what he calls "first-person events." The aim is to be able to determine the brain activities that enliven the rich phenomenal aspect of mental life. This interesting contribution involves nevertheless significant difficulties, due mainly to the ambiguous scientific status of introspection.

The challenge is therefore to find a way of knowing more about phenomenal-consciousness, and its connection with access-consciousness (or even with self-consciousness) without losing scientific objectivity. In a slightly different context, Dennett (1991, p. 83) proposed what he calls a "heterophenomenological approach." His idea consists of compiling, in constructive and sympathetic neutrality, the heterogeneous descriptions of the world provided by the largest possible number of subjects. But, at the same time, he confesses a profound skepticism as for the authenticity of what people say about the ways the world appear to their consciousness. As Dennett puts it, people tend to think that they are much more immune to error than they really are (1991, p. 68).

Our own proposal, although also heterophenomenological, is more grounded in an observational stance than on the declarations of subjects—declarations which would be rather difficult to record in this case, as will be seen. The idea is indeed the following: by tracking the child's development, it is possible to infer her internal structure from the emergence of new forms of behavior and, later on, of new kinds of reasoning styles. Such a study is of course far from easy to undertake and demands a true gift for precise observation. The pioneer of this kind of exploration was Jean Piaget (helped by his wife Valentine Châtenay), and his description of the child development, if criticized, remains a model for the current psychology of development.

3. The ontogenesis of consciousness

3.1. Piaget's view of development

Piaget's influence is tremendous in developmental psychology. Many aspects of his work have been criticized, but the milestones he established still constitute the backbone of the discipline. Before we focus more precisely on the elements that could define the ontogenesis of consciousness, it is therefore useful to briefly present his general model.

Piaget's interest was primarily focused on the mechanisms that give rise to intellectual development and the periods such a development necessarily goes through. For him, the child could be compared to a scientist: he explores the world, observes regularities, and makes generalizations. Two fundamental cognitive processes are at work. By assimilation, new information is incorporated into an already existing cognitive structure. When such a structure does not quite fit incoming information, the child may need to call upon the second process, called accommodation, to modify the existing cognitive structure to incorporate the new information. Piaget postulated that the development of intelligence could be split up into four principal periods. During the first period, the sensorimotor period (from birth through roughly two years of age), a child principally learns how to modify reflexes to make them more adaptive, to coordinate actions, to retrieve hidden objects, and, eventually, to begin representing information mentally. The preoperational period (from about two to seven years of age) is a period during which a child experiences the growth of language and mental imagery and focuses on single perceptual dimensions, such as color and size. The third period, called concrete-operational (about 7–12 years of age), is characterized by the acquisition of an important set of skills referred to as conservation skills. Finally, the fourth formal-operational period (beginning about 12 years of age) is a period when the child develops thinking skills in all logical combinations and learns to think with abstract concepts. We are concerned here by the emergence of consciousness, and therefore by the first period; it is therefore not relevant to detail here the other periods.

Before digging any further into the first period, an important Piagetian concept has to be defined. To design the mental constructions elaborated by the child during his or her development, Piaget uses the notion of scheme. To understand this concept, we must first remind that Piaget was profoundly committed to biology. For him, psychology was considered as a field of human biology and the psychogenesis as an "embryology of reason." The metaphors he uses to describe the psyche are also biological; he sees the child's cognitive interaction with the world as a kind of "digestion." Like any other biological structure, a scheme requires nutrient or aliment to sustain itself. But schemes, conceived as the basic building block of the psyche, cannot be observed as other biological entities. They are essentially postulated psychological constructions that interact with the outside world as well as with one another and serve as a basis for the psychological development. Schemes evolve through the two mechanisms described above. Once a scheme is constructed, it has a tendency to assimilate the patterns of stimulation that have a configurational

resemblance to it. But, when the stimulus manifests a significant difference, the scheme can also accommodate to it and can thereby change.

For Piaget, psychological development consists essentially in the construction and the modifications of the schemes. Admittedly, the newborn does not "land" without any coping mechanisms. Confronted by her new environment, she has a certain number of reflexes available to quickly interact with the immediate environment. The first schemes are built out of these sensory and motor coordinations, adapted by heredity. From a cognitive–emotional point of view, most crucial is probably the sucking reflex. The second point is fundamental, since it relates to a basic distinction that is often implicit in the analysis of cognitive processes: the difference between the subject and the object of knowledge. For Piaget, the sucking scheme, this global, undifferentiated ensemble of activities related to sucking an object, is the object itself. At the same time, this ensemble of activities is not separable from the subject at this stage of his development. We pause to stress that, by adult standards, this unity that brings together the object and the subject in an inseparable whole seems rather strange. But this inextricable ensemble is that out of which, through assimilation and accommodation, the schemes adapt, differentiating and constructing, little by little, schemes of self, object, and attributes (e.g. color or selfishness) which will be relatively distinct from each other later on. This implies that, from Piaget's perspective, the distinction between the subject and the object, or between the perceiving organism and the perceived world, has itself to be constructed.

3.2. Some important criticisms and their limits

Before we use some of the Piaget's observations, it is important to point out some of the most important criticisms that were directed to him. At least four of his basic assumptions were actually called into question. The first criticism questions the postulated "blurriness" between the subject and the object at the beginning of the human journey. The second one is about the total absence of knowledge that, according to Piaget, characterizes the newborn ("constructionism"). The third criticism concerns the centrality of action in the process of knowing. And the fourth one challenges the idea that the development is regulated by the succession of well-defined stages.

The arguments pleading for an early and very basic distinction, by newborns, between oneself and the world around them, although not numerous, are convincing. This differentiation can indeed be considered as an *a priori* necessity for survival. To understand why, imagine a robot designed to perceive and act in a basic environment. Its function can be very simple, as searching for blocks scattered in a room. This robot is endowed with an artificial eye and an artificial limb to detect and grasp the blocks. Without a built-in mechanism enabling it to discriminate between the blocks and its own limb, this machine will endlessly chase itself instead of blocks (Rochat, 2001, p. 31). The intense exploration that babies do of their own bodies show that a simplified version of the self as a sensory entity should be present at a very early stage, in particular through their proprioception. Proust (1995) proposes

a good physiological candidate for this initial function could be the "corollary discharge," a neuronal signal that indicates to the organism that an action has been originated from itself, and not from an external stimulus.

As a constructionist, Piaget was reluctant to endow the newborn with any kind of innate knowledge. For him, even the sense modalities function as independent systems early in life. This was contradicted by some interesting observations that show that the perceived world is already largely unified at birth. For example, careful experiments have shown that the newborn infants systematically orient their head according to the direction of the sound source (Clifton *et al.*, 1981) [3]. Another impressive example of the early-organized perception across modalities demonstrates that infants as young as one month are able to transfer and coordinate information from touch and/or proprioception to vision. Two different kinds of pacifiers were introduced in the infants' mouth. For some of them, the pacifier has a spherical shape; for the others, it was shaped like a small sphere with knobs on it. The pacifier was then removed and infants were presented with two slides projected on a screen side by side. These sides represented either a sketch of the smooth or the bumpy pacifier. The visual fixations on either side were then recorded and the researchers found that infants looked significantly longer at the visual equivalent of their pacifier's experience (Meltzoff & Borton, 1979). To Rochat (2001) these kinds of evidence tend to prove that infants perceive a unified world across modalities.

Certain authors tend to go even further, and affirm that infants have innate knowledge about how objects behave (Spelke, 1994). These stances are based on a series of experiences where situations are occluded for a short period of time, then followed by the presentation of an event that is either physically plausible or impossible. For example, infants were familiarize with a screen whose top rotated toward and away from them through a full 180°. The experimentalist laid then the screen flat toward the infant, and placed an object (a box) behind the pivot line of the screen. In the "possible" condition, the top rotated away from the infant, hiding first the box and then reaching the position where it contacted the box and stopped. In the "impossible" condition, the box was secretly removed and the screen continued to rotate a full 180°, invading the space that was occupied by the box. Infants looked significantly longer at the impossible than the possible event (Baillargeon, 1987). This result, and other similar ones, such as dropping objects that do not fall down, has been interpreted as highlighting a precocious knowledge about how objects behave: the infants' surprise when the screen did not stop implies that they already had expectancies on the behavior of physical entities. We will come back on these issues when we will discuss the constitution of intentional objects.

The two last lines of criticism require less attention in our context. First, Piaget thought that it was through their actions that the children gradually build cognitive structures. This emphasis on action is, today, called into question. Actually, the development of the motor system is quite slow and the infants, by observation, are already able to learn a lot about their environment without physically interacting with it. It is therefore not suitable to test what babies know by asking them to reach something. But this is precisely what Piaget did (Piaget, 1954). Second, as seen above, Piaget conceived the development in a succession of well-cut stages, under

the influence of a general-purpose problem solver (Piaget, 1971). But arguments coming from neuropsychology (Shallice, 1988), linguistics (Chomsky, 1968), and evolutionary psychology (Barkow *et al.*, 1992) suggest that the architecture of human mind is instead made up of specialized devices ("modules") selected for their ability to resolve specific kind of problems regularly encountered in the evolutionary past of the species. It would be therefore surprising to have the same developmental timing for all these capacities. These differential rhythms are indeed observed throughout the development: the ability to ascribe mental states to others in order to understand and predict their behavior ("naïve psychology"), for example, is achieved by the child only at around four years old (Wellman, 1990). In contrast, as we have just seen, the knowledge of physical knowledge is acquired much earlier (Baillargeon, 1987). Therefore, most researchers admit that the linear constructivism of Piaget has to be replaced by a more "interactive" process:

> Rather than a succession of general stages, development would be best characterized as a collection of parallel developments within particular domains of competence (such as the linguistic, spatial, arithmetic, or perceptual). (Rochat, 2001, p. 170)

4. Consciousness and intentionality

As announced in our introduction, the main purpose of this paper is to highlight the role of the "what it is like" effect in the process of consciously "accessing" certain mental states. Before tracking the ontogenesis of access-consciousness, it is important to better understand what is referred to by such a concept. A more detailed account of phenomenal-consciousness will be provided later, once the elements of developmental analysis are exposed.

Block's way of pinning down the specificity of access-consciousness is vague. As a reminder, access-consciousness designates for him a state in which representations of its content is poised for use as a premise of reasoning, for rational control of action, and for rational control of speech. This kind of definition is to be understood in the context of cognitive sciences, where mental states are considered according to their causal role in the determination of behavior (Chalmers, 1996, p. 11). From this point of view, consciousness is explained by the role it plays in the cognitive economy. This role was highlighted by Baars (1997, pp. 6–7), who used the metaphor of a theater to describe the cognitive function of consciousness: it creates access to many knowledge sources in the brain. It is a facility for accessing, disseminating, and exchanging information, and for exercising global coordination and control.

In short, this functionalist approach insists on the capacity that conscious state have to "summon" representations to a "working space" where they can be prone to higher order thoughts (Carruthers, 2000). On this virtual space, mental contents can be the focus of attention, tested for their validity, and used for planning and reasoning. For that to be possible, the involved representations have to be endowed with a kind of internal "stability": to be retrieved in memory and become the focus

of attention, the represented contents have to be implemented in neuronal assemblies that can be reactivated "at will." All the function of consciousness is therefore dependent on the way the brain is able to emulate states matching external states of affairs. In philosophy, this property of mental states is designated by the notion of intentionality. This latter is the property of mental states as referring to, concerning or being about states of affairs—also called "aboutness" (Searle, 1983, p. 1). To Searle, the characteristic feature of human mind is the intentionality, that is, the generic capacity to be about an outer state of affairs and the semantic ability to represent this latter "inside the head."

In order to achieve our objective, namely, to describe the development of consciousness in the first months of life, it seems thus relevant to focus on the emergence of intentional states. Two ways can be explored: (a) the elaboration by the child of "mental objects," i.e. conscious representations that can stand for external objects even in the absence of any external stimulus; and (b) the advent of purposeful actions [4]. In this latter situation, the desired state of affairs has to be mentally represented in order to guide the infant's behavior. Let's start with the construction of mental objects.

4.1. The heralds of intentionality

From a strategic point of view, our objective is now double. On the one hand, we want to track the development of aboutness and Piaget's stages will be helpful in that perspective. On the other hand, we would like to show how the emergence of intentional contents is related to phenomenal-consciousness. That is why we will be attentive to the infant's feelings. To describe the first structures enabling the infant to interact with her environment, we have seen that Piaget uses the notion of "scheme."

The concept of scheme designates the psychological constructions that emerge during the first contacts with the external world. The sucking reflex example emphasizes two important points about the schemes constitution. One is that the sucking scheme includes much more than impulses from the nipple or another object. The sucking scheme includes more than proprioception from tongue and cheek muscles and motor control of sucking behavior. The scheme potentially includes proprioception from and motor control of the head and neck, position sense from the semicircular canals, hot feeling from an adjacent body (or not), sensations from the milk (or lack of milk) and attendant emotional comfort (and discomfort), even ambient light and warmth, etc. According to Piaget, the early sucking scheme is the total concatenation of these patterns of activity and whenever the sucking scheme is active, it assimilates to itself any activation that is simultaneous or resembles previous activation of the sucking scheme. At the same time, the scheme accommodates to different "aliment." For example, the child shapes her mouth differently when sucking a block than when sucking a finger or a nipple. Schemes are therefore characterized by a kind of holistic way to gather information into coherent wholes.

Again, Piaget was probably mistaken when he claimed that schemes elaboration

was uniquely based on the child's physical interaction with the world, and he was wrong when he diminished perceptual abilities and stated that even inter-sensory coordinations have to be built from scratch (Mandler, 1992). So if there is more coherence and stability in the infants' world than Piaget imagined, how to describe the way they first make sense of what is happening? The psychologists who study the first weeks of the newborn's life tend to insist on the importance of the felt qualities, already experienced at a very early stage (Stern, 2000). This was actually observed by Piaget. For example, when he offered his finger to his hungry newborn child, this latter sucked the finger. Within four days, if the infant was hungry, he clumsily extruded Piaget's finger. By one month, the infant, when hungry, became expert at extruding a finger. Very quickly, the child is therefore able to make a distinction between two kinds of stimulation, one susceptible to calm his hunger, the other not. The stimuli are therefore characterized by a certain amount of intensity and a hedonic tone (Stern, 2000, p. 55). These "vitality affects" can be used by the young organism to attribute a primitive sense to what is happening to him.

4.2. The birth of aboutness

All activities related to the sucking reflex imply a direct contact with the stimulus. To understand the emergence of intentionality, it is therefore important to detail how the newborns put a certain "distance" between the actual object and its "mental representative" [5].

During the first two months, newborns are indeed essentially busy with their own body, which is the subject of all kinds of "observations." Here again, the infants take great care to gather diffuse experiences into coherent wholes, or schemes. The first results of this exploration appear a little bit later, when they recognize experiences as sharing similar features, and are able to reproduce them at will.

> By two to three months infants will bring their hands and feet into view for long periods of exploration and will start cooing, babbling, and making all kinds of repetitive sounds with their mouths. They might shake their heads vigorously from side to side, then stop suddenly and burst into a smile. They will repeat the sequence over and over again, like toddlers discovering dizziness by spinning until they fall to the ground with delight. (Rochat, 2001, p. 38)

Once their own body mapped, the infants' attention can be turned to the objects' world; the "distance" that characterizes intentionality is about to emerge. Here again, the observations made by Piaget keep all their acuteness. In a first step, the activity related to the reproduction of events that are of some interest for the infant is no more restricted to her body. For example, at around five months, if a child strikes an object and it moves or makes noise, the child will repeat and vary her striking, watching, or listening all the while [6]. These kinds of action are interesting because they could hardly be reproduced without the presence of a mental scheme matching them. Nevertheless, these types of behavior are still dependent on the actual perception of an external stimulus. To study the constitution of representa-

tions as such, one has to focus on the cases where the object is no longer perceptible and yet continues to be "reachable" by the infant's mind. To better understand this process, Piaget developed his famous observations on the "object permanence." These experiments used a series of clever object-hiding scenarios. Basically, the task was to retrieve an object that disappeared between a cover or several covers. For example, six-month-old infants interrupted their ongoing search if the object is occluded before they get in touch with it. Two months later, they may succeed in finding an object hidden under one cover. For example, in order to grasp a remote watch, a child may be observed to knock aside and later to set aside an intervening pillow (Piaget, 1963). But when the object is hidden under two successive covers, they may stop after uncovering the first cover, even if the object is not there. At around eight to nine months, Piaget highlighted a rather puzzling pattern of search activity: the "A, not-B" error. At that age, infants often searched at the location they have previously found a hidden object (location A), even when they intently watched as it was hidden at a second location (location B). Piaget interpreted this error as evidence that infants viewed the object as an extension of their own action, the schema of the object and the schema of the object being not completely separated from one another. Although this interpretation is questionable, this task indicates that a stable object representation "poised for" action is not yet available at that age. For Piaget, this crucial acquisition takes place between the age of 12 and 18 months. For example, it is the time when the child will search under any number of screens, showing that she constantly maintains an image of the invisible object in mind through the searching period. This new acquired ability shows that an important cognitive restructuring happens at that time, enabling the child to make use of an improving mental imagery. From now on, she is able to invent new means not only thanks to an overt sensorimotor exploration, but thanks to an internal experimentation, an inner exploration of ends and means. In fact, prior to the appearance of language, these internal manipulations of mental representations are still limited but, for Piaget, there is good evidence that the infant has already at her disposal certain symbolic devices, which permit her some limited manipulation of reality (Flavell, 1963, pp. 119–121) [7]. With the emergence of "inner experimentations," the principal components of A-consciousness seem to be, to a large extent, already present. Actually, since the age of 18 months, the child seems to be able, at least to some extent, to recruit mental representations in order to obtain some concrete results in the external world.

Notice that the previous discussion contradicts the more recent hypothesis on object's knowledge mentioned earlier. Indeed, researchers like Baillargeon and Spelke have tried to demonstrate that infants as young as 3.5 months represent the existence of occluded objects. But, without getting to the heart of this complex issue, there are good arguments for saying that a number of the experiments trying to demonstrate an early possession of object's concept can be instead interpreted in terms of perception (Mandler, 1992). In any case, the "A, not-B" errors shows that it takes some time for the child to build a stable representation of an object—a representation that persists in the absence of this very object and can be used for the planning of action.

4.3. Intentional actions

The capacity to access certain of our own mental representations did not emerge gratuitously. As Block put it (1995), access-consciousness enables us to use these representations as premises for reasoning, for rational control of action and for rational control of speech. We subscribe here to the evolutionary perspective, where the brain can be considered as a "reality emulator" enabling better predictions. This leads us to the second meaning of intentionality, i.e. purposefulness. The question is therefore the following one: how does the capacity to act intentionally (with purpose) emerge through the development?

First, it is important to emphasize that, to be able to utilize a mental representation to draw up a plan or to resolve a practical problem, one must be able to activate this representation independently of an external stimulus. It seems therefore logical to think that the "aboutness" that characterize intentional contents has to be present before a purposeful action can be elaborated. Nevertheless, some weak forms of purposefulness can be highlighted in early stages of the development. Some observations show that even very young infants develop expectations for their actions. Rochat (2001) cites research where two-month-old infants showed signs of happiness (smiles) when they managed to set off a melody from a musical box, and anger when their action did not lead to the expected effect. According to Rochat (2001, p. 184), a large range of intentional actions starts to take place by the second month of life; the infant's behaviors are no more merely stimulus-bound but seem to be "based on deliberate coordination of means and ends to achieve anticipated goals." Babies are, for example, able to reach for a novel object, to remove a screen to see an object, or to find new ways to touch an object. But if all these activities are indicating a form of intentionality, isn't there a contradiction with our previous hypothesis about the progressive and slow constitution of "aboutness" phenomena? Indeed, if acting intentionally requires the mental representation of the desired state, how could such young infants act intentionally?

To respond to this potential objection, we have to get back to philosophy and borrow another distinction proposed by Searle (1983). For him, an action can be described as fully intentional (premeditated or deliberative) when it is caused by a "prior intention": an intention to act formed in advance of the action itself. In order for the intention to be satisfied, conditions in the world must conform to the conditions specified by the prior intention. But there are many cases in our everyday actions where actions are not premeditated. When the intention is not formed in advance of the action but developed "on the fly," Searle proposes to use the notion of "intention in action." In this case, the intention causes, and is simultaneous with, the agent's bodily movement or state that conforms to the conditions of satisfaction. When one wants to rapidly write something down, for example, one doesn't have to elaborate the intention to extend one's hand toward the pen within reach; one just grabs it. In our opinion, the actions make by young infants can precisely be considered as intentions in action. Most of these actions are done in presence of an object that displays what we could call "affordances" [8]: a string fosters a pull, a suspended mobile a kick, a rattle a shaking, etc. If we are right, the elaboration of

prior intentions emerges only later, once the object permanence starts to be acquired.

The emergence of prior intention can be detected in the processes by which the children attempt to acquire a desired state of affairs. For example, when a box, resting on a cushion, is too far to be reached, a one-year-old child will pull the cushion to her and then grasp the box (Piaget, 1963). She is also able to pull on a string attached to an object in order to retrieve it. These accomplishments are often preceded by a period of staring, without so many motions, until the solution pops up in her mind [9]. Once the resolution is elaborated, the intention can be satisfied.

4.4. The importance of the "what it is like" effect

In our preceding descriptions, the role of phenomenal-consciousness in accessing and processing mental representation appears rather obvious. But we have now to make this role more explicit by summarizing the developmental arguments, which will be then completed with some evolutionary elements. Let's remember that our "enemy" is the zombie, i.e. the idea that an individual without any qualia could be able to have access to his mental representation in a very similar way that we do—actually, from an external point of view, this zombie won't even be detectable (Chalmers, 1996).

Notice that newborns are far from being the "vegetables" they are sometimes compared to. Numerous observations show that they experience from the beginning what we could call hedonic responses. For example, neonates have highly functional senses of taste and smell. They are able to modify their sucking pattern when they obtain sweet water from a nipple compared to plain water. When tasting the sweetest liquid, they slow down their sucking and appear to savor it. Lipsitt (1979) described this phenomenon as an innate hedonic response. Regarding smell, newborns manifest clearly differentiate reactions. They display various facial expressions in response to bitter (they show depressed mouth corners and elevated upper lip), sour (they purse their lips, wrinkle their noses and blink), and sweet smells (they smile, suck and lick) (Soussignan *et al.*, 1997). It is actually very likely that the first contact with the world is mediated through the flood of feelings newborns are experiencing. For Stern, these "forms of feeling," characterized by a certain level of activation and a specific hedonic tone, could constitute the first steps in the constitution of a rich mental life. As we have seen, the cross-modal capacities of the infants suggest that some properties of the environment, such as shape, intensity level, motion, and rhythm, are experienced as global, amodal perceptual qualities. For example, a perceived skin contact, a taste of sweet liquid, and a "rush" of pleasure all share, as Stern (2000, p. 55) put it, "similar envelopes of neural firings, although in different parts of the nervous system." The integrated experience of sucking the maternal milk is thus supported by the felt "activation contours" that characterizes it.

The importance of experienced feelings in the ontogenesis of access-consciousness is not so surprising once set back within an evolutionary context. Actually, the intimate connection between phenomenal and access-consciousness is far form

being denied by recent works in neuroscience. In particular, Damasio (1999, p. 26) has already proposed to relate consciousness to "a feeling that accompanies the making of any kind of image—visual, auditory, tactile, visceral—within our living organisms." From an evolutionary point of view, it is very likely that access-consciousness has evolved to enable the organism to make a choice between different kinds of action that can be triggered in a given context. Instead of simply reacting to a stimulus, the conscious organism can take advantage of the opening of a "time window" when he can decide which action is the more appropriate to the situation. In this perspective, the experienced feelings can be seen as a construction that "allows for the individual senses to operate or co-mingle in an ensemble fashion" (Llinàs, 2001, p. 221). According to Llinàs, qualia are therefore far from being epiphenomenal. In enabling mental states to "get themselves noticed" by the organism, experiential feelings are on the contrary the properties whose advantages have brought about the evolution of the central nervous system.

In sum, evolutionary arguments reinforce the idea we were led to by developmental psychology: phenomenal-consciousness constitutes the essential "gate" to access-consciousness. Qualia are therefore far from being epiphenomenal. There are the necessary steps to intentionality. From an evolutionary point of view, "what it is like" effects allow the organism to find its fundamental bearings and to meet its basic needs. From an ontogenetical point of view, the newborn has qualia and sensations long before being able to maintain intentional contents in the "workplace" of her mind. And from a logical point of view, it seems indeed not possible to have mental representations without those representations creating any "what it is like" effect. As a result, phenomenal-consciousness definitely appears as a necessary but not sufficient condition of possibility of the more abstract, demanding and "self-conscious" features of access-consciousness. It is not sufficient because, as seen above, access-consciousness requires more complex abilities, mainly the capacity to activate a representation even in the absence of the represented object.

5. Conclusion: what is it like to be conscious?

In this paper, our main objective was twofold: by tracking the emergence of intentionality during the development, we wanted to show that phenomenal-consciousness is the essential link to access-consciousness. The progressive constitution of mental objects, as well as the emergence of purposefulness, is a clear indication of the ontogenetic anteriority of phenomenal-consciousness. We even summarized neurological arguments stating that phenomenal-consciousness is even an ontological prerequisite for consciously accessing mental contents [10].

We would like to come back to the question we have asked in our title: what is it like to be conscious? To be honest, we now have the feeling that this is one of the most difficult questions that can be asked. The reason for this difficulty is probably to be looked for in the essence of consciousness itself. As the phenomenologists put it, every consciousness is consciousness of. As Sartre wrote it in his literary way, consciousness in itself, deprived of its aboutness, is nothing: "consciousness is born

supported by a being that is not itself" (Sartre, 1943/1984, p. 23). As a result, consciousness is almost invisible for the inquirer's mind.

This being so, we can try to go farther by tracking down different examples of consciousness. What is common to experiences as different as seeing a red apple, flying into a rage, and trying to invalidate a philosophical argument? As different as they can be, all these phenomena involve what we will call, in lack of a better word, the "feeling" that these representations are both ours and presently activated. In Damasio's terms, "we become conscious when the organism's representation devices exhibit a specific kind of wordless knowledge—the knowledge that the organism's own state has been changed by an object" (1999, p. 25). Contents of consciousness are so diverse that it is impossible to define "what it is like" to be conscious by referring to one of its contingent objects. But what would it remain if we removed all these contents of which consciousness is about? What is left is basically the bare feeling shared by all kind of awaked states. To get an approximate idea about the nature of such a feeling, let's imagine the mental state that takes immediately place after waking up, just before a flow of images and thoughts overruns the mind. The basic property of all conscious mental states would indeed be closely related to what we propose to call "awakeness."

This position, which links consciousness to awakeness, could lend to a criticism that we need to briefly put into perspective. Dreams seem to constitute a rather obvious counter-argument. Don't we experience all kinds of strong qualia, in particular emotions, during our dreams? Admittedly, and yet, a closer look at the dreams permits one to raise a counter-argument that weakens this criticism. Actually, some important properties of consciousness are diminished or impaired during dreams. For example, the sleeper may be topographically lost, unsure of the area he fictively acts in and ignoring what purpose his dreams might have. He even mistakenly assumes that he is awake. His thoughts are no more critical and he accepts all kinds of illogical and incongruous *ad hoc* thinking. And, above all, the sleeper cannot stop his action by an act of volition so as to access his memory and critically analyze what is going on (Hobson, 1999, pp. 134–137) [11]. In summary, a large part of the adaptive properties of consciousness are no more efficient during dreams. It would therefore be quite strange to consider them as a paragon of consciousness [12].

During wakeful periods of time, contents that are relevant for the immediate interest of the organism stand out against a background of unperceived processed information. It is precisely this perseverance, which monopolizes "resources long enough to achieve certain typical and 'symptomatic' effects—on memory, on the control on behavior and so forth," that constitutes consciousness (Dennett, 1993, p. 923). In order to manifest themselves to the organism in an environment lacking sensations—i.e. the brain [13]—these cerebral activations probably had to recruit processes initially designed to alert the organism of potential threats or opportunities: the emotions. Such a scenario relating emotion, qualia, and intentionality is at least strongly suggested by the ontogenesis of consciousness.

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Notes

[1] We will set aside the social example in our discussion. For interesting developments, see Sperber (1996) and Searle (1997).

[2] This notion of "zombie" has been used by cognitive scientists to designate a being that is physically identical to a human but which doesn't have any consciousness (Chalmers, 1996, p. 94).

[3] Actually, Piaget (1963, p. 81) himself reported this phenomenon at around two months in his children.

[4] This kind of behavior is also called "intentional," what often causes an unfortunate mix-up between the two meanings of intentionality. Actually, this connection is probably not fortuitous, for to be able to design a purposeful action, one has to be capable to maintain in mind a representation of the final state of the world. It is only on that condition that the subject is able to regulate his activity in order to get the desired state of affair or event.

[5] From an evolutionary point of view, there is of course a considerable advantage to process information without being in contact with the stimulus. When an organism touches a harmful object, it is often too late for him to react (Dennett, 1991). From this biological perspective, the brain can be considered as a "reality emulator," which enables the organism to make predictions (Llinàs, 2001).

[6] For example, Piaget (1952, pp. 168–169) describes the way his son Laurent progressively learned how to reproduce a sound made by a paper knife against the wicker of a bassinet.

[7] A famous example is the way Lucienne manages to understand how to retrieve a chain in a partially open box by opening and closing her mouth. According to Piaget (1952, pp. 337–338), this schema of imitation constituted for her the means of thinking out the situation. However, we do not agree with Piaget, when he says that the formation of mental image symbol is based on the interiorization of active imitation, this latter being considered by him as the basic mechanism by which the child learns to interact with the surrounding objects.

[8] This notion was developed by Gibson (1979, p. 127) to designate what the environment offers to the animal, what it provides or furnishes, either for good or ill. For Norman (1988, p. 9), the term *affordance* "refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used. A chair affords ('is for') support, and, therefore, affords sitting."

[9] These events correspond to what Kohler called "insights," i.e. the sudden apprehension of a problem's solution (Simon, 1986).

[10] This assertion does not mean that there is no "unconscious" processing of information. One of the most important contributions of cognitive sciences is precisely to show that the large majority of the cognitive processes are non-conscious.

[11] If we exclude the particular cases of lucid dreaming persons, who learn to know that they are dreaming and who can exert a certain control on their dreams (Hearne, 1982).

[12] Another line of arguments would be to underline that dreaming states cannot be considered as ordinary sleeping states. By certain aspects, dreams are more analogous to waking states than to sleeping states, even from a neurophysiological point of view.

[13] Llinàs (2001, p. 4) judiciously remarks that the brain, as the spine, is covered by an exoskeleton that provides support and protection to the detriment of sensations: we do not have any direct sensory access to the processes happening in our brain.

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