

CHAPTER 4

Early Objectification of the Self

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On what basis do we assume that animals, young or old, human or nonhuman, are endowed with a sense of self? Does a sense of self, as an entity situated in and differentiated from the environment, imply self-awareness? These questions run through the book, and this chapter is an attempt to address them within a functional theoretical framework.

The primary assumption of this framework is that young infants are actors in a meaningful environment. From their precocious and rapidly developing propensity to explore and act in relation to functional goals stems a sense of self as an agentive, differentiated, and situated entity in the environment (the "ecological self," Neisser, 1991). This sense of self does not imply any self-consciousness or self-awareness,¹ and does not emerge with the development of particular representational systems as it is sometimes suggested. Also, the ecological self is not specific to humans, but is an emergent property of any biological system that perceives and acts in relation to functional goals. However, at least in humans and possibly in other nonhuman primates (see chapters by Povinelli; and Spada, Aurelli, Verbeek, & de Waal, this volume), there is obviously more to self-knowledge than the sense of the ecological self. Along with the direct, early sense of being an agent in the world develops the indirect idea of "me," or the sense of self as both subject of action and object of reflection (i.e., self-awareness). Where does this aspect of self-knowledge come from, and how?

In this chapter, I propose that this question needs to be considered in light of the fact that from birth, infants are not merely passive reactors to nonspecific stimulation. In the context of goal-oriented action systems, infants develop an ability to perceive the effectivities of their own body, long before they are capable of recognizing themselves in a mirror. Furthermore, starting at least by the end of the first month, and possibly before, infants engage in exploratory activities that support and are probably at the origin of the process of an *objectification* of the

self. In repeating actions and when apparently compelled to observe systematically their consequences on objects and people, young infants come to specify both what they are capable of doing (the ecological self), and who they are as sentient, intentional, and emotional entities. However, I will argue that the developmental origins of self-awareness are primarily social, emerging in the interaction of the infant with others. Others provide infants with a constructive mirror (the social mirror) that supports from birth an objectification of their own feelings and emotions. The reciprocity characterizing social interactions is viewed as instrumental in scaffolding self-awareness.

But first, let us consider two precocious facts of life from which stems an early sense of self: goal orientation and exploration.

Goal Orientation and Exploration in the Newborn

Until fairly recently, and in the footsteps of William James, many authors insisted on the chaotic, blooming, buzzing confusion of neonates. René Spitz presented newborn behavior as "... random, unstructured, and ... inconsistent" (Spitz, 1965, p. 54). At first sight, many reasons exist to consider neonates as highly immature entities, whose behavior is on the whole erratic, manifesting vegetative (organismic) rather than psychological functioning. From this perspective and in relation to the environment, early behavior was interpreted as the expression of an initial state of fusion or undifferentiation between young infants and their surroundings (Wallon, 1942/1970; 1981; Piaget, 1952).

Within the psychoanalytic tradition, the initial stage of behavioral development is sometimes described as "normal autism" (Mahler, Pine, & Bergman 1975). Accordingly, young infants behave in independence of, not in attunement to the environment: "...the reaction to any stimulus that surpasses the threshold of reception in the weeks of normal autism (first two months) is global, diffuse, syncretic — reminiscent of fetal life. This means that there is only a minimal degree of differentiation, and that various organismic functions are interchangeable" (Mahler et al., 1975, p. 43).

Before dismissing this view, it is important to note that its adoption is understandable in light of the rapid development occurring in the course of the first months, which brings about increasing organization, predictability, and apparent intentionality to infant behavior. If this development is apparent to any observer, this does not preclude the existence of an initial organization of behavioral systems that are highly predictable and remarkably attuned to particular features of the environment. In fact, the impetus of such development is to be found in the dynamics of this initial organization of behavioral or action systems, which

defines the avenues of behavioral change (Rochat & Senders, 1991; Rochat, in press).

In a somewhat contradictory statement, Mahler et al. note a few paragraphs below the above quotation that in the rare and fleeting state of alert inactivity (when they are not fussy, sleeping, or crying), young infants and even neonates demonstrate *responsivity* to external stimulation. The authors suggest that "...this fleeting responsivity to external stimuli makes for the continuity between the normal autistic phase and later phases." (Mahler et al., 1975, p. 43). It appears that the initial autism is not absolute and that there are moments in which neonates are receptive to their environment. But these fleeting moments are in fact what import to any understanding of newborn psychology. It is during these moments, which become increasingly protracted over time, that young infants reveal their actual state of mind in relation to the outside world: how they function in the environment, what they perceive of it, and how they act upon it. When crying or sleeping, infants as well as adults are indeed self-absorbed, in a momentary state of unrelatedness to the environment that can be interpreted as normal autism, or undifferentiation. Such is not the case in the state of alert inactivity when young organisms appear to tune into, and be receptive to, the resources of their environment.

Relative to the fleeting state of alertness of young infants, recent research provides much evidence of precocious plasticity, goal orientation, organized action toward functional goals, and exploratory activities. This research supports the idea of an early differentiation and puts seriously into question the interpretation of an initial autism. Infants from birth appear to behave as actors in a meaningful environment. But what does that mean? It means that newborn behavior cannot be merely reduced to a collection of discrete reflexes that progressively become oriented and intentional. Aside from the inventory of responses normally observed by pediatricians in their routine neurobehavioral assessment of neonates, infants manifest from birth actions that are oriented toward particular environmental resources, such as people or food. They are not merely responsive to nonspecific stimulation, as in the case of intense light or an air puff (e.g., blinking response), abrupt vestibular stimulation (e.g., Moro response), or tactile strokes from any external object whether it be the finger of the examiner, a pencil, or a pacifier (e.g., rooting, Babkin, or Babinsky responses).

Recent infancy research demonstrates that infant behavior shows selectivity and attunement to particular features of the environment. It indicates that early behavior is more meaningful than mere reflexes, which are by definition, and in the original sense of the physiological reflex arcs described by Sherrington (1947/1961), automatic and the expression of rigid stimulus-response links. For example, newborns orient toward sound sources but show more propensity to

orient toward the source of a rattle sounds than a pure tone (Clarkson & Clifton, 1991). When presented with cloth pads carrying either the body odor of a stranger or the body odor of their own mother, newborns tend to orient more toward the latter (MacFarlane, 1975). From 1 month, infants show enhanced visual attention to particular facial features, such as eyes and mouth, that are most relevant for the reading of emotional expressions (Maurer & Salapatek, 1976). These types of observations demonstrate that young infants are not merely responsive in the reflex (physiological) sense discussed above, but are functionally oriented toward meaningful features of the environment: sounds, odors, and visual configurations that are functionally relevant for the maintenance of their transactions with the environment, and ultimately their survival among people and objects. Although this selectivity is based upon the functioning of preadapted action systems such as sucking or rooting, such functioning entails selectivity, hence basic functional values that guide groping and exploration.

The claim that newborn infants are not merely responsive is best supported by evidence of exploratory activities at the onset of development. Newborns appear to be not only selective with regard to environmental features, but also to engage in active probing of their environment. Two sets of empirical observations on early oral activity illustrate this point.

In a recent article on imitation of various types of tongue protrusion by 6-week-old infants, Meltzoff & Moore (1994) report striking data demonstrating that these infants engage in an active exploration and approximation of the model. This spontaneous approximation leads to more accurate matches of the model (e.g., tongue protrusion to one side of the mouth) over few successive trials. Aside from the active exploration involved in the imitation of tongue protrusion, there is an exploratory component to the oral behavior of young infants when a suckable object is introduced into their mouth. Neonates engage in more than sucking in response to intraoral stimulation. When various intraoral objects (pacifiers) varying in shape, texture, and consistency are introduced, neonates selectively manifest particular movements of the tongue, gums, and lips (Rochat, 1983, 1987). The amount of such oral-haptic activity depends on the degree of eccentricity of the pacifier compared to the normal physical characteristics of the biological nipple. The more physically eccentric the pacifier, the less infants engage in activities serving a nutritional function (sucking), and the more they engage in activities serving a perceptual function (oral-haptic exploration; Rochat, 1983, 1987). From birth, infants appear to engage in scanning activities of intraoral objects that are not readily assimilable to sucking and the functional goal it serves (i.e., the eventual ingestion of food).

The exploratory component of infant behavior as in the case of early imitation and newborns' oral activity suggests that early on, young infants are not merely

responsive, but show orientation toward functional goals. This orientation is first determined by action systems that are functional at birth (e.g., imitating or feeding) and are readily organized to tap into environmental resources that are essential for the neonate's survival (e.g., people and nutritional objects).

Early Sense of Self and the Perception of Body Effectivities by Young Infants

If we accept that at no point in development infants can be reduced to automata, that their behavior is not merely a collection of S-R links, and if we consider that from the beginning behavior is guided by functional goals and survival values that are an integral part of the newborn's action systems, then the claim of an early sense of self is reasonable. If a biological system does not simply respond automatically to meaningless stimulation, and if, on the contrary, it shows exploration, plasticity (discovery of new solutions), and orientation towards functional goals, it implies that it knows something about itself: It perceives itself as an agent, differentiated, and situated in the environment. Accordingly, any biological system that expresses exploration, plasticity, and goal-oriented actions is endowed with a sense of self. This means that not only humans and human infants possess a sense of self, but all mammals, birds, and insects. When an animal adjusts its behavior to achieve a functional goal and is not merely responding to a stimulation, it needs to be capable of at least three things: to distinguish between itself (the agent) and the goal to be achieved; to situate itself in relation to the goal; and to perceive its own potential effectiveness to achieve this goal. For example, in order to plan a successful action, a foraging bird that detects a worm on the branch of a neighboring tree will be required at minimum: to differentiate itself from its prey; to situate itself in relation to the prey; and to perceive that it can fly in order to reach the prey. These are three basic ingredients of a sense of self that Neisser (1988, 1991) first coined as the ecological self. Like birds and other animals, young infants do manifest a sense of the ecological self: a sense of a differentiated, situated, and agentive entity. Because infants are *actors and explorers* in relation to functional goals, and not mere automata reacting in rigid ways to stimuli, they have a sense of the ecological self. An illustration of this argument can be made on the basis of some empirical observations on early reaching behavior.

From an early age, infants show the propensity to bring their hands in contact with objects in the environment, first for short contact with no grasping, then to grasp and bring them to the mouth, and eventually to engage in fine manual exploration to transform them or use them as tools. Reaching is probably the

earliest clear expression of a goal-oriented action, the goal being at minimum to have manual contact with the object. It is a good index of the early sense of self.

Hofsten (1984) demonstrated rudiments of reaching behavior within the first week following birth. Newborns were shown to wave their arms in the direction of an object-target translating in front of them. They showed significantly more arm movements when the object was present in their field of view. Coordination and anticipation in reaching develop rapidly in the course of the first 6 months, to include fine arm and hand adjustments in relation not only to the spatial location of the object, but also to its size and shape (Lockman, Ashmead, & Bushnell, 1984; Hofsten & Ronnqvist, 1988; Clifton, Rochat, Litovsky, & Perris, 1991). This anticipation indicates, with no ambiguity, that the infant perceives the affordance of the object in terms of its reachability. In reaching the way young infants reach, what is implied is that they situate themselves as actors in relation to an object, which is differentiated from themselves, is out there in the environment, has particular characteristics, and moves in a certain way relative to themselves.

The study of early reaching also demonstrates that infants perceive their own effectivities as actors in the environment, this perception being an integral part of the early sense of self. As adults, we constantly gauge what is safe or unsafe to do. If we stand on the ledge of a skyscraper, we perceive the danger of our situation and resist the temptation of leaning too far to have a better view of what is happening below. We understand our situation and what it affords. In less extreme situations, we perceive what we can do successfully with a minimum of energy expenditure. We adjust our posture in the anticipation of lifting a heavy object, and we stretch out in order to catch a fly ball. This tight link between perception and action is based on the perception of what objects afford for our actions, hence the perception of our own body effectivities. Knowing what we can do, without harming ourselves or wasting too much energy, is crucial for our survival and is a basic aspect of self-knowledge.

Recently, a colleague and I collected data suggesting that the perception of body effectivities determines reaching behavior by young infants when they start successfully to grasp objects around them (by 4 months). These data demonstrate young infants' accuracy in perceiving the effectivities of their own body in reaching. Here is a sample of what we observed.

In two different experiments (Rochat & Goubet, 1993), infants were presented with an object for reaching, which was presented successively at four different distances. Infants were placed in an upright infant seat with the object centered at their shoulder height. The nearest distance placed the object about 30 cm from the infant's torso, in alignment with the toes. The other three distances expanded from this referential distance by 5 inches. At Distances 1 and 2, the object was within

reach of the infant. At Distance 3, it was at the limit of prehensile space; the infant could eventually touch it, but only with intense stretching forward of the trunk and upper limbs. At Distance 4, the object was out of the infant's reach. During 30-second presentations, frequency and duration of gaze at the object, latency to reach, and reach attempts were scored. In the first study, three groups of infants aged 5–6 months were compared based on their relative ability to control independent sitting (i.e., their ability to coordinate reaching of the hand(s) and leaning of the trunk). Results showed that at distances 3 and 4, gazing activities and the frequency of reach attempts increased, depending on the infant's relative sitting ability. With increased control over self-sitting, infants demonstrated an expansion of the perceived limits of prehensile space.

In the second study, 5- to 7-month-olds were analyzed with either light (2g) or heavy (200g) bracelets attached to their wrists. Reaching with heavy bracelets moved forward the infant's center of mass when reaching, and reduced the limits of maximum reachability without losing balance. The rationale was that if infants were sensitive to this change, they should reach less with the heavy bracelets. Results indicated that at distances 3 and 4 only, the frequency of reach attempts decreased when infants wore the heavy bracelets compared to when they wore the light ones. These results suggest that infants as young as 4 months are sensitive to what their body affords for action, by detecting and adjusting with remarkable accuracy the perception of their own body's effectivities. They adjust the planning of their activity (reaching) by perceiving sudden experimental changes in their bodily characteristics (i.e., weighted limbs causing forward displacement of their body's center of mass). These results indicate that when starting to reach, 4-month-old infants plan their reach based on both the perception of their situation in the environment and particular postural constraints. They detect visual and proprioceptive information specifying their relation as actors to the object and to the region of maximum extension of the body without losing balance (i.e., the "region of postural reversibility"). Note that the region of postural reversibility determines the perceived limits of prehensile space in adults as well (Rochat & Wraga, 1994). Thus, infants, like adults, demonstrate an ability to perceive the limits of what they can do without losing balance. This detection is the direct expression of a sense of the body's effectivities.

As for any other self-generated and goal-oriented actions, the planning of reaching behavior is based on the perception of body effectivities. In relation to a functional goal (e.g., bringing hand(s) in contact with an object), this perception integrates the actor's sense of its own capability and its particular situation in the environment. The argument proposed here is that this perceptual ability is a primary aspect of self-knowledge. It corresponds to the sense of the ecological self, which is an emergent property of any biological system that does not merely

respond to stimuli, but acts, explores, and invents new means to achieve functional goals. In humans, this ability is expressed at, and develops from, birth. However, at least in our species, the development of self-knowledge implies much more than the development of an early sense of self construed as the progressive discovery of body effectivities. Infants also develop self-awareness that is not implied by the early sense of self discussed so far.

What are the origins of an ability to perceive oneself, not only as a subject of action (the ecological self), but also as an *object* of reflection and recognition (the conceptual self)? How does the idea and specification of "me" emerge in development, and what are the mechanisms underlying the progressive *objectification* of the self? These questions are fundamental from both a developmental and an evolutionary perspective. Indeed, the emergence of self-consciousness potentially indexes a quantum leap in both ontogeny and primate evolution (e.g., see Gallup, 1982; Povinelli, 1987).

Object Exploration and the Early Objectification of the Self

Parallel to the development of goal-oriented action systems from which emerges an early sense of self (e.g., the perception of body effectivities in relation to functional goals), infants also develop a propensity to contemplate and analyze the results of their own actions on objects. When infants explore and act in the environment, they learn as much about the object with which they are interacting as they learn about themselves. To explore objects is indeed to coexplore oneself, to paraphrase Gibson's (1979) original quote about the inseparable process of perceiving the environment and the self. I propose that from the perceptual analysis of their own actions and their consequences on physical objects, infants gather more than information specifying the ecological self and what objects afford for action. They also gather information about their own vitality and the dynamics of their own emotions.

In general, infants do not only perceive and act in order to achieve utilitarian goals, such as the search for food or social comfort. This fact was already emphasized by Werner & Kaplan (1963), who distinguished two basic modes infants engage in that become rapidly differentiated in the course of the first months: the action on or with things versus the contemplation of things. From an early age, and aside from acting toward basic utilitarian goals, infants do engage in playful monologues that are linked to a contemplation of the self. These monologues appear to have the main function of *acting out* current feelings and emotions that are experienced internally by the infant (e.g., when happy infants from the second month vocalize, babble, coo, and get motorically excited with no

other apparent purpose than to enjoy these activities and experience themselves as actors). This process is tentatively viewed here as a primary objectification of the self by which feelings and emotions become objects of multimodal exploration.

Aside from the playful monologues infants appear to engage in, by exploring and acting in the environment infants also develop a sense of what they are at an emotional level. The idea proposed here is that as young infants explore and act on objects and on their own body, they are simultaneously gathering information about their own internal states by acting them out. I borrow here from the concept of "vitality affect" introduced by Stern (1985) to capture a certain quality of feelings and emotions experienced by young infants that are traditionally not accounted for in the literature.

Following Stern, vitality affects correspond to:

"...these elusive qualities (that) are better captured by dynamic, kinetic terms, such as 'surging,' 'fading away,' 'fleeting,' 'explosive,' 'crescendo,' 'decrescendo,' 'bursting,' 'drawn out,' and so on. These qualities of experience are most certainly sensible to infants and of great daily, even momentary, importance. It is these feelings that will be elicited by changes in motivational states, appetites, and tensions (Stern, 1985; p. 54).

These feelings are important aspects of the perceived self, and from birth on infants are actively involved in investigating them.

Early on, there is an objectification of feelings and emotions in the process of perceiving and acting on physical objects, which include the body. While interacting with objects and exploring the perceptual consequences of their own actions on their own body, infants are actually *externalizing* their own feelings of vitality, which become public and accessible to multiple perceptual modalities, in addition to being felt internally or subjectively. This process can be construed as an early *objectification of the self* (self as object of reflection; hence, object of exploration) that develops in parallel to the ecological self (self as subject of action).

Let me try to articulate this idea with an example: Consider an infant systematically kicking a mobile hanging low from above her crib. What kind of perceptual information is available to her? First, one can assume that the infant detects (as indexed by the systematicity of her kicking) the temporal contingency between her own movement and the effect it has on the mobile. This information specifies a causal link from which certain expectations can be made: When the feet contact the mobile, it happens to move contingently. By exploring the results of her own action, the infant detects what Watson labels a perfect algorithm, or perfect contingency: "...a temporal pattern between two events that potentially reflects the causal dependency between them" (Watson, 1994, p. 134). The detection of this temporal invariant is based on multimodal information (visual,

proprioceptive, tactile, and auditory). It specifies both the infant as an agent, who is differentiated, and situated in the environment (the ecological self), as well as the affordances of the activated object (that it is kickable, moveable, and noisy).

But is that all? When infants engage in exploratory activities within the context of such playful soliloquies, they are actually detecting much more than a temporal contingency, the affordances of an object, and their own efficacy as agent. By exploring the visual consequences of their own actions, they are also experiencing *their own force and the dynamics of their own emotional tone*. Their own vitality is reflected to them via the externalized movements they cause (e.g., the movements of the mobile, its noise, the felt and seen movements of their own legs, their impact on the object, etc.). In a sense, the way the object moves reflects to the infants not only what they are causing, but also how they are causing it (with more or less force, for example). This process represents an early objectification of the self in the sense that it is an exploration of the dynamics of internal properties of the self, which are accessed via the exploration of an external event. Literally, the infant acts out the experience of subjective, internal feelings. It is the physical object, animated by the infant, that externalizes qualitative features of the self: its vitality and the intrinsic dynamics of felt emotions.

This information goes beyond the specification of the ecological self because it specifies intrinsic aspects of the self as agent. These aspects pertain to the dynamics of motivational and emotional forces that animate the infant as she perceives and acts in the physical environment. In terms of the process involved, the developing objectification of the self (the idea of "me") might originate in the perception of these dynamic aspects of the self that are externalized or "acted out," in addition to being felt internally. The idea is that by animating objects and exploring how they move, infants actually externalize and gain further perceptual (e.g., visual, auditory) access to the dynamics of their own feelings. It allows them to detect the invariants of their unique vitality.

From an early age, infants appear to be actively involved in exploring their rich emotional experiences while acting on their own body or interacting with objects in the environment. Piaget (1952), and Baldwin (1906) before him, noted that young infants engage in playful repetitions of action schemes, first on their own body (primary circular reactions) and eventually on external objects (secondary and tertiary circular reactions). This propensity for repetition favors self-exploration and the discovery of one's own effectivity and vitality. In particular, the repetition of actions, such as the transport of the hand to the mouth, thumb sucking, or the kicking of a mobile, enable young infants to calibrate the effectivity of their own actions, as well as to specify their own force and vitality.

Here is one among many other examples of what Piaget (1952) observed regarding the early propensity for self-examination, and what I consider to be active

emotional monologues in the context of circular reactions. The first is in relation to primary circular reactions which, once again, are body oriented:

Observation 12: At 1 month and 3 days, Laurent puts out his tongue several times in succession. He is wide awake, motionless, hardly moves his arms, and makes no sucking-like movements; his mouth is partly open and he keeps passing his tongue over the lower lip. At 1 month and 5 days, Laurent begins sucking-like movements and then the sucking is gradually replaced by the preceding behavior. At 1 month and 6 days, he plays with his tongue, sometimes by licking his lower lip, sometimes by sliding his tongue between his lips and gums. The following days this behavior is repeated and always with the same expression of satisfaction (Piaget, 1952, p. 50).

This observation demonstrates a 1-month-old infant's propensity to repeat a newly discovered action over protracted periods of time. This action is generated for the apparent pleasure of its repetition. What is interesting is that this action of the tongue is not stereotypical, but rather is modulated and associated with an unmistakable emotional expression of satisfaction. The following observation pertains to self-examination and a playful monologue in the context of secondary circular reactions (repeated actions that are object oriented):

Observation 94: At 3 months, 5 days, Lucienne shakes her bassinet by moving her legs violently (bending and unbending them, etc.), which makes the cloth dolls swing from the hood. Lucienne looks at them, smiling, and recommences at once. These movements are simply the concomitants of joy. When she experiences great pleasure Lucienne externalizes it in a total reaction including leg movements. As she often smiles at her knick-knacks she caused them to swing (Piaget, 1952, p. 158).

Again, this observation demonstrates the infant's propensity to become self-absorbed, this time by observing traces of her vitality in the visual consequences of her own action on the object. This exploration is accompanied by positive affect (smiling), which suggests that concomitant to the exploration of her own agency, the infant is also immersed in the exploration of her own pleasure and emotional experience, an obviously important aspect of the self. Lewis, Sullivan, & Brooks-Gunn (1985) (cited by Lewis, 1990) also observe the systematic expression of joy by infants as young as 2 months who are learning the contingency between a pulling movement of the arm and a visual stimulation. In this instrumental learning situation, an arm pull by the infant triggered the short appearance on a screen of an image showing an infant's smiling face accompanied by the sound of a singing child. Interestingly, the authors report that during an extinction phase in which the contingency was surreptitiously suppressed, infants switched their emotional expression from joy to anger. They expressed joy again when the contingency was reestablished. These observations once again point to the fact that

the exploration of the self as agent is inseparable from the exploration of concomitant vitality and emotions.

The specification of experienced feelings and emotions is an important aspect of the early development of self-knowledge. As suggested above, it is inseparable from the development of the ecological self and from the discovery by young infants of their own efficacy in the physical world. Again, in perceiving the results of their own actions, infants do not only gain information about whether or not they are successful in achieving a goal. They also gain information about their idiosyncratic way of doing things and about the emotional aspects of themselves as actors. They learn about their unique vitality, strength, and impact on the environment.

What I have proposed so far is that by acting on objects, infants cast their own specific way of doing things, and it is based on the detection of this information that infants probably start specifying themselves as objects of reflection. Accordingly, the perceptual analysis of self-generated actions and their consequences on physical objects might be an important factor in the development of the self as both subject of action and object of reflection. However, this contribution is probably minimal in comparison to the objectification of the self that stems from social interactions and the constructive reciprocity provided by others.

Early Objectification of Self in Others

In perceiving and acting in the social environment, infants develop a special set of expertise that they do not acquire in interacting with inanimate, nonintentional objects. I will argue that before recognizing themselves in mirrors, pictures, or films, infants start recognizing themselves in others, via imitation and the reciprocity of social interactions. In reproducing emotional expressions, perceiving emotions in others, monitoring their own, and probing how they impact on others, infants discover aspects of themselves that they could not discover otherwise. It is essentially from the experience of the social mirror that they develop self-awareness, and in particular the awareness of themselves as objects of reflection.

Based on the work of Eckman, Levenson, & Friesen (1983), which demonstrated that particular facial movements influence one's emotion-specific physiological changes, Meltzoff (1993) suggests that in imitating the facial expression of others, young infants might directly experience the emotional state of the person they are imitating. In other words, imitation may be the process that underlies the infant's emotional empathy with others. In relation to self-

knowledge, the intriguing idea proposed by Meltzoff means that infants from birth might engage in the process of an objectification of their own emotions via the imitation of body movements and the facial expressions of others. Note that infants from birth are invariably positioned by caretakers and engaged in particular games that provide them with opportunities to imitate and act in reciprocity. Some 50 years ago, Spitz (1965) provided striking observations of infants in a crowded orphanage displaying the syndrome of infantile hospitalism. When deprived of frequent exposure to the constructive "mirror" afforded by others, infants tended to withdraw from the world, apparently losing their basic sense of self as active participants in both the physical and human environment.

Although we have seen in the preceding section that opportunities for an early objectification of the self occur via the interaction between infants and physical objects (i.e., the monologue of circular reactions), this process is obviously not sufficient to account for the development of self-consciousness. Self-consciousness is essentially coconstructed and needs to be conceived of as a byproduct of social interactions (i.e., the reciprocity characterizing the dialogue with others). In his compelling book, Kaye (1982) suggests that self-consciousness corresponds to the child's realization of other persons' intentional agency. In this process, the child views herself as another person equally endowed with intentionality. Kaye describes multiple frames by which parents and caretakers might scaffold infants' knowledge in general, and self-knowledge in particular, in terms of an awareness of being an intentional entity among others. For example, Kaye describes how adults carry out what they detect as the infant's intention (instrumental frame). Parents manifest exaggerated consequences to the infant's action (feedback frame), or provide the infant with actions to be imitated within appropriately timed turn-taking patterns (modeling frame). These frames are expressed to the infant from birth and determine the developing ability to conceive of themselves as intentional agents among others.

Self-awareness depends on social interactions, and in particular on the systematic scaffolding of empathic, exquisitely attentive, and more expert others. The parental frames described by Kaye (1982) are pervasive in the sense that any empathic adult expresses the ability to foster and scaffold the infant as they interact together. In fact, it is remarkable how systematic and robust adults are at modulating their behavior as a function of the infant's age, and how parents in general tune in their infant's progress by constantly adjusting the frames of their interaction. This ability is indeed instrumental in fostering development and is probably at the origins of competencies, including self-awareness, that might be exclusive to the human species and perhaps few of its close relatives (see Tomasello, Kruger, & Ratner, 1993, for a discussion of this interesting issue).

Infants from birth show a great inclination to explore and interact with others, developing precocious signs of social skills. This inclination is at the origins of what Neisser (1991) calls the "interpersonal self," and what Trevarthen (1974) interprets as the "primary intersubjectivity" expressed by young infants in the course of the first months. Research demonstrates the social attunement of young infants in the context of face-to-face interactions (Stern, 1985; Tronick, 1980; Murray & Trevarthen, 1985). Features that pertain to others are shown to have a strong attraction value for neonates, who orient preferentially toward the social resources of their environment. For example, they demonstrate increased visual attention toward facial features, in comparison to other, nonfacial configurations (Fantz, 1963; Johnson & Morton, 1991). This early inclination contributes to the development of self-knowledge.

In general, by perceiving and acting in a social context, infants gain a deep, private knowledge about themselves. The human environment for young infants, as for older individuals for that matter, is a "deep mirror"² that scaffolds further objectification of the self as a sentient, emotional, and intentional entity. Others, construed as social objects, afford much more than physical objects: In addition to specifying our situation in the environment as other objects do (where we are and what we can do, which correspond to the early sense of self), they afford a deep reflection about our worth and what we feel. In interacting with others, infants engage in both a "doing in the world" mode from which the early sense of self emerges, but also and simultaneously, in a "reflecting" mode from which *self-awareness* emerges. According to this view, others are privileged objects in the environment that afford the idea of "me"; hence, self-consciousness. It is true that when infants encounter resistance with physical objects in the environment — that, for example, a particular object is not easily suckable and requires much effort to provide nutrients (think of a clogged rubber nipple) — it informs them both about the quality of this object and about the relative efficacy of their own actions. Physical objects do sometimes provide "deep reflection" about what we are (e.g., weak, strong, cowardly, or brave), but only interactions with others invariably reflect to us what we are and how we feel.

As an illustration of the deep reflection provided by others to young infants, and of a typical parental frame at work from the earliest age, here is a short, reconstructed excerpt of a mother interacting with her 2-month-old infant via a close-circuit video system as part of an ongoing research conducted in collaboration with Ulric Neisser and Viorica Marian at the Emory Infant Laboratory:

The mother with a high pitch, motherese voice:

"...Hi baby...hi my baby...are you happy to see me?...Are you going to give me a smile?...Are you?...Are you going to give a smile to mommy?... (the baby starts to look away from the mother)..."

The mother:

"...look here baby...what's happening my baby?.... Are you sad?... Are you unhappy?... Aren't you going to give a smile to mom?.... C'mon, give a smile to mom..." etc.

This dialogue illustrates the typical affective scaffolding provided by the mother, who encourages a certain type of hyper-positive, highly charged exchange where positive affects are displayed, exaggerated, and requested with insistence. The mother reflects to the infant a certain affective tone, and by the modulation and timing of her voice (not the content of her words, of course), she is *commenting* literally on-line about the feelings of her baby in an obvious attempt to control and make them more positive. The mother in this example is an affective broadcaster of her infant's affective state changes — not unlike the running description of a sportscaster — except that she is commenting in order to impact positively on her infant. She is a commentator as a way of being an active participant, and in particular an initiator of particular affects in the ongoing interaction. This affective scaffolding is unique to the interaction with others and provides infants with a deep reflection about the dynamics of their own emotions, and ultimately about themselves as sentient and intentional entities. Again, the idea of "me," or self-consciousness, is mainly social in its origins, via the process of the "deep reflection" afforded by the reciprocal and constructive social mirror.

As infants interact from birth with both physical and social objects, they simultaneously develop a sense of themselves as subject of action (ecological self) and as object of reflection (self-awareness). Although self-awareness manifests itself unambiguously by the second year when infants become explicit about their idea of "me" (see Lewis, this volume), self-awareness does develop in the course of the first months. Much research is needed to unveil the early ontogeny of self-awareness in relation to the objectification of the self afforded by the systematic reciprocity and scaffolding of others.

Conclusion: The Paradox of the Physical Mirror

As a conclusion, I would like to convey a final idea regarding reactions to specular images or mirror reflections, which often have been used by comparative and developmental psychologists as a mean to assess the emergence of self-awareness (e.g., see the influential work of Gallup, 1970; Lewis & Brooks-Gunn, 1979).

This idea is that reactions to specular images are interesting, not because they denote the presence or absence of self-awareness, but because they can potentially denote subjects' awareness of a fundamental paradox attached to these images: the

simultaneous experience of self and nonself (others). I propose that sensitivity to such a paradox underlies particular reactions of young children and adults confronted for the first time with their specular image. These reactions are revealing of a basic perceptual differentiation that takes place in the course of the first months. This differentiation is construed as the perceptual prerequisite of self-awareness.

In general, it is erroneous to assume that self-consciousness emerges suddenly by the second year of life, as numerous researchers have proposed using mirror self-recognition as a paradigm. Mirrors are ambiguous at best and cannot be used as the crucial test of self-consciousness. When infants face their own image and start showing emotional embarrassment in the mark test, it is not because they become conscious of themselves, but because they come to terms with the ambiguity of physical mirrors as objects in the environment. What they experience, in my view, is the ambiguity reflected by the specular image, which specifies two things that are normally viewed as one: the sense of self, and the sense of another individual that is by definition distinct from the self. On one hand, the specular image specifies what the infant is (the ecological self) via the perfect temporal contingency of visual-proprioceptive information. On the other hand, it specifies simultaneously *someone else* for the mere reason that it is something that looks like another person, i.e., an animated and differentiated entity that is *externalized* (a nonself entity by definition). Children's embarrassment probably corresponds to a deep perceptual and emotional puzzlement associated with the highly unusual experience afforded by the mirror. Interestingly, this puzzlement seems to be much more dramatic in mature individuals who have never experienced the ambiguity of the specular image and who are confronted for the first time with their own reflection in a large mirror.

The anthropologist Edmund Carpenter (1975) reported striking observations collected from adult individuals of an isolated tribe (the Biame) living in the Papuan plateau where neither slate or metallic surfaces exist, and where rivers do not provide clear physical reflections. Here is what Carpenter reported regarding these individuals' initial reaction to a large mirror, a wholly new experience for them:

They were paralyzed: after their first startled response — covering their mouths and ducking their heads — they stood transfixed, staring at their images, only their stomach muscles betraying great tension. Like Narcissus, they were left numb, totally fascinated by their own reflections; indeed, the myth of Narcissus may refer to this phenomenon (Carpenter, 1975, pp. 452–453).

In conclusion, let us remember that the experience of the mirror violates something fundamental that infants experience from birth: the perception of

themselves and of objects (including people) as differentiated and situated entities in the environment. If the determinants of self-awareness are mainly social, this awareness is fundamentally based on the detection of perceptual information that specifies the self as an entity differentiated from others. There is an element of fascination in mirrors, not because they are a key to self-knowledge, but because they afford an illusion. They are a source of ambiguous information that conflicts with what infants learn from birth as actors in a meaningful environment.

NOTES

1. The terms *self-consciousness* and *self-awareness* are considered as equivalent, both linked to a reflexive process whereby the self is both subject of action and object of reflection. In contrast, the sense of the ecological self is viewed as direct, pertaining exclusively to the self as subject of action.

2. *Deep* is used here to provide a contrast between the reflecting process of our person provided by people interacting with us, and the specular image reflected by the physical mirror that is a superficial, bidimensional reflection of our physical envelope.

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