Chapter 1

The emergence of self-awareness as *co-awareness* in early child development

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This chapter presents some recent observations supporting two general ideas. The first idea is that, contrary to what has been assumed by early theorists of child development, from the first few weeks of life, infants manifest an implicit sense of themselves. They perceive their own bodies as differentiated, situated, and agent entities among other non-self entities in the environment, namely physical objects and people. The second idea is that from this early sense of self, infants develop rapidly a sense of themselves *as perceived by others*. They develop what I call "co-awareness", or the *awareness of self in relation to and through the eyes of others*. Ultimately, the aim of this chapter is to provide readers with some empirical food for thoughts regarding what can be viewed as a major developmental transition from the evidence of self-awareness manifested at birth, and the awareness of the self as perceived by others, which starts to be manifested by the end of the second year in the life of the healthy developing child.

1. Public and private re-presentation of the self: *The Irreconcilable*

The 19th century French poet Arthur Rimbaud wrote as a young adult: "I is someone else" ("Je est un autre"). Rimbaud points to the difficulty of reconciling self-knowledge with the self that is known by others, what can be construed as the *irreconcilable difference between what we represent of ourselves privately and what is represented by others based on what we display publicly*. There is indeed, at least for adults, an inseparability and also a marked gap between what we perceive of ourselves and what we construe as the perception of our-

selves by others. Typically, and this seems to be a universal psychological issue across cultures and for individuals of all walks of life, we can never quite reconcile what we feel about ourselves from within our own body, with what we construe as the perception of ourselves by others from their own embodied perspective.

As a case in point, let me mention the observations reported some 30 years ago by the visual anthropologist Edmund Carpenter. Carpenter recorded the reactions of adult Biami, an isolated tribe living in the plateau of Papua New Guinea, when introduced for the first time to their own mirror reflection, video image, and other Polaroid photographs of themselves. Carpenter reported a powerful expression of fear and anxiety in these adult individuals: "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" (Carpenter 1975: 452).

It is my contention that the fear expressed by the Biami adults, confronted for presumably the first time with their specular image, rests on the fact that the individual comes to grip with the profound discrepancy between what he or she feels and perceives about the self from within his/her own body, and what others actually perceive of him or her as it is objectified by the specular, photographic, or video image. In short, what the adult comes to grip with is the basic discrepancy between private and public self, a discrepancy that, I propose, is never filled. In development, the awareness of this discrepancy emerges by the end of the second year, with young children beginning to manifest embarrassment in front of mirrors, in addition to self-recognition.

2. Specular image and levels of self-awareness

Developmental psychologists have used the reaction of children to their own specular image as an index of self concept (Amsterdam 1972; Lewis & Brooks-Gunn 1979; Povinelli 2001), for example, when toddlers begin to reach for a dab of rouge surreptitiously applied on their face, which they have discovered in the mirror. This response, in the context of the so-called "rouge test", is taken as indexing mirror self-recognition (Bertenthal & Fisher 1978). In fact, upstream and downstream of mirror self-recognition, as indexed by the passing of the rouge test, one can distinguish at least six basic possibilities of what an individual can perceive when seeing him- or herself in a mirror. I construe below that these six possibilities map onto five levels of self-awareness (six levels if we include a Level 0 of non self-awareness) as they unfold in early development

(see also Rochat 2003). This ontogenetic unfolding includes the mirror self-recognition, which is indexed by the passing of the rouge test, but also points to implicit levels of self-awareness that precede the passing of such a test, as well as explicit levels of self-awareness that follow it. I review these possibilities below in the order of their emergence, asking the question: what is the range of possible perceptions of the self in the mirror?

Possibility 1: The first possibility is that the individual perceives the specular image as *undifferentiated from other entities perceived in the environment*. The image of the self reflected in the mirror is confounded with the environment itself, hence the reflective property of the mirror is overlooked by the individual. The mirror is perceived as a mere extension of the surrounding space. Birds flying in a room with a mirror and crashing repeatedly against it express such undifferentiated perception. The individual perceived in the mirror stands for somebody else. Other birds, cats, dogs, or macaque monkeys who display aggressive behaviors to their specular image also manifest such possibility, somehow oblivious of the self-reflecting nature of the mirror (Zazzo 1981).

Possibility 2: A second possibility is that the individual perceives the specular image as *differentiated from other entities in the environment*. Instead of a mere extension of the surrounding space, the mirror reflection is detected as a solid, flat, polished surface that is differentiated from the three-dimensional layout of surfaces and objects. The mirror is seen as an object among other objects in the environment.

Possibility 3: A third possibility is that the individual perceives the specular image as differentiated from other entities, but also as *indexing invariant contingent relations between self-produced and seen movements*. The individual picks up the specificity of the specular image as temporally contingent and spatially congruent correspondences between proprioception and vision of his/her own body. This detection is perceptual, based on the detection of intermodal invariants in the mirror that specify the body as to how it looks and feels from within when set in motion. This third possibility is expressed, for example, by chimpanzees caught picking their teeth while guiding their action visually via a mirror (Povinelli 1993, 1995).

Possibility 4: The fourth possibility is that individuals actually recognize themselves in the specular image, as indexed by self-referencing in the context of the rouge test. The act of bringing the hand in contact with the spot of rouge on the face indicates that the child goes beyond the mere perception of the specular image as a perceptually differentiated entity in the world. The child manifests an explicit understanding that *what is reflected in the mirror*

stands for his/her own body that is facing it. The mirror is perceived as self-referencing: it refers and maps onto the currently felt body. The specular image is thus recognized as standing for the self, beyond mere intermodal contingency detection.

Possibility 5: The fifth possibility is that the individuals recognize themselves in the specular image whether it is contingent or not. Such recognition does not depend on the perfect contingency and spatial congruence between proprioception of the body and the vision of it moving as perceived in the present. The perceived image of *the body is identified as a permanent entity beyond the here and now of intermodal perception*, recognized as an image that refers to the self in the past, as for example in a photograph or in a pre-recorded video (Lewis & Brooks-Gunn 1979; Zazzo 1981; Povinelli 2001).

Possibility 6: The sixth possibility is that individuals not only recognize themselves in the specular image as permanent entities, but also see this image as standing for *what other people actually perceive of the self*. The specular image is recognized as standing for the private as well as the *public* self. This recognition opens the process of an exploration and ultimately an evaluation of the gap between how individuals feel from within as well as represent themselves privately, and how they are actually perceived by others as indexed by the mirror reflection. The specular image is construed as an objectified, publicly accessible self presentation that is open for evaluation and re-assessment.

3. Early development of self-awareness

The order of the 6 possibilities outlined above corresponds to an increasing complexity in the perception and representation of mirror self-reflection: from mere perceptual discrimination to explicit recognition, identification, and ultimately to evaluation. This progressive order corresponds also, I will contend, to the order in which self-awareness develops between birth and 3 years of age. Next, I present this development in its chronology and as it appears to unfold in the first 3 years of life. For illustration, I selected empirical evidence that support each of these proposed developmental steps. Table 1 below summarizes these steps, in the chronology of their manifestation early in life, with approximate age onset. Note that these ages are only indicative, varying across individual infants and depending on the experimental and cultural context of the child, as well as the kind of tests used to probe the development of self-awareness. Rather than exact timing, what is important here is the putative

Table 1. Proposed developmental progression in levels of self-awareness

Development Age		Process	Behavioral expression
Step 1	(possibility 1) —	confusion	(self-world fusion)
Step 2	(possibility 2) Birth	differentiation	(self-world discrimination)
Step 3	(possibility 3) 2–7 months	causation	(self-exploration)
Step 4	(possibility 4) 18 months	recognition	(self-objectification)
Step 5	(possibility 5) 24 months	extension	(permanence)
Step 6	(possibility 6) 36 months	evaluation	(co-awareness)

invariant developmental progression in terms of emerging processes, behavioral expression, and motives that seem to underlie the ontogeny of self-awareness.

3.1 Self-world differentiation at birth

Recent research shows that from the first minutes of life outside the womb, babies manifest a sense of their own bodies as differentiated entities among other entities in the environment (see Rochat 1997 for a more detailed discussion of experimental facts supporting this assertion). According to Neisser (1991, 1995; see also Rochat 1997), newborns manifest rudiments of a perceived or "ecological" self.

For example, in one study (Rochat & Hespos 1997) we showed that from birth, infants manifest a discrimination between tactile stimulation that is self produced (self-stimulation) and tactile stimulation from a non self, external origin (allo-stimulation). Comparing the rooting responses of newborns following a stimulation to either the right or left cheek, caused by either the finger of an experimenter (allo-stimulation) or the spontaneous transport of the infant's own hand toward the face (self-stimulation), we observed that newborns tend to turn their head significantly more toward the experimenter's finger compared to their own hand. When the hand of the experimenter was involved, the newborns showed more head orientation with mouth opening and sucking movements with tongue protrusion.

It appears that infants from birth are capable of discriminating information that specifies their own bodies as differentiated entities. This observation

is not trivial since it is contrary to the long held idea of an initial state of un-differentiation or confusion between infants and their environment (e.g., Piaget 1936). Some psychoanalysts went as far as elaborating theories of personality development on the premise that the starting point of such development is an initial state of un-differentiation or "infantile autism" (Mahler, Pine, & Bergman 1975).

Recent research indicates that, on the contrary, early on, infants process intermodal (polysensory) information that specifies the body as a distinct entity. Researchers have now accumulated numerous data demonstrating the remarkable coordination at birth of visual and postural/vestibular systems. Such coordination allows an infant to pick up information that specifies movements of his/her own body in a stable environment or the reverse, the stability of the body in a moving environment (Butterworth 1995; Bertenthal & Rose 1995; Jouen & Gapenne 1995). Such discrimination, which is based on the processing of perceptual information from multiple modalities, is evident from birth and probably the result of an active prenatal calibration of sensory and motor systems. Fine ultrasonic scanning of fetuses during the last 3 months of pregnancy reveals indeed that most of the behaviors observed immediately after birth in newborns are already functional and well established in the womb (Hopkins & Prechtl 1984; De Vries, Visser, & Prechtl 1984).

There is a remarkable continuity between pre- and post-natal behaviors (Prechtl 1984). This continuity suggests that the implicit knowledge of the body as differentiated entity expressed in newborns' behavior could well be the product of prenatal learning, as in the case of maternal voice discrimination expressed by newborns immediately after birth (DeCasper & Fifer 1980; DeCasper, Lecanuet, Busnell et al. 1994) or the evidence of neonates' olfactory discrimination of maternal amniotic fluid compared to the amniotic fluid of a female stranger (Marlier, Schaal, & Soussignan 1998).

The perceptual learning of their own bodies as differentiated from other entities in the world is the main pillar of an ecological sense of self expressed by infants from birth. Although far from a conception of the self as perceived by others, this basic sense of self is a necessary precursor, a *sine qua non* condition for the emergence of co-awareness. Questions remain, however, as to how infants develop co-awareness from this basic, early (perceived) sense of self.

3.2 Emerging intersubjectivity and self-exploration at 2 months

One can observe a radical behavioral reorganization with the apparition of the social smile at around 6 weeks of age. This reorganization corresponds to a

revolution in the way infants relate to the world, in particular, how they relate to others via reciprocal exchanges. This revolution is *de facto* the true psychological birth of the infant, the beginning of a sense of shared experience with others, hence the beginning of co-awareness (Rochat 2001).

For parents, witnessing the first smile of their child in the context of intimate face-to-face exchanges (as opposed to the automatic smile expressed by neonates during sleep or following feeding) is a major event. Nothing can exaggerate the importance of the emergence of socially elicited smiling in the life of a child and his caretakers. This emergence marks the beginning of the child's relational existence, as it is the first explicit manifestation of a shared positive experience. It is the first unmistakable manifestation of an experience of well being with others. It is also the first message of reciprocity that is not solely linked to basic physical care dispensed by the adult. It is a first message that begins a lifelong conversation with others. With socially-oriented smiling, infants affirm their presence in the world *with* others. It is the beginning of co-awareness and indeed the true psychological birth of the child.

Parallel to the emergence of social smiling, many other aspects of infants' behavior are reorganized. For example, during the second month, the capacity of infants' attention changes markedly and in a relatively sudden fashion. Wolff (1987) observed that by 6 weeks, infants spend significantly more time in an awake and alert state, spending significantly more time attending to their environment with eyes wide open. It is also by this age that infants begin to scan faces by focusing markedly more on the eyes and the mouth, facial regions that are rich with information regarding the fluctuating emotional states of others. In sharp contrast, neonates tend to focus much more on the periphery of the head (Maurer & Salapatek 1976; Haith, Bergman, & Moore 1977; see also the relevant work of Morton & Johnson 1991).

At the level of general cognitive development, the second month marks a change in the stance the infants take toward the world that surrounds them. There is some kind of a radical world view change. From birth, and even prior, infants are capable of complex sensory-motor learning and perceptual discrimination. However, this learning and discrimination are not yet under anything that resembles voluntary control, still dependent on the here and now or immediacy of perceptual experiences. There is not yet clear evidence of systematic groping or exploration. For example, numerous research studies done in the past 30 years demonstrate the stunning capacity of neonates to imitate facial expressions such as mouth opening, tongue protrusion, and even emotional facial displays such as happy or sad expressions (Meltzoff & Moore 1977; Field et al. 1982). However, this imitation is still rather fragile. It is not very system-

atic and does not show much flexibility. This led some critics to view neonatal imitation as nothing more than the product of innate automatic release mechanisms (Anisfeld 1991). By 6 weeks, infants' imitative behavior eludes such interpretation, clearly demonstrating that there is more to it than a pre-wired automatism. Meltzoff and Moore (1992) showed that by this age, infants begin to systematically modify their imitative response to match the adult model. For example, if the experimenter pulls his tongue to the side, the infant might first pull her tongue to the center and slowly bring it to the side to match the target gesture. This behavior shows systematic approximation and what amounts to willful groping.

Recently, we made similar observations comparing newborns' and 2-month-olds' sucking behavior on "musical" rubber nipples. In this research (Rochat & Striano 1999), every pressure applied by the infant on the nipple was associated with a contingent succession of sounds that were more or less the auditory analog of the oral pressures generated by the infant on the pacifier. In one condition (analog), the pitch variation of the successive sounds heard by the infant was proportional to the variations of pressures applied by the infant on the pacifier. In another (non-analog) condition, the pitch variation of the sounds was not dependent, but rather varying randomly. We observed that by 2 months, infants manifest a differential modulation of their suction of the pacifier depending on the condition (i.e., analog or non-analog auditory consequence of sucking). In contrast, we tested newborns, who did not show any evidence of such differential responding, hence no evidence of systematic exploration of the auditory consequences of their own oral (sucking) activities.

Around 6 weeks of age, babies thus manifest a novel stance toward objects, toward themselves, and toward others. This novel stance is a *contemplative* and *reciprocal stance*, as opposed to the discriminatory and immediate stance of newborns (Rochat 2001). This new stance is linked to expectations and the systematic exploration of physical events, as well as to the first reciprocal exchanges with others. Affective reciprocity by the second month is a major step toward co-awareness, a *sine qua non* condition of his/her development. From birth, which was the first *sine qua non* condition for the emergence co-awareness.

3.3 First signs of self-objectification by 18 months

Until the middle of the second year, when linguistic and symbolic competencies start to play a major role in the psychic life of children, self-awareness remains *implicit*. It is expressed in perception and action, not yet expressed via sym-

bolic means such as words. Prior to approximately 14–18 months, there is yet no clear evidence that children perceive traces of themselves, as *standing for* themselves, only themselves, and no one else, such as the little footprints they might leave in the mud or the image they see in the mirror.

However, months earlier, infants do discriminate between their own image and the image of another infant. Preferential looking studies show that by 5–6 months infants tend to be significantly more captivated by a pre-recorded video of another, same-age infant, compared to a pre-recorded video of themselves wearing an identical, same color outfit (Bahrick, Moss, & Fadil 1996). It appears that by this age, and presumably via previous exposure to mirrors and other self reflecting devices, infants pick up invariant features of their own faces. It does not mean however that they construe these features as standing for themselves. It is the product of perceptual learning of subtle invariant facial features they quickly become familiar with. When placed in a situation where they have the choice to explore either their own familiar face or the face of another child, they show a typical preference for novelty (e.g., Fantz 1964; Rochat 2001). Although certainly a necessary precursor and a sign of remarkable perceptual learning ability, this preference does not mean yet that infants do *recognize* that it is themselves on the TV.

The same kind of interpretation applies to our finding that 4- and 7-month-old babies show clear discrimination between seeing themselves live on a TV while moving around in their seat versus seeing a live experimenter on a TV engaged in the systematic imitation of what the infant is doing (Rochat & Striano 2002). In this experiment, the experimenter shadowed the infant as mirrors do. We found that infants smiled, vocalized, and looked differentially at the imitating experimenter seen on TV compared to the self. In addition, infants tended to react differentially depending on the condition when the image was suddenly frozen in "still-face" episodes.

In all, young infants demonstrated once again their perceptual ability to distinguish between the familiar sight of themselves and the novelty of the experimenter appearing on the TV, the age variable, not withstanding the inescapable lack of perfect contingency in the Experimenter's shadowing of the infant's own actions (see Rochat & Striano 2001, 2002).

Despite all this perceptual discriminability between what pertains to the self and what pertains to others, up to the middle of the first year, infants appear oblivious that some rouge has surreptitiously been smeared on their faces or that a yellow "Post-It" might appear on their foreheads when looking at their own specular image (Bertenthal & Fisher 1978; Povinelli 1995). It is only by 18 months that infants start to reach for the mark on their own bodies, of-

ten in order to remove it. This behavior is considered by most developmental and comparative psychologists as the Litmus test of self-awareness. It is often viewed as evidence of a conceptual or "represented" sense of self in any organism that behaves like this in front of mirrors, whether human children, non-human primates, avians, mammals like elephants, or even cetaceans like dolphins (Parker, Mitchell, & Boccia 1994). But why is this? It is mainly because by showing this behavior, individuals demonstrate the ability to refer to the specular image as standing for their own bodies. In other words, they reference the silhouette they see reflected in the mirror to precise regions of their own bodies they cannot see directly (e.g., their foreheads). This would be impossible without a body schema or own body representation that is mapped onto what is seen in the mirror. Therefore, this behavior indicates that the mirror reflection is seen by the individual as standing for this representation. It is identified as referring to the body experienced and represented from within, not anybody else's. Identity is used here in the literal, dictionary sense of "recognizing the condition of being oneself, not another" (Random House Unabridged dictionary, Second Edition, 1993).

In relation to the above formulation, mirror self-recognition expressed via the "successful" passing of the mark test is predictably linked to major progress in symbolic (referential) functioning of the child in other domains, in particular language development.

By 18 months, infants also start to mark contrasts between themselves and other people in their verbal production. They express semantic roles that can be taken either by themselves or by others (Bates 1990). An explicit, hence reflective conception of the self is apparent at the early stage of language acquisition, at around the same age that infants begin to recognize themselves in mirrors. This chronological link in development provides indirect validation of the mirror test and the interpretation I provided above. Indeed, as argued by Bates (1990), language acquisition requires a preexisting conceptual or represented sense of self as "Me" as opposed to simply "I": "a theory of the self as distinct from other people, and a theory of the self from the point of view of one's conversational partners" (Bates 1990: 165).

3.4 Developing self permanence by 24 months

If infants identify themselves in mirrors starting at 18 months, they still demonstrate that the *Me* they identify in the specular image remains enigmatic and ambivalent. They appear to still oscillate between an awareness of the self and an awareness of seeing someone else facing them (Piaget 1962;

Povinelli 2001; Rochat 2001). Identifying oneself in the mirror is a major feat, not only for the referential mapping between the mirror reflection and the own body schema, but also because what the child sees in the mirror is the way he or she always sees others: in an "en face" posture often with eye contact. In relation to this basic experience of social encounters, what the child experiences in the mirror might be "Me", but it is also what others typically look like. The child therefore has to suspend and override his overall visual experience of others, the specular image standing for "Me as an other" (Me but Not Me dilemma, Rochat 2001; see also from a psychoanalytical perspective Jacques Lacan's account of "the mirror stage").

The mirror experience of the self carries this fundamental ambiguity and children struggle with it, as we will see, until at least their fourth birthday. Note that this ambiguity is pervasive all through the life span. As adults, we look at ourselves in mirrors, working on our presentation by simulating or representing the looking of others at our own bodies. What we are seeing, is de facto our appearance as seen by others, hence the pretense of someone else.

In his seminal observations of his own children, Piaget reported anecdotes that pertain to the mirror dilemma. Jacqueline, aged 23 months, announces to her father as they are coming back from a walk that she is going to see her father, her aunt, and herself in the mirror. Perfectly capable of identifying herself in the mirror as "Me" when prompted by her father asking "who is there?", Piaget observes that Jacqueline provides also, at times, a *third person* account of what she sees in the specular image. Likewise, she tends to oscillate between claiming that it is "Me" or that it is "Jacqueline" when viewing photographs with herself in it (Piaget 1962: 224–225).

More recently, as part of a series of ingenious studies on the developmental origins of self-recognition, Povinelli reported the commentary of a 3 year-old with a sticker on her forehead, viewing herself on a TV. She says: "it's Jennifer. . . .it's a sticker" and then adds, "but why is she wearing my shirt?" (Povinelli 2001: 81).

In all, these observations illustrate once again the Me-But-Not-Me dilemma, which children struggle with months after they show signs of self-identification in mirrors. Povinelli's research demonstrates that children continue to struggle with well into their third year with the Me-But-Not-Me dilemma when viewing live or pre-recorded videos of themselves. For example, children 3 years and younger do tend to reach for a large sticker they see on top of their own heads while viewing a live video of themselves. In contrast, they don't when viewing the replay of the same video taken only 3 minutes prior. Furthermore, when asked who was on the TV, it is only by 4 years that

the majority of children say "Me" rather than their proper name suggesting a first person stance rather than a third (see Povinelli 1995, 2001, for a review and discussion of this research).

The careful empirical work of Povinelli and colleagues on delayed self-recognition shows that it is not prior to approximately 3 years that children begin to grasp the temporal dimension of the self. They start to grasp that the self pertains not only to what is experienced now, but also to what was experienced then, what can be seen in a mirror now or in a movie tomorrow: the same enduring self.

3.5 Others in mind by 36 months and older

By the time young children begin to express and recognize themselves as enduring entities, they also begin to show major advances in their understanding of others. By 4–5 years, children demonstrate the ability of holding multiple representations and perspectives on objects and people. They can infer for example the particular age, relative sentience, temperament, and emotionality of a person by merely looking at the quality of a simple drawing. By this age, children infer the mind and affect of the artist behind a graphic symbol (Callaghan & Rochat 2003). This ability is linked to the developing child's ability to construe false belief in others, as well as to grasp the representational status of graphic and other symbolic artifacts such as maps, photos, or scale models (Callaghan & Rochat 2003; Rochat & Callaghan, in press; DeLoache 1991; Olson & Cambell 1993; Perner 1991).

The development of representational abilities in general and theories of mind in particular corresponds also to evidence of meta-awareness in relation to the self. For example, when children begin to understand explicitly that another person holds a false belief, they necessarily understand that they themselves hold the right belief. In the same way, when infants demonstrate some construal of object permanence, they also demonstrate their own permanence in relation to objects (Rochat 2001). These terms are inseparable.

The expression of embarrassment in front of mirrors by 2–3 years can be interpreted as the first sign of young children's awareness of their public appearance and how others perceive them. As proposed earlier, by this age, children begin to experience the basic fear-generating realization of a gap between how they perceive themselves from within and what people actually perceive from the outside.

An alternative interpretation would be that young children shy away from their reflections in the mirror, not because they are "self-conscious", but rather

because they wrongly construe the presence of another child staring at them with some kind of a persistent still face. But this is doubtful considering, as we have seen, that very early on infants discriminate between seeing themselves or seeing someone else in a video (Bahrick et al. 1996; Rochat & Striano 2002).

By showing embarrassment and other so-called secondary emotions (Lewis 1992), young children demonstrate a propensity toward an evaluation of the self in relation to the social world. They begin to have others in mind, existing "through" in addition to "with" others.

Secondary emotions such as the embarrassment children begin to express by 2–3 years parallel and are probably linked to the emergence of symbolic and pretend play. Such play entails, if not at the beginning, at least by 3–4 years, some ability to simulate events and roles, to take and elaborate on the perspective of others (Harris 1991; Tomasello 1999; Tomasello, Striano, & Rochat 1999; Striano, Tomasello, & Rochat 2001).

The process of imagining what others might perceive or judge about the self, whether this imagination is implicitly or explicitly expressed, is linked to the cognitive ability of running a simulation of others' minds as they encounter the self. There is fantasy and phantasms involved, the stuff that feeds the self-conscious mind and characterizes the meta-cognitive level of self-awareness. Note that the articulation in development between the evaluative sense of self expressed at level 5 via embarrassment and the meta cognitive awareness of level 6 remains for the most part a mystery and deserves much more experimental scrutiny.

4. The development of co-awareness: Toward a collaborative and seductive stance

The reference to others' views starts a process that rapidly becomes a major determinant of infants' and toddlers' behavior. It leads the child toward a growing awareness of the self in relation to others. At the level of behavior, the emergence of this novel (self-conscious) awareness manifests itself most blatantly in the form of a proactive and systematic enterprise of seduction (in the general sense of enticing the attention of others for pleasure and comfort) leading the child to behave in increasingly irrational and phantasmal ways. It is the dawn of the complex nod of representations that children generate as to how they relate to others, how they are perceived, and ultimately valued by them. These representations range from the longed for sense of being loved and affiliated to the most dreaded sense of being rejected and disenfranchised.

The elaboration of these representations brings the social dependence of the young child to new, much more complex levels of meaning. These new levels of meaning are indexed by the blossoming of behaviors that defy reason and common sense. These include coy behavior, embarrassment, excessive and defiant behavior, irrational fears and anxieties in pretend play as well as in the form of nightmares during sleep.

At the level of exchanges with others, this psychological "revolution" also translates into the emergence of a whole range of proactive behaviors driven by the irresistible need to maintain affective proximity with others. This marks the beginning of young children's active and selective attempts at engaging the people they encounter, rather than the reverse (adults actively, and often selectively engaging infants), which up to this stage has dominated their lives. As we know, games of seduction often defy reason! It is in this sense that parallel to the progress in logic and the rational conception of the physical world that continues to be documented by numerous studies in the cognitive developmental tradition of Jean Piaget, by the second year, children develop also, and probably more decisively, a capacity for seduction that leads them to irrationality.

This development pertains to a world that is essentially subjective and phantasmal. It is the represented world regarding how others perceive, value, and eventually judge us.

Beyond their first birthdays, infants manifest a dependence toward others that defies more and more common sense and straightforward understanding. When their child begins to walk and even to run, it is common for parents to notice how toddlers seem systematically attracted by the most dangerous obstacles in the environment: stairs, roads, furnaces, and other threatening features. These kinds of behaviors become quickly a means by which infants express defiance and gain renewed attention from the caretakers by controlling their panic intervention. Under the threat of defiant behaviors, parents are coerced into the undivided attention and exclusivity the infant is longing for.

Undivided attention of others on the self is indeed the ultimate expression of closeness and affective fusion that the young child is now actively looking for in others. Defiant behaviors mark the beginning of active seduction as a process of appropriation of others, in particular the appropriation of their undivided love and attention. In this process, children begin actively and systematically to coerce others into co-awareness. Note that this process is not unlike caretakers' drive to coerce younger infants' attention and positive emotions in silly games in an attempt to create a sense of shared experience.

To illustrate and give some empirical background for this developmental account, I report below three observations that point to the beginning of active

seduction at around the first birthday. In a study on the developmental origins of instructional learning, we recently examined the impact of the presence and interventions of others in a problem solving situation with various levels of difficulty (Goubet, Leblond, Poss, & Rochat 2001; Rochat et al. 2002). We systematically observed infants, aged between 9 and 18 months, presented with an attractive toy placed at a distance on a blanket in front of them. The infant sat on her mother's lap and an experimenter sat to the right of the infant. To grasp the toy, the infant first had to pull the blanket toward her to bring it within reach, a classic Piagetian means-end task that is solved at around 8 months (Piaget 1936; Frye 1995).

Our observations confirmed that the great majority of 9 month-old infants managed with no hesitation to pull the blanket and bring the toy toward them for further exploration and play. Curiously and rather unexpectedly, we found that this simple means-end performance tends to *deteriorate* by 14 and 18 months! At these older ages, about half of the infants do not try to pull the blanket. Rather, they desperately try to reach directly toward the distal toy by stretching and whining while looking at the experimenter. They request help and do not even seem to consider that they could manage to get to the object on their own. This behavior defies reason and does not reflect what infants at this age and following Piaget's account are clearly capable of doing in terms of means-end coordination. In fact, it appears that the physical meaning of a simple means-end task is now transformed into a more complex social and relational problem. It is as if others rather than the toy are becoming the game's end. The infant seems to construe the task as an opportunity to gain proximity and the undivided attention from others. The goal of the child is to commune and ascertain closeness with others, not to get to the toy. By the middle of the second year, the toy becomes a means to a social end, the end of creating co-awareness.

Another example indexing the emergence of an active process of seduction by the second year is illustrated with another observation we made of infants aged 9, 11, 14, and 18 months. Infants were facing an experimenter who systematically imitated the kind of actions they spontaneously performed on a toy (Agnetta & Rochat, in press; see also the original study reported by Meltzoff 1990). By 11 months, but particularly by 18 months, infants begin systematically to test the imitation of the experimenter by accelerating or suddenly stopping their own actions while staring at the experimenter and sometime smiling toward her. With this subtle mutual imitation game, infants attempt to ascertain their control of the experimenter's behavior by probing imitative responses. Again, with these actions, infants convey a sense of co-awareness.

They play on the same key with the experimenter, equally engaged in trying to be the imitator rather than the imitated. With this kind of development, infants reach new, more reciprocal levels of affective fusion and complicity with others.

Finally, another clear piece of evidence of a major step toward co-awareness is the emergence of embarrassment at around 18 months of age. Already from 2–3 months, infants demonstrate behaviors that look like embarrassment (i.e., smile accompanied by gaze aversion), when, for example, encountering an unfamiliar person (Reddy 2000). However, it is by 14 months that infants begin to manifest social embarrassment in a predictable and marked way, not only in the context of protracted attention on the self by others, but also in the context of a task or performance that can be evaluated by others.

By 18 months, the young child begins to manifest explicitly that he can recognize himself in a mirror, trying for example to wipe a spot of rouge that has been surreptitiously put on his face and that he discovers in the mirror (Gallup 1982; Zazzo 1981; Lewis & Brooks-Gunn 1979). Interestingly, we have seen that, aside from explicit self-recognition as in the rouge task, by 2–3 years, children also manifest embarrassment in front of their own specular image. This behavioral manifestation is very complex and even paradoxical, from the hiding of the face with arms and hands, gaze aversion, or sudden acting out in an apparent attempt to distract from what is revealed in the mirror (Fontaine 1992). The emergence of these behaviors is linked to the development of co-awareness, in particular the awareness of others' view of the self. With embarrassment, children indicate that what they perceive in the mirror is not only an image that refers to themselves (the identified and conceptual "Me" according to William James), but also what others can see of the self (in other words, the "public and potentially evaluated Me").

The development of self-awareness opens the door to the development of self presentation based on the very complex and often highly irrational process of representing how others perceive and evaluate us. This process certainly contributes to the development each individual constructs, according to his or her circumstances, of a sense of moral conduct (i.e., a sense of what behavior is socially more or less acceptable) and of a sense of affiliation (i.e., a sense of being more or less accepted by others). It is also on the basis of this process that children learn to collaborate with others and are able to engage in a didactic (i.e., explicitly instructional) relationship, either as teacher or student, all of which is resting on co-awareness. More importantly, it is on the basis of this process that children begin their career as compulsive seducers, exploring and exploiting for better or for worse the affective resources of their social environment, endlessly foraging for intimacy, proximity, and group affiliation.

Acknowledgments

The ideas presented in this chapter were also discussed in a recent article by the author for a special issue of the journal *Consciousness and Cognition* (2003) on self-perception and action, as well as in a chapter by the same author for a book entitled "*Theories of Infant Development*" (Bremner & Slater, Eds., Blackwell Publisher, 2003).

References

Agnetta, B. & P. Rochat (2004). Imitative games in 9-, 14- and 18-month-old infants. *Infancy, 6*(1), 12–38.

Amsterdam, B. (1972). Mirror self-image reactions before age two. *Developmental Psychobiology, 5*, 297–305.

Anisfeld, M. (1991). Neonatal imitation. *Developmental Review*, *11*, 60–97.

Amiel-Tison, C. & A. Grenier (1980). *Evaluation neurologique du nouveau-né et du nourrisson.* Paris: Masson.

Bahrick, L., L. Moss, & C. Fadil (1996). Development of visual self-recognition in infancy. *Ecological Psychology, 8*, 189–208.

Bates, E. (1990). Language about me and you: Pronominal reference and the emerging concept of self. In D. Cicchetti & M. Beeghly (Eds.), *The self in transition: infancy to childhood* (pp. 165–182). Chicago: University of Chicago Press.

Bertenthal, B. & K. Fisher (1978). Development of self-recognition in the infant. *Developmental Psychology, 14*, 44–50.

Bertenthal, B. I. & J. L. Rose (1995). Two modes of perceiving the self. In P. Rochat (Ed.), *The self in infancy: Theory and research* (pp. 303–326). Amsterdam: North-Holland, Elsevier Publishers.

Butterworth, G. E. (1995). The self as an object of consciousness in infancy. In P. Rochat (Ed.), *The self in infancy: Theory and research* (pp. 35–52). Amsterdam: North-Holland, Elsevier Publishers.

Callaghan, T. C. & P. Rochat (2003). Traces of the artist: Sensitivity to the role of the artist in children's pictorial reasoning. *British Journal of Developmental Psychology, 21*(3), 415–446.

Carpenter, E. (1975). The tribal terror of self-awareness. In P. Hikins (Ed.), *Principles of visual anthropology* (pp. 56–78). The Hague, Netherlands: Mouton.

DeCasper, A. J. & W. P. Fifer (1980). Of human bonding: Newborns prefer their mother's voices. *Science*, *208*, 1174–1176.

DeCasper, A. J., J. P. Lecanuet, M. C. Busnell, C. Granier Deferre, & R. Mangeais (1994). Fetal reactions to recurrent maternal speech. *Infant Behavior and Development, 17*(2), 159–164.

DeLoache, J. S. (1991). Symbolic functioning in very young children: Understanding of pictures and models. *Child Development, 62*, 736–752.

De Vries, J. I. P., G. H. A. Visser, & H. F. R. Prechtl (1984). Fetal motility in the first half of pregnancy. In H. F. R. Prechtl (Ed.), *Continuity of neural functions from prenatal to postnatl life* (pp. 46–64). Spastics International Medical Publications.

Fantz, R. L. (1964). Visual experience in infants: Decreased attention to familiar patterns relative to novel ones. *Science*, *146*, 668–670.

Field, T. M., R. Woodson, & R. Greenberg (1982). Discrimination and imitation of facial expressions by neonates. *Science*, *218*, 179–181.

Fontaine, A.-M. (1992). *L'enfant et son image*. Paris: Nathan.

Frye, D. (1991). The origins of intention in infancy. In D. M. C. Frye (Ed.), *Children's theories of mind: Mental states and social understanding* (pp. 15–38). Hillsdale, NJ: Lawrence Erlbaum.

Gallup, G. G. (1982). Self-awareness and the emergence of mind in primates. *American Journal of Primatology, 2*, 237–248.

Gergely, G. & J. S. Watson (1999). Early social-emotional development: Contingency perception and the social-biofeedback model. In P. Rochat (Ed.), *Early social cognition* (pp. 101–136). Hillsdale, NJ: Erlbaum Publishers.

Goffman, E. (1959). *The presentation of self in everyday life*. New York: Doubleday.

Haith, M. M., T. Bergman, & M. J. Moore (1977). Eye contact and face scanning in early infancy. *Science, 198*, 853–855.

Harris, P. (1991). The work of the imagination. In A. Whiten (Ed.), *Natural theories of mind* (pp. 283–304). Oxford: Blackwell.

Hopkins, B. & H. F. R. Prechtl (1984). A qualitative approach to the development of movements during early infancy. In H. F. R. Prechtl (Ed.), *Continuity of neural functions from prenatal to postnatal life* (pp. 179–197). Oxford: Blackwell Scientific Publications.

James, W. (1890). *Principles of psychology*. New York: Henry Holt.

Jouen, F. & O. Gapenne (1995). Interactions between the vestibular and visual systems in the neonate. In P. Rochat (Ed.), *The self in infancy: Theory and research* (pp. 277–302). Amsterdam: North-Holland/Elsevier Science.

Kagan, J. (1984). *The nature of the child*. New York: Basic Books.

Lewis, M. (1992). *Shame: The exposed self*. New York: The Free Press.

Lewis, M. & J. Brooks-Gunn (1979). *Social cognition and the acquisition self*. New York: Plenum Press.

Loveland, K. A. (1986). Discovering the affordances of a reflecting surface. *Developmental Review, 6*, 1–24.

Mahler, M. S., F. Pine, & A. Bergman (1975). *The psychological birth of the human infant.* New York: Basic Books.

Marlier, L., B. Schaal, & R. Soussignan (1998). Neonatal responsiveness to the odor of amniotic and lacteal fluids: A test of perinatal chemosensory continuity. *Child Development, 64*, 611–623.

Maurer, D. & P. Salapatek (1976). Developmental changes in the scanning of faces by young infants. *Child Development, 47*, 523–527.

Meltzoff, A. N. & M. K. Moore (1977). Imitation of facial and manual gestures by human neonates. *Science*, *198*, 75–78.

Meltzoff, A. N. (1990). Foundations for developing a concept of self: The role of imitation in relating self to other and the value of social mirroring, social modeling, and self practice in infancy. In D. B. M. Cicchetti (Ed.), *The self in transition: Infancy to childhood* (pp. 139–164). The John D. and Catherine T. MacArthur foundation series on mental health and development. Chicago, IL: University of Chicago Press.

Meltzoff, A. N. & M. K. Moore (1995). A theory of the role of imitation in the emergence of self. In P. Rochat (Ed.), *The self in infancy: Theory and research* (pp. 73–94). Amsterdam: North-Holland, Elsevier Publishers.

Meltzoff, A. N. & M. K. Moore (1992). Early imitation within a functional framework: The importance of person identity, movement, and development. *Infant Behavior & Development, 15*, 479–505.

Morton, J. & M. H. Johnson (1991). CONSPEC and CONLERN: A two-process theory of infant face recognition. *Psychological Review*, *98*, 161–181.

Neisser, U. (1991). Two perceptually given aspects of the self and their development. *Developmental Review, 11*, 197–209.

Neisser, U. (1995). Criteria for an ecological self. In P. Rochat (Ed.), *The self in infancy: Theory and research. Advances in psychology, 112* (pp. 17–34). Amsterdam, Netherlands: North-Holland/Elsevier Science Publishers.

Olson, D. & R. Cambell (1993). Constructing representations. In C. Pratt & A. F. Garton (Eds.), *Systems of representation in children: Development and use* (pp. 11–26). New York: Wiley & Sons.

Parker, S. T., R. W. Mitchell, & M. L. Boccia (1994). *Self-awareness in animals and humans.* Cambridge: Cambridge University Press.

Perner, J. (1991). *Understanding the representational mind.* Cambridge, MA: MIT Press.

Piaget, J. (1936). *La naissance de l'intelligence.* Neuchâtel, Paris: Delachaux & Niestlé.

Piaget, J. (1962). *Play, dreams and imitation in childhood.* New York: Norton.

Povinelli, D. J. (1993). Reconstructing the evolution of mind. *American Psychologist*, *48*, 493–509.

Povinelli, D. J. (1995). The unduplicated self. In P. Rochat (Ed.), *The Self in Infancy: Theory and Research* (pp. 161–192). Amsterdam: North-Holland/Elsevier Science.

Povinelli, D. J. (2001). The self: Elevated in consciousness and extended in time. In C. Moore & K. Lemmon (Eds.), *The self in time: Developmental perspectives* (pp. 75–95). Mahaw, NJ: Lawrence Erlbaum Associates.

Prechtl, H. F. R. (Ed.). (1984). *Continuity of neural functions from prenatal to postnatal life.* Oxford: Blackwell Scientific Publications.

Random House Unabridged dictionary, Second Edition (1993). New York: Random House.

Reddy, V. (2000). Coyness in early infancy. *Developmental Science, 3*, 186–192.

Rochat, P. (1995). Early objectification of the self. In P. Rochat (Ed.), *The self in infancy: Theory and Research* (pp. 53–71). Amsterdam: North Holland/Elsevier Science.

Rochat, P. (1997). Early development of the ecological self. In C. Dent-Read & P. Zukow-Goldring (Eds.), *Evolving explanations of development* (pp. 91–122). Washington, DC: American Psychological Association.

Rochat, P. (1992). Self-sitting and reaching in 5–8 month old infants: The impact of posture and its development on early eye-hand coordination. *Journal of Motor Behavior*, *24*, 210–220.

Rochat, P. (2001). *The infant's world*. Cambridge: Harvard University Press.
Rochat, P. & N. Goubet (1995). Development of sitting and reaching in 5–6-month-old infants. *Infant Behavior and Development*, *18*, 53–68.
Rochat, P., N. Goubet, & S. J. Senders (1999). To reach or not to reach? Perception of body effectivities by young infants. *Infant and Child Development, 8*, 129–148.
Rochat, P. & S. J. Hespos (1997). Differential rooting response by neonates: Evidence for an early sense of self. *Early Development & Parenting, 6*(150), 1–8.
Rochat, P. & T. Striano (1999). Emerging self-exploration by 2 month-old infants. *Developmental Science, 2,* 206–218.
Rochat, P., J. Querido, & T. Striano (1999). Emerging sensitivity to the timing and structure of protoconversation in early infancy. *Developmental Psychology*, *35*, 950–957.
Rochat, P. & T. Striano (1999b). Social cognitive development in the first year. In P. Rochat (Ed.), *Early Social Cognition* (pp. 3–34). Mahwah, NJ: Lawrence Erlbaum Associates.
Rochat, P. & T. Striano (2001). Perceived self in infancy. *Infant Behavior and Development*, *23*, 513–530.
Rochat, P. & T. Striano (2002). Who is in the mirror: Self-other discrimination in specular images by 4- and 9-month-old infants. *Child Development, 73*, 35–46.
Rochat, P. (2001b). Social contingency detection and infant development. *65*. 3. *Bulletin of the Menninger Clinic* (pp. 347–361).
Rochat, P. (2003). Five levels of self-awareness as they unfold early in development. *Consciousness and Cognition*, *12*, 717–731.
Stern, D. (1985). *The Interpersonal World of the infant*. New York: Basic Books.
Striano, T., M. Tomasello, & P. Rochat (2001). Object and social support for early symbolic play. *Developmental Science, 4*(4), 442–456.
Tomasello, M. (1999). *The cultural origins of human cognition*. Cambridge, MA: Harvard University Press.
Tomasello, M., T. Striano, & P. Rochat (1999). Do young children use objects as symbols? *British Journal of Developmental Psychology, 17*, 563–584.
Trevarthen, C. (1979). Communication and cooperation in early infancy: A description of primary intersubjectivity. In M. M. Bullowa (Ed.), *Before speech: The beginning of interpersonal communication* (pp. 321–347). New York: Cambridge University Press.
Wolff, P. (1987). *The development of behavioral states and the expression of emotions in early infancy*. Chicago: The University of Chicago Press.
Zazzo, R. (1981). Miroir, images, espaces. In P. Mounoud & A. Vinter (Eds.), *La reconnaissance de son image chez l'enfant et l'animal*. Collection Textes de Base en Psychologie (pp. 77–110). Neuchâtel: Delachaux et Niestlé.