CHAPTER 10

Roots of Typical Consciousness: Implications for Developmental Psychopathology

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Mental illness has to be considered against what supports and might be the roots of typical consciousness: what human consciousness is made of, how it tends to work and develop in the healthy young child. Deviances do exist and are only revealed against what might constitute a typical norm. The etiology, emergence, and evolution of mental ills (main object of developmental psychopathology) do require both a clinical and a normative approach. That is the imperative behind this chapter, attempting to provide some normative look at what appears to constitute typical consciousness in early development.

GENERAL AIM

The tidal wave of infancy data harvested in the past 50 years changed the view of the starting state of typical development, away from strict empiricism (behaviorism) or stage-like, domain general structural constructivism à la Piaget. The discovery of early capacities interpreted as deeply rooted in animal evolution is now part of mainstream theorizing. It is important to remember that such views were demonized for their reductionism only a few decades ago. In recent years, nature did regain some weight in contrast to nurture. The explosion of brain measurement technology contributed to such radical shift in the perennial nature–nurture controversy, a polarized and weight shifting debate. Here, I want to propose a few basic systems and mechanisms accounting for starting state representational development. These systems are supported by a large body of infancy research and tend to be acknowledged by most theorists. General enough, yet falsifiable, these systems and mechanisms cut across and somehow transcend the many theoretical controversies that continue to animate the field of developmental psychology.

First and foremost, I want to describe and discuss a system that allows infants from birth and even in utero, to represent what is of the same, in other words to represent *sameness* of feelings. Sameness detection systems are a necessary pre-condition for the emergence of any forms of consciousness, in other words any forms of awareness of having knowledge about something. Sameness detection is the backbone of the conscious (thinking) mind as William James describes it.

Representations that form the content and format of the conscious mind, is framed here as a dynamic process

of informational transformation that operates at multiple representational levels: analogical sensory representations of what is out there in terms of physical energy (proximal stimulation); more cognitive and conceptual representations capturing what is out there in terms of differentiated objects or entities (distal stimulation); pretend representations of what was there (imagined stimulation); might-be representations of future events (projected stimulation); or could-be representations in terms of conjectures (simulated stimulation).

In the generic sense, representation does capture a transformational process that operates at sensory, perceptual, and conceptual levels. The question is what might be the foundational expression and early development of such process? Ample evidence now suggests that the starting state development of the child is not just sensory and motor, but perceptual and very early on, at least within the first year, also conceptual with a propensity toward essentialism or the default belief that things are made of a set of ontologically deep characteristics (as opposed to surface features). Research shows that from the outset, infants are objective perceivers whose actions are organized around functional goals. They start off from birth being actors and not just complex passive reactors or thermostat-like reflex machines. These action systems have their own motivational components (hunger, comfort, curiosity), tapping into physical and social environmental resources that are indispensible for their survival. This starting state can be viewed as the evolutionary product of prolonged immaturity and hypersocial dependence of human childhood, two uncanny characteristics that are unique to our species.

It is within this general context that we discuss the roots of human consciousness as it typically develops in an attempt to characterize basic prerequisites for its healthy development. The attempt here is to provide some general frame to the perennial reflection in the field of developmental psychopathology regarding what it takes—minimally—to function in an adaptive way and what could go wrong, such as in cases of autism or schizophrenia.

WHAT DOES IT MEAN TO BE CONSCIOUS?

Consciousness comes from the Latin word *conscientia*, meaning "with knowledge" or "knowledge with others" as it was originally meant in ancient Greek philosophy prior to Descartes' ergo sum, his "ego-logy" that announced the modern self-identity of eighteenth-century Enlightenment (Rochat, 2009; Taylor, 1979). In a literal sense, to be without conscious or nonconscious means to exist without knowledge or in the ancient sense, without the potential of sharing knowledge with others (*sine sientia or con-sopio*: literally "stupefied," "benumbed," "put to sleep"). But what does it mean to be minimally conscious and have knowledge, hence not to be benumbed or stupefied?

By definition, consciousness necessarily entails some sensory awareness, some embodied feeling experience corresponding to any affective or emotional experience like pain but also feelings of surprise in the face of the unexpected, comfort in the face of what is expected. In the most generic sense, consciousness would correspond to the process by which sameness among sensations or individuated perceptual events is detected and assembled (synthesized) for further mental processing. Consciousness is the process of meaning creation by linking disparate experiences on the basis of what they share (sameness) and, hence, also necessarily what they don't share (difference). In the most generic sense, consciousness is thus the experience of discrete events (i.e., sensations) that are linked and compared. It is what unifies and gives direction to subjective experience, the primary and necessary root of self-unity and self-agency.

Questions remain as to what are the representations or syntheses that are produced by the typical conscious process? What is the typical content of consciousness early in development? Infancy research has shed new empirical light on the issue and the roots of what might be lacking when psychological development goes astray.

Origins of Feeling Experience

A rich body of neuroanatomical and behavioral evidence points to the fact that implicit feeling awareness—and hence subjective experience—is already present at birth, possibly even in the womb. This is a rather revolutionary idea considering that not so long ago, the idea of feelingless infants (i.e., *infans,* or nonverbal children) was the default assumption.

Until fairly recently, the zeitgeist was to deny infants any form of worthwhile feeling experience (phenomenal awareness). Proof of it is that in the 1940s and 1950s, surgery without anesthesia was routinely performed on infants and young children. Modern surgeons conveniently paralyzed squirming infants injecting Curare or similar paralytic agents. Under such circumstances, adults recalled excruciating pain during surgery; however, patients were not believed, and the practice went on for 20 years. As Dennett (1981) pointed out, "The fact that most of the patients were infants and small children may explain this

credibility gap" (p. 201). Even today, local anesthetics are not routine in painful procedures on newborns such as heel prick and circumcision, even by pediatricians practicing in state-of-the-art maternity hospitals. The zeitgeist continues to be that infants have either no feelings or less feelings or that feeling experience at this early stage might not be as consequential for lack of memory (infantile amnesia; see later section on the topic). Such rationale raises questions when looking at the brain as well as behavior in pre- and postnatal development.

Looking at brain development during the prenatal and postnatal period suggests that the necessary neurological prerequisites for feeling experience might already be in place by *8 weeks* after conception, meaning when the sperm meets the egg! Here is in a nutshell what we know today about the emergence of the brain and neural growth from conception to birth. This emergence is humbling for its pace and complexity, considering that the brain is probably the most complex system in the universe. It reminds us of the great biological forces behind development. It takes only 4 weeks from conception for the neural tube to be formed from layers of cells on the embryonic disc (Hepper, 2002). Only one extra week is needed for the basic five-part structure of the brain (i.e., telecephalon and diencephalon of the forebrain, midbrain, hindbrain, and the spinal cord) to be anatomically differentiated and clearly visible. By 11 weeks of gestation (not 3 months after conception), the medulla, cerebellum, inferior and superior colliculus, and both cerebral hemispheres covering the diencephalon are also clearly visible (Carlson, 1994).

From then on and for a few years, both hemispheres grow in surface areas via folding grooves and convolutions. This growth reflects rapid and exponential connection network among synapses and myelination of axons that provide insulation (fatty white matter) for better transmission of electrochemical nerve impulses. By 2 years of age, the child's brain already weighs 80% of its lifetime maximum (Kretschmann, Kammradt, Krauthausen, Sauer, & Wingert, 1986).

In terms of neural growth, between 10 and 26 weeks gestational age, neurons are produced at a rate of 250,000 a minute, leading to overproduction. Beyond 26 weeks, more than half of the produced nerve cells are selectively pruned and die. The surviving 100 billions will eventually form the adult brain (Oppenheim, 1991). All of this development is indeed humbling. We should always keep it in the back of our mind when thinking about what it means to be present, alive, and having experience in this world.

Regarding connection between cells, an overproduction of synapses also continues beyond birth, with peaking periods that vary across brain regions (Rakic, 1972). Synaptogenesis continuing after birth is not homogeneous and synchronous across brain regions. For example, postmortem data indicate that synaptic density peaks earlier in the auditory cortex (3 months) compared with the middle frontal gyrus (15 months; Huttenlocher & Dabholkar, 1997). This kind of growth asynchrony is reflected, for example, in the sequential development of sense modalities in the womb and beyond (i.e., vision lag).

In short, these facts remind us that brain emergence and the neural (sensory) machinery that necessarily underlies implicit feeling experience are fast, remarkably precise, and predictable in their unfolding. To the naked eye or through the lens of the microscope, it is an explosive and amazingly well-programmed growth. In relation to putative first feeling experience, brain development puts in place within 8 weeks the potential for fetuses to sense the world and hence the necessary prerequisite to eventually feel it: the potential for first minimal, obviously implicit, and very rudimentary feeling experience. Let us not forget, however, that feeling experience rests on the prerequisite of an ability to sense the world, as machine do. In humans, such necessary sensory machinery matures within weeks of conception and long before birth. In its development and within the confine of the maternal womb, fetal research show that it actually recapitulates the emergence order of the main sensory systems in the course of species evolution. The sensory machinery (sense modalities) of fetuses matures in the same sequential order than our ancestral species (Gottlieb, 1971; Lecanuet & Schaal, 1996). Somesthetic sensitivity (skin and body feelings) matures first. This sensitivity corresponds to tactile (skin pressure), vestibular (posture and balance), and pain stimulation (tissue damage). It is followed by the maturation of chemosensory sensitivity that combines olfaction and gustation (i.e., smell and taste), followed by audition (pitch, amplitude, and phrasing of sounds) and finally by vision (light and optic array). From this, we can conclude that the necessary sensory prerequisites of first feeling experience are in place at least by the third semester of gestation. But when can we say that first feeling experiences actually emerge in development? New ways of observing fetuses (three- and four-dimensional sonic echography and image scanning) suggest that already by the last trimester fetuses express emotions such as *happiness* via smiling and *sadness* via frowning of the eye brows and lowering of the corner of the lips in the same way newborns express such mental states at birth and beyond (Hata, Dai, & Marumo, 2010). More intriguing is the fact that nociceptive (pain) receptors appear first in and around the mouth area at

around 7 weeks postconception. They rapidly extend to the palmar surface of the hands by 11 weeks, and the rest of the skin and mucosal surfaces by 20 weeks (Brusseau & Mashour, 2007; Smith, 1996).

In all, this suggests that in trying to find the roots of feeling experience, above and beyond sensing, we should probably look in the womb for its embryonic stage. But what about representation? Does feeling experience entail representational ability? Next, we turn to this question, but first it is necessary to clarify what lies behind the concept of representation and its multiple meanings at various levels of analysis.

What Is Representation?

The term *representation* is widely used across all sciences—from engineering to brain science and cognitive psychology. It is among the most polysemous and mixed-bag concept of all, the meaning of which lies in the eyes and uses of the beholder. Do brain scientists, roboticists, cognitive psychologists, or computer scientists talk about the same thing when using the term representation in their respective fields? It appears that they might refer to one basic process after all—but a process that is happening at incommensurable and irreducible scales, from groups of neurons or electronic chips storing nondescript information to semantic networks forming bodies of knowledge and the creation of meanings about the larger environment. Like philosophers or anthropologists, it is to the latter that developmental psychologists typically refer to when talking about representation.

In the most literal sense, representation means re-presenting or *presenting again*. Etymologically, it thus refers to a transformation from one state of being to another. It is fundamentally a transformative process and its product, for example, the transformation of a physical event (light stimulation in the environment) to a subjective or psychic state that is embodied and stored for further mental processing (sensation of the light hitting the retina).

Representation is thus essentially a process. It is not a thing in itself but a transformation. By analogy, a cloud in the sky is the symptom of an ongoing atmospheric condensation and air mass exchanges, not a thing. Representation (presenting again) captures the transformative process by which information is translated from one system to another, whatever the translation code might be: analog, digital, or symbolic.

Representational process is pervasive in nature, present at all levels of functioning in living organisms: from the transduction of light energy at the cellular level on the retina, giving rise to its sensation; to the mental generation of spatial maps, the emotional expression of mental states; to the macro level of collective habitus or group ways. The process of representation is also present and what characterizes any information processing machines, minus the feeling experience and subjectivity that are exclusive to living and sentient animals like us.

From this perspective, the transformative process of representation exists at all levels of description, from the neurological to the psychological, moral, and societal—each level requiring a different language to account for them. At the low neurological level, the language of mechanical causality applies. The process can be analyzed and accounted for on the basis of highly specific neurochemical factors causing the transduction process underlying any sensory awareness that is the object of psychophysics. Vision neuroscientists can trace precisely the successive representational transformations in the visual cortex leading to higher levels perception and consciousness that is the object of perception theories. From such causal description, neuroscientists capture the necessary transformative, meaning-making process of perception. An example of such representational process at a cellular level is captured by pioneer neuroscientist Donald O. Hebb in his seminal 1949 book on the *Organization of Behavior*: "...A repeated stimulation of specific receptors will lead slowly to the formation of an 'assembly' of association-area cells which can act briefly as a closed system after stimulation has ceased; this prolongs the time during which the structural changes of learning can occur and constitutes the simplest instance of a representative process (image or idea)" (p. 64).

At the psychological, sociocognitive, and interpersonal level, any causal account of representation is much more elusive as they depend on an intricacy of complex interacting factors such as age, individual, and group (cultural) differences. As social scientists, the best we can do is to capture representational patterns. These patterns are documented in the same way natural scientists document varieties of species, eventually coming up with some accounts as to what might be some of the underlying causes of the observed diversity.

At the macro level, the developmental approach has the distinct advantage of allowing for the description of representation not only for what they are at various ages but also for how they systematically unfold in ontogeny. The credo behind the developmental approach is that the constitutive elements of human representational systems are best revealed in their change and as new forms come about in ontogeny. However, for representational systems

to become organized around concepts that unify and give direction to subjective experience, some prerequisites are necessary. It includes—as we will consider in subsequent sections—built-in action attractors and sameness detection systems supporting the basic ability to pay attention and register what remains invariant in the midst of what otherwise would be mental chaos and confusion, meaningless, and maladaptive experience.

Three General Levels of Mental Synthesis

Philosopher Immanuel Kant's (1724–1804) views on the mind continue to be valid and helpful today when dealing with the issue of trying to distinguish levels of representation as a transformative cognitive process. Following Kant (see Brook, 1994), sensory inputs from the world need to be unified to become conscious experiences about something. In other words, for the sense datum to become knowledge about the world, it needs to be synthesized within a temporal and spatial structure at three levels: (1) the transformation of sensory apprehension into intuitions or percepts; (2) the coordination of intuitions or percepts in reproductive imagination (what would correspond to mental simulation in today's neuroscientific jargon); and (3) the recognition of concepts in coordinated intuitions (conceptualization of a priori categories).

Kant proposes that the unity of our conscious experience rests on these three kinds of synthesis, an idea that still prevails in current cognitive sciences. Within the Kantian framework, one can argue that newborns do engage in the synthesizing of sense data, certainly at the first level proposed by Kant and probably also at the second level. The third level seems to be evident only in a few months down the road, possibly before the first birthday as suggested by Jean Mandler (1988, 1992). Mandler and now many other researchers provide numerous empirical evidence that at least by 9–12 months infants manifest object categorization that is based on ontological concepts such as containment, agency, continuity, or nonobvious inferred property like weight, animacy as opposed to inanimacy, self-propulsion as opposed to driven by passive movement, even intentional as opposed to accidental or random actions (see also Wellman & Gelman, 1992, for further detailed discussion). Core knowledge and essentialist interpretations of infant cognition are continuously challenged by researchers within a more empiricist (Humean) tradition that emphasizes perceptual learning over ad hoc representational capacities in the young child (see, e.g., Rakison & Poulin-Dubois, 2001).

However, there is unquestionably a trend toward an ever growing body of research suggesting that in the first year, infants are already engaging in a perceptual analysis expressing the three kinds of syntheses proposed by Kant, presumably the foundation of unity in consciousness. But what about newborns, and what about infants at birth? Do they show signs of unity in their experience? The most probable answer is yes.

EXPERIENTIAL AWARENESS AT BIRTH

Based on empirical facts accumulated over the past 50 years in the booming field of infancy research, we now have more empirical ammunition to speculate about what it might be like to encounter the world by seeing, feeling, or hearing at the origins of life. We better understand not only how newborns experience the world from the perspective of psychophysics (what range of stimulus thresholds infants detect across the various sense modalities) but also what attracts them in their exploration of objects in the environment and what information they appear to pick up, store, and eventually retrieve as newborns and even as fetuses during the last two trimesters of gestation. We know that newborns see colors and use dynamic information, preferring moving rather than static things (Rochat, 2001). We also know that infants are innately attracted to particular configurations like moving faces, regions of high contrast on a visual display, high-pitch sounds, and human voices with particular contours (i.e., motherese). We know why they crave sugar, why they appear to innately savor sweet tastes, and why they show repulsion and strong rejection of bitter tastes.

Topping all of these well-established empirical facts, there is now a vast amount of habituation and other operant conditioning studies with newborns showing that infants from birth are fully attuned to novel as opposed to familiar experiences. Probably one of the greatest and most striking discoveries in developmental psychology over the past few decades is that most of what is demonstrated in newborns is also shown in healthy fetuses during the last trimester of gestation: they habituate, learn, store experiential information, and demonstrate comparable threshold across sensory modalities. Furthermore, what they learn in the womb is readily transferable ex utero. Facts show that few-hours-old newborns prefer to suck in certain ways on a pacifier and to hear the voice of their mother over the voice of a female stranger (De Casper & Fifer, 1980). They orient significantly more, showing preference in smelling a gauze impregnated with the mother's amniotic fluid over the fluid of a stranger that just gave birth (Marlier, Schaal, & Soussignan, 1998a, 1998b).

What can be safely inferred from these now well recognized and numerous facts (see Rochat, 2001) is that not only are newborns sophisticated learners, perceivers and even knowers, but more importantly that they have from the start a very rich affective and emotional life. We are not born affectively "neutral" but on the contrary alive with forces pushing and pulling us around: born with strong desires and untamed affective needs as Freud speculated in a highly controversial book over a century ago (Freud, 1905). This rich and untamed affective life cannot, however, be reduced to an early sensory experience that would be undifferentiated and disorganized. What newborns experience of the world is not a blob of chaotic multimodal sensations befalling onto the senses as "a blooming, buzzing, confusion," confusion taken to mean "chaos" and not the literal sense of con-fusion or *fusion with* that suggests some harmony of experience.

We now know that newborn experience is anything but chaos. Healthy neonates are quick to learn, they attend and respond to specific physical events felt in and out of the body, manifest emotions (in the literal sense of moving out feelings via scream and other clearly readable basic facial expressions that are innate). In all, this experience is not an affectively neutral experience that would be mainly attached to the functioning of automatic reflexes. This is not the case since learning is involved from the start, infants acting rather than responding in a world that has values: comfort, pain, relief, and an intense orientation toward particular affective states linked to satiety, specific odors and tastes, dim lights, contrasted visual contours or high-pitch speech sounds. This experience rests on an embodied semantics of approach and avoidance, dangers and strong attractors or pulls.

Because of learning, newborns' experience is not repetitive but rather cumulative: a present experience is influenced by what happened prior. It can be therefore assumed that if successive experiences might be homologous, they are never absolutely the same. This inference simply means that newborn experience does not rest on the feelings that might accompany automatic reflexes as for example the feeling of something hitting my knee and the proprioceptive sensation of my knee automatically jerking forward. Such machine-like experience does exist in newborns, in the same way it persists in adults with the feeling experience that accompanies nonvolitional responses like a knee jerk or the obligatory chill one feels running down the spine while stepping on what was thought to be a snake but in fact is a piece of dead wood laying around.

However, what it is like to be a neonate cannot be reduced to the sensations that arise from such responses. Infants at birth are more than reflex machines: from the outset they desire. They are fast to learn, showing unmistakable orientation toward specific and meaningful experiences: food, comfort, and an optimum level of stimulation (e.g., not too loud, not too bright, but with a lot of contrast and movement).

What Is it Like to Be a Newborn?

Daniel Stern (1991), in an unusual book titled *Diary of a Baby: What Your Child Sees, Feels, and Experiences*, took on the task to imagine what it is like to be a young child from 6 weeks to 4 years. Stern writes from the perspective of the child and reconstructs what it must feel like to be hungry, to wake up, or to stare at a moving spot of light. Stern infers the world of sensations of a fictive newborn (named Joey), based on what we now know about perception, learning, and affect regulation in infancy. The world of Joey at 6 weeks is for Stern a world of sensations. Although this world is nameless and nonobjectified, not yet explicit or conceptualized, it is a world rich of motion and moving impressions, where pieces of space are contrasted, detached, move, meet, overlap, vanish. It is a world made of rhythms and changes of pace in which the infant detects forces expressed in movements: acceleration, deceleration, shrinking, and looming of forms and shapes that are more or less capturing the attention of the child-like magnets of various forces that wax and wane. The world that Stern describes has phenomenal *qualities*. It is experienced from a particular embodied point of view, the first-person perspective that Stern tries to capture. It is a world of sensations, but a world with a point of experiential origin that is the body, the referential point in space where sensations arise while the infant experiences being awake and alive in the world via multiple sensory channels that are *all open at the same time*, either actively when the infant is on his own or more passively while cared and manipulated by others. This in-unison working of the senses does not however entail chaos but rather a pull toward a primitive harmonious order (of phenomenal awareness) that will become eventually objectified, brought to explicit cognitive coherence and scrutiny (consciousness proper), a phenomenal consciousness that has, in addition, cognitive accessibility. (See the discussion and distinction proposed by philosopher Ned Block [2007]).

Stern's assumption, in his speculation, is that the world of sensations of the newborn is not just undifferentiated or diffuse. It is a world of experiences with distinct qualities and values that are anchored in the body, lived from within and therefore carrying with them a subjective perspective.

Such speculation regarding what it must be like to be a newborn finds support in numerous research studies pointing to a minimal *self-awareness* at birth, therefore evidence that even neonates have subjectivity and the propensity to experience the world from their own embodied perspective.

Among all the existing speculations on what might animate the psychic life of newborns, assuming that there is one prior to language, which was not easily accepted until fairly recently, ideas emerging from Freud's psychoanalytical approach have been the most prolific as well as the most controversial. Freud (1905) was the first to place desire in the instinctive behaviors expressed by newborns, and the first to identify early embodied sensory experience as being the cradle of the person, with its often, debilitating characteristics emerging in development. To introduce the notion of infantile sexuality was a revolutionary act of courage at the time and still is to a large extent.

Freud's pulsion theory of psychosexual development outlined in *Three Essays on the Theory of Sexuality* (Freud, 1905/2000) was a paradigm shift. With it he took on the taboo idea that infants from birth might be driven by erotic desires that quickly extend and transcend survival instincts evolved by the species. In the history of ideas, de facto, Freud offered with his pulsion theory the most comprehensive account of what might drive behavior at birth, aside from conditioning.

Obviously, Freud's theory was not the first published account on the questions of early experience and what it might be like to be an infant, but Freud's account was the most thorough and inquisitive to be proposed on what might constitute the psychoaffective forces driving behavior at birth. This account opened a whole new vista on what might be the constitutive elements of subjective life.

Although Freud's pulsion theory and the theoretical concepts inferred continue to be criticized, it was the first to ground subjective life, from the outset, in the experience of the body as we perceive and act in the world, an embodiment of psychic life, its somatic grounding that is now routinely vindicated by current research in the cognitive and affective neurosciences (see Barsalou, 2008; Damasio, 1995; Gallese, 2007; Gazzaniga, Ivry, et al., 1998, for a review).

The important contribution of Freud's pulsion theory is that it grounds psychic life in the feeling of the body, particularly certain bodily regions (oral, anal, genital) invested successively by the young child in his or her development. At the core of this theory, there is the pleasurable quest for bodily feelings (excitability) and its control (search and suppression): a drive-reduction account that remains a powerful causal account of what might motivate psychic life at the outset. There is also the general, rightful intuition that at birth, the body is the primordial locus of exploration and meaning making.

However, the concepts of *autoeroticism* and primary narcissism expressed by the infant, both at the core of Freud's (1905) pulsion theory, need serious revision in light of recent progress in infancy research. The Freudian idea of a first drive toward autoeroticism and the view that early psychic life is primarily revolving around a basic form of narcissism are now problematic. Autoeroticism as a primary drive reduces early experience of being in the world to some sort of blind, circular, nonobjectified, and autistic quest toward bodily excitation and suppression. We now know that there is much more than blind autoeroticism in the life of newborns.

Starting State Synesthesia

Throughout our lives we try to establish what can be counted on and relied upon to survive and make sense of being alive in this world. This quest is already embodied in the neonate, and that is the built-in focus on what can be expected and trusted in a world that is by definition constantly changing, associated to a subjective experience that is fundamentally dynamic, the stream of consciousness William James writes about.

The question is what mechanisms might jumpstart the sense of sameness expressed by infants at birth? What might drive newborns to focus their attention and learning on what remains the same in the midst of constant changes? Based on recent discoveries in behavioral neurosciences, some basic mechanisms might jumpstart the innate sense of sameness expressed by newborns: in particular what would amount to a starting experiential state of acute *synesthesia*.

Synesthesia corresponds to the spontaneous, implicit metaphorical experience of a sensation or percept in one modality that is simultaneously experienced in another. For example, one might experience the particular timber or pitch of a sound with the vivid experience of a specific color, the experience of time duration corresponding to the obligatory experience of a particular spatial layout or form (Simner et al., 2006). Neuroscientists have now established the embodied (neurobiological) reality of such synesthesic experiences that, according to existing surveys, are part of the life of approximately 5% of all adults (Hubbard, Arman, Ramachandran, & Boynton, 2005; Spector & Maurer, 2009).

What is of interest to us here is the idea proposed and tentatively documented with infancy research by Spector and Maurer (2009)—that adult cases of synesthesia

might in fact be remnant and magnifying cases of intersensory connections that are present at birth, pruned, and somehow inhibited in the course of typical perceptual development. But these connections are expressed in muted forms in *all adults,* as Spector and Maurer put it. Accordingly, synesthesia could be the natural starting state of our subjective sensory experience. We would indeed start off with a conflation of all sensory modalities as suggested by William James (1890) in his statement about blooming, buzzing, confusion. Here is what James had to say:

> The physiological condition of (the) first sensible experience is probably nerve-currents coming in from many peripheral organs at once. .... In a new-born brain, this gives rise to an absolutely pure sensation. But the experience leaves its "unimaginable touch" on the matter of the convolutions, and the next impression which a sense organ transmits, produces a cerebral reaction in which the awakened vestige of the last impression plays its part. Another sort of feeling and a higher grade of cognition are the consequences; and the complication goes on increasing till the end of life, no two successive impressions falling on an identical brain, and no two successive thoughts being exactly the same. (pp. 7–8)

This experiential conflation or pure sensory experience elegantly described by James is possibly the symptom of a major competence and not an incompetence as it has been taken by most infancy researchers over the past 50 years.

Infants are born with the ready-made opportunity to link experiences from the various sense modalities, experiences that co-occur and tend to be qualitatively linked, corresponding to particular feeling tones and profiles.

From the start, intermodal systems might exist that allow these sensory experiences to coalesce into the affective core of subjective experience that ultimately gives it *values*: values in rudimentary polarized terms such as pleasure or displeasure, stress or calm, soothing or enhancing, attunement or disharmony, bonding or estrangement. All these represent affective meanings (good or bad feelings) that are at the core of subjective experience, particularly in early development.

This affective core cannot be simply dissociated from subjective experience, as abstract and rational such experience might be later in development: as for example in the epistemic pleasures and satisfactions in discovering a theorem, in the building of a coherent argument, or in the reaching of an agreement with others.

But what kind of empirical evidence is there that supports the assertion of a rich primitive sensory conflation, a conflation that would harmonize rather than confuse early experience?

In relation to *synesthesia*, there is an abundance of empirical evidence showing that infants from birth are readily able to process information across sensory modalities. One-month-old infants are reported to discriminate an object they see projected on a screen based on the previous experience of an analogous object explored with their mouth only (i.e., a smooth spherical pacifier or a bumpy spherical pacifier with a knobee texture; Meltzoff & Moore, 1979). In another series of highly controlled, careful psychophysical studies on newborns in the early 1980s, Lewkowiz and Turkewitz (1980) demonstrated that neonates transfer learning from the auditory to the visual modality. Following visual habituation to either a bright or a dimmed light, they responded differently to corresponding soft or intense sounds in the auditory domain.

In support of such unitary or common functioning of the senses at the outset, an even older neurobehavioral study by Wolff and collaborators (Wolff, Matsumiya, Abrohms, van Velzer, & Lombroso, 1974) shows that if the tactile stimulation of the newborn's wrist evokes activation of the somatosensory cortex, this activity is significantly enhanced when the infant hears also a white noise. Such auditory-tactile interaction is not found in adults, a phenomenon that appears to be specific to the perceptual experience of newborns.

As additional developmental evidence on an early unitary functioning of the senses, let me mention the work of Neville and collaborators showing that if infants respond to spoken language with, as expected, enhanced activity in the auditory cortex, unlike adults and children, they also respond with enhanced activity in the visual cortex (Neville, 1995).

Finally, in support of the natural primacy of synesthetic experience, Mondloch and Maurer (2004) show in a series of studies that 2–3-year-old children tend to be naturally inclined to perceive the same pitch–lightness, color–letters, or sound–shape correspondences typically expressed by synesthetic adults (but also to some extent by nonsynesthetic adults). Young toddlers tend, for example, to systematically perceive that a higher pitch sound goes with a brighter color; a nonsense word made of rounded vowels goes with a jagged shape (e.g., te-ta-ke goes with a sharp-edged form), or that the letter A goes with the color red).

In all, these few empirical examples taken from the developmental literature on synesthesia, and there are many other, support the idea of a highly organized intermodal and resonating experience at birth. Early perceptual experience is made of rich sensory correspondences and implicit "a-modal" representations that can be said to be

metaphorical because they transcend the particularities of the sense modalities as singular perceptual systems. It is, and this is important, an experience that carries rich conflation and correspondences, not the cognitive confusion that has been assumed by many infancy researchers, including myself, since James's misconstrued blooming, buzzing confusion.

Experiential Vicariousness at Birth

In addition to starting state synesthesia, there is also abundant empirical evidence and even precise animal models substantiating the possibility of an innate capacity for vicariously experiencing self-produced and other-produced action: the experiential (phenomenological) equivalence between the observation and the execution of the same action. As a quick reminder, in the original experiments, Rizzolatti and his team from Parma found that the responses of single nerve cells recorded in area F5 of the premotor frontal cortex of the macaque monkey discharge equally when the monkey itself performs a specific action (e.g., reaching for a peanut) or when the same monkey observes another monkey (or another person) perform the same action (Rizzolati, Fadiga, Gallese, & Fogassi, 1996). These cells are thus multimodal by nature and are activated when a particular action is performed by the individual or seen performed by another.

This discovery has had much resonance as it might provide some biological validation to the idea that there might be a deeply rooted system matching self and others' representations, a mirroring system that could be the constitutive element of higher order phenomena like empathy, language learning, and basic embodied intersubjectivity. Note, however, that these ideas remain highly controversial (see Hickok, 2014). Plausible yet indirect behavioral evidence of mirror systems functional at birth is provided by the numerous research on facial imitation in neonates, the matching reproduction of facial expression, tongue gestures or emotional displays, actions that are seen repetitively being performed by an adult model at close visible range and that are systematically reproduced by the infant (e.g., Meltzoff & Moore, 1977, 1997). Such imitative responses in neonates suggest that typical infants are born with the necessary mechanism that would allow for the experience of an equivalence between the perception and the execution of actions (Lepage & Théoret, 2007). In James's terminology, infants would be born with the opportunity to experience the *sameness* of what is done by the self or what is seen done by somebody else or vice versa. Rather than in a state of cognitive confusion, infants would therefore be able from the start to experience and exploit in future learning, the *analogical link* between the products of two different agents: something self-generated and the same thing generated by others, in the same way that they would be able to experience the analogical link between the varieties of sensory experiences in their incipient *synesthesia*.

It is worth noting that the importance placed here on an innate sense of sameness expressed by neonates is also at the root of analogical reasoning and processing, the mechanism by which novel situations are understood in reference to what is familiar (the same) and that developmental psychologists view as a core mechanism of cognitive development (see Gentner, Holyoak, & Kokinov, 2001). The analog format of early representations that would allow for sameness detection across domains is demonstrated in multiple infancy works documenting the existence of a general system supporting the comparison and determination of relative magnitude in terms of number but also spatial extent, frequency, and duration (see Lourenco & Longo, 2011, for a thorough review of exiting infancy research and lively debate around the issue). Such general magnitude system, presumed to be innate, would cut across numerical, spatial, and temporal domains, therefore entailing some starting state analogical and synesthetic abstraction. As suggested by Walsh (2003, p. 486):

> Given the utility of relational inferences on quantities and the power of a statistical picture of the physical world that would extract co-variance of time, space and quantity, it would perhaps be as maladaptive for the infant brain not to use a common metric as it is difficult for an older child to unbind these three elements when learning mathematics.

CONSTRAINTS ON EARLY EXPERIENCE

In the short history of modern developmental psychology, theoretical controversies have revolved primarily around the relative role of innate biology (i.e., nature expressed in maturational and evolutionary factors) and the relative role of experience and learning factors (i.e., nurture). Progress in infancy research during the last 40 years strongly supports a marked theoretical shift from either strict empiricism (behaviorism) or constructivism à la Piaget (1967/1971) and toward a third solution to the nature–nurture controversy, not unlike the *diathesis–stress* model found in recent theories of developmental psychopathology (see Cummings et al., 2000).

Truthfully, 50 years of infancy research certainly debunk the myth of the tabula rasa and reinforce the major role played by evolved propensities to experience and construe

the world in specific ways, what philosopher Jerry Fodor coined *modularity of mind* in a highly influential book of the early 1980s (Fodor, 1983). However, these propensities change and are transformed in the course of the first weeks, when infants swiftly manifest new fluencies in innate propensities and also develop new capacities that are qualitatively different and more powerful to resolve problems, adapt to new situations, construe what is going to happen next. They also rapidly become better at picking up invariants over change, parsing such invariants to be memorized for further inferences.

Admittedly, when the tabula rasa was debunked (e.g., Pinker, 2002), it created blind spots on the actual process of learning and the mechanisms underlying developmental changes. The particular focus of dissident infancy researchers then was inspired by dynamic system theories and the self-organizing emergences of new forms in physics (Thelen & Smith, 1996) or epigenetic phenomena in the realm of biology by which experience crucially determines the phenotypic expression of genes (Gottlieb, 1971; Oyama, 2000).

In spite of such neglect, the majority of infancy researchers have focused on accounting for innate or precocious competencies in acting, perceiving, and representing objects, people, and the self.

Experiential Versus Conceptual Awareness

Newborns' experience of the world is rich from the start—within the polarity of pleasure and pain, restfulness and agitation, approach and avoidance. Newborns cry and fuss when hungry or tired. They show irrepressible smiles with eyes rolling to the back of their head after a good feed. They feel something, expressing unmistakable pleasure and pains. These expressions have adaptive functions, forming crucial signals for caregivers on whom newborns rely to survive. But how much unity and embodied self-awareness can be ascribed to such emotional, obviously not yet objectified experience of being alive in the world?

To address this question, it is necessary to distinguish two basic forms of being in the world: the *experiential* and the *conceptual*. This is not a new approach, supported and proposed by recent research and theories in cognitive neuroscience, in the footsteps of James proposing a distinction between the I or experiential self and the Me or conceptual (objectified) self. Damasio (1999) emphasized the fundamental difference between core consciousness and extended consciousness about the self and events that are construed over time and emerging with language. Similarly, Edelman and Tononi (2000) called for a distinction between primary- and symbolic- (language- and narrative-) driven consciousness. A large body of research in neuroscience supports the experiential diversity of being aware in the world, including blind-sight, hypnotic dissociation of pain, and other highly relativist (as opposed to real or core) perceptual phenomena (see Gazzaniga, Ivry, & Mangun, 1998). There are different kinds of awareness, not all necessarily requiring re-cognition, language, or the capacity to represent representations as in meta-cognition. It is justified to talk about infra- or prelinguistic awareness. There are indeed markedly different ways of being aware and conscious, as opposed to nonconscious or unconscious (Rochat, 2009).

Newborns are not yet conceptually aware of being themselves alive in the world, obviously. However, they are *experientially* aware. Newborns, when not sleeping, are not merely in a wakeful state of confusion between what they feel and what causes them to feel. If they see a face or are struck by an object, they do not become this face or this object. Although not yet conceptualizing them as objects of reflection, they do not confound them with their own subjective feeling or sensory experience. This can be assumed to the extent that newborns feelings and behaviors cannot be simply reduced to automatic reflex responses, like the mechanical adjustments of a thermostat or any kind of automata.

Infants are born predisposed to act with purpose, oriented toward indispensable resources in the environment, be it food, comfort, or protection. These innate functional action systems are what unify the experiential awareness of newborns. It is also what justifies the ascription of selfhood from the outset of development.

Although babies are born with poor contrast sensitivity and grating acuity (Banks & Shannon, 1993), infancy researchers investigating newborn vision demonstrate that despite the obvious developmental lag of the modality, active perceptual processing does take place at birth. For example—and relevant to our discussion—using habituation and novelty preference paradigms researchers have established that newborn infants, only a few hours old, when awake and alert, perceive the real (distal) size of objects, not the varying (proximal) sizes projected onto the retina. Newborns perceive size constancy of objects (Granrud, 1987), most likely via visuo-proprioceptive convergence cues from both eyes as they line their gazes and focus onto the distal object (Kellman & Aterberry, 2006). In all, this kind of empirical evidence suggests that newborn infants have feeling experience and are not just limited to sensing what is recorded at the proximal level of the receptors (i.e., the retina). Early perceptual competency

of perceiving a world that is distal and objectified in relation to the self forms the necessary core for the perception and control of self-produced action in relation to nonself things in the world.

Functional Propensities of Newborns

Newborns are born actors and not just passive "reactors" to stimulations (any stimulations) as pioneer child psychologists tended to describe the starting state of development: reflex montages or systems following Piaget, pure autoeroticism according to Freud, or random reactions as suggested by James. In addition to automatic reflex responses, that are clearly part of the child's survival kit and innate endowment, newborns also act in certain organized and oriented ways that are not merely automatic in nature. Thumbs are brought to the mouth for sucking, eyes are moved to track objects selectively, and leg movements are organized in coordinated stepping or kicking patterns. Even in the womb, fetuses manifest actions with some invariant patterns and a compression of degrees of freedom that is oriented outward, toward the environment, making movements of the infant and related perceptions more than merely random or disorganized.

In recent years, research based on the ultrasonic observations of fetuses demonstrates the remarkable continuity between prenatal and postnatal behaviors (Prechtl, 1984). Fetuses and newborns show the same rich repertoire of organized patterns of movements that are not simply random, but rather preadapted to tap into vital environmental resources such as food or comfort. These movements are not of a solipsistic and endogenous nature like tics or twitches. Rather, they are outward oriented, coming to closure with particular external consequences (e.g., food or thumb in mouth; skin or eye contact with particular objects in the environment). Such movements are actions, not mere reflexes.

Reflexes and action systems correspond to two radically different control systems and hence to two radically different psychologies. The beating of the heart, the movements of the lungs in breathing, the shaking of the whole body under a cold spell, the knee-jerk response, or the blinking of eyelids in response to an air puff all belong to the first kind of bodily movements. They are autonomic and reflex responses of the organism. The control of such movements is endogenous and self-contained. These movements consist in highly predictable stimulus–response loops. They are in essence automatic, *triggered* by particular stimulations.

Following physiologist Sherrington's (1906) first account of this kind of bodily movements, the control is encapsulated and rigidly prescribed within the organism as reflex arcs. It clearly involves subcortical neural networks as surgically decorticated animals continue to express such movements. The control of such movements can be described as closed feedback systems like thermostats controlling for constant temperature inside a house. Closed control systems are simple when considered in isolation, but they are complex when considered in interaction with each other. Each is calibrated to respond to particular ranges of stimulation from the environment that are internal and external to the body. Each system controlling for a particular autonomic/reflex response is also adapted to interact with myriad other similar systems that, in concert, maintain the integrity of the organism as a whole living and adapting system.

In brief, autonomic and reflex movements are controlled by closed-loop feedback systems that ensure basic physiological functioning. They keep the individual organism alive, but such movements do not involve any perception or any particular higher order treatment of basic physiological signals or sensations. In a way, this kind of bodily movement is sensitive but psychologically blind to its responding environment. The movements are triggered by nonspecified circumstances.

The second kind of innate bodily movement is *action systems*. They are more than autonomic or reflex responses, also expressed from birth and prominent during the first six weeks of life. Such movements are distinct from the first kind on two basic grounds. First, they are movement systems consisting of actions that are oriented toward particular functional goals. These systems are by definition adapted to tap into available resources that exist outside the individual organism, in the surrounding environment: food, surfaces, objects, or people. Second, these movements are organized into systems that are flexible, capable of changing based on previous experiences, and adjusting to novel circumstances. They allow room for learning, controlled by open-loop feedback systems. Although still unintentional, this second kind of movement entails perception and learning, some psychology, and presumably higher order cortical involvement.

Infants at birth show more than autonomic/reflex arcs (Rochat, 2001 for a general review). Sucking, grasping, stepping, rooting, or head turning are too often construed as reflexes or automatic responses triggered by non-specific stimulations. Multiple studies show in fact that such movements need to be construed as actions rather than reflexes, actions that are already oriented toward particular features and resources in the environment: for example, faces or objects with a certain shape, texture, consistency, or smell.

Above and beyond the search for optimum visual stimulation and in particular toward maximum light contrast, immediately after birth newborns track with their eyes objects that move close by in their field of view. More impressive is the fact that they do so preferentially when the objects consist of face-like displays. Research shows that they tend to track more canonical face-like displays (two adjacent dots for eyes above vertically aligned two dots for nose and mouth) compared with noncanonical face-like displays with the same but scrambled features (Morton & Johnson, 1991). Similarly, newborns tend to suck differentially on pacifiers that are more or less mimicking the biological nipple of the mother. They suck less and increase oral exploration as a function of the eccentricity of a pacifier compared with the biological nipple in terms of texture and consistency (Rochat, 1983; Rochat & Senders, 1991). We found the same kind of results when recording newborns' grasping of objects varying in texture and consistency that are placed in one of their palms (Rochat, 1987). Researchers have even established that newborn infants are significantly more inclined to orient their face toward gauze impregnated with their own mother's amniotic fluid or breast milk compared with gauze impregnated with the amniotic fluid or the breast milk of another woman who just gave birth (Marlier et al., 1998a, 1998b).

If newborns orient and root to smells or face-like displays, if they suck and grasp at objects introduced in their mouth or in their hands, they do so with discrimination and preference. This kind of movement is not made of autonomic, reflex responses triggered by nonspecific stimulation. It is under the control of previous experiences (learning) and intrinsically oriented toward particular environmental resources. It calls for some psychology engaging more than subcortical structures. However, such control is not yet intentional proper. It arises in the context of adaptive actions generated by the single individual in relation to physical objects and the physical aspects of people. It does not depend on reciprocal communication and shared experience with others or intersubjectivity.

Built-In Motivational and Attention Systems

Born in a world of values, from the start infants experience the basic affective polarity of approach and avoidance, events that are either qualitatively attractive or repulsive. It is well documented, for example, that from birth infants are attracted to sweet tastes and avoid bitter or sour tastes (Steiner, 1979). This built-in motivational system is linked to automatic positively rewarding or negatively rewarding mechanisms. Reward mechanisms via endogenously triggered opioid (endorphin) pathways are now well supported by numerous animal models (see, e.g., Barr, Paredes, Erikson, & Zukin, 1986; Blass, Fitzgerald, & Kehoe, 1987). In other words, infants are born prepared to be reinforced in certain ways in their learning and channeled in their experience and to be drawn to a particular carving of attractive objects in the environment, including their mother's smell and the taste of maternal amniotic fluid or the colostrum laced with sweetness, a reward needed for newborns to survive (see Marlier et al., 1998a, 1998b).

At a more epistemic level, infants are also born with typical ways of attending the visual world. Visual activity of the newborn is endogenously organized and not simply reflex-like, not just triggered by light stimulations.

In a seminal book, Marshall Haith (1980) systematically documented via an eye tracker the visual behavior of neonates in the dark, looking at a homogeneous ambient light environment, and when presented with various contrasted contours (e.g., solid horizontal, vertical or oblique black and white bars). Haith reveals the "systematic rules that babies look by"—the title of his book. His research shows that infants are oriented toward maximum information in the environment guided or rewarded toward maximum rate of cortical firing, which corresponds to the zeroing the fovea and scanning where there is maximum contrast in the environment. Newborns eyes are attracted by the defining edges of a contour. Once located, these edges are systematically scanned back and forth to generate maximum cortical firing rate. From his series of studies, Haith concludes that newborn function visually according to precise rules driven by specific reward contingencies (maximum cortical firing rate, or high firing rate principle according to Haith). These innate rules constrain infants from the start to carve meaningful perceptual information, hence specific representations about their environment, an interesting alternative to either radical tabula rasa (nurture) or nativist (nature) perspective. As Haith (1980) pointed out:

> Perceptual theorists agree that homogeneous surfaces are uninformative, it is the edges and boundaries of stimuli that carry the important information. One could imagine a sequence in which babies first scan areas of high contour density for their firing potential. Such activity would facilitate neural growth and, as associative areas and memory capabilities develop, these same stimulus regions would provide information for synthesizing objects and placing them in a spatial-temporal perspective. (p. 124)

Built-In Sameness Detection System

If we have learned one thing in recent years from studying babies—and there has been a huge wave of interest in

studying infants in the past 40 years—it is that from birth, and even prior to that based on the numerous evidence of fetal learning (Lecanuet & Schaal, 1996), infants are active in processing invariant information over changes. In their inclination to scrutinize novelty hides a deep look for sameness. They avidly look for regularities in the environment, and this is the name of the game from the outset: we are born and built in a way that what we are primarily preoccupied with is the detection of what remains the same in the midst of constant changes.

Throughout our lives we try to establish what can be counted on and relied upon, building trust and coherence. This quest is already embodied in the neonate, and that is the built-in focus on what can be expected and trusted in a world that is by definition constantly changing, associated to a subjective experience that is fundamentally dynamic.

But prior to developing these ideas, it is important to insist that the focus on *sameness* in the environment, which seems to be the core aspect of infant behavior and development, remains a core aspect of the human mind all through the life span. It might even be thought to be at the root of morality and the conception of justice and equity across human cultures. As James wrote over a century ago: "The mind can always intend, and know when it intends, to think of the Same . . . . This sense of sameness is the very keel and backbone of our thinking" (James, 1890, p. 459).

The past 40 years of booming infancy research did certainly debunk a great deal of strong-held common assumptions: that babies were born cognitively helpless and passive, their behavior disorganized. Prior to this research, it was not uncommon to construe infants as born blind and oblivious of the world surrounding them, a blank slate in need of fundamental growth and learning, often thought to be born in a vegetative state that kept them alive and tentatively able to receive indispensable care and protection from others. These views have certainly changed, but the fact that human children are pretty helpless at birth should not be overlooked, particularly when comparing them to the infants of other species. These ancient views were not that counterintuitive after all.

Compared with other species, humans are indeed born too soon, greatly immature and markedly dependent on others to survive. This is due to the combination of the proportionally larger brains we evolved as a species, together with the narrowing of the female's birth canal associated with bipedal locomotion, a posture uniquely evolved by our species and linked to protracted external gestation, namely, that we are born much sooner compared with other primate species (Montague, 1961; Trevarthan,1987). We start standing and roaming the world on our own by 12 months, and it takes many, many long childhood years to separate from our own original niche and to become autonomous to reproduce this cycle of development with new progenies.

The premature human birth leads to a state of protracted dependence during approximately one-fifth of our life. This remarkable dependence shapes our psychology from the outset. It is a simple, straightforward fact yet is probably the major determinant of what makes us psychologically unique in the animal kingdom.

The new wave of infancy research shows not that infants are born much more mature than previously thought but that infants are born much better equipped to tap into and exploit the prolonged state of dependence in which they are born. As Bruner (1972) wrote years ago, there are "uses of immaturity" (p. 1) by the young child. Numerous research tapping into preferential looking, and sucking, visual familiarization; violation of expectations; and other clever habituation and dishabituation paradigms show that infants from birth and even prior in the confine of the womb are remarkably quick to learn (see Rochat, 2001, for a review).

The most solid and reliable finding is indeed that healthy young infants get easily bored and are particularly inclined to seek novel information. From birth on, infants expect particular outcomes to occur based on past experiences and show a natural inclination to build up on new expectations.

Two-month-olds are attuned to complex probabilistic algorithms or conditional probability that one particular event will be followed by another, for example, in their ability to discriminate among strings of speech sounds they hear successively or the frequency of lights flashing at different locations in the environment (Haith et al., 1997; Saffran et al., 1996).

Infants show all this remarkable learning ability while not having to worry about being fed, getting enough cuddling, or living in wet diapers. Their protests are typically heard, and they are able to explore and encounter the world around them in playful ways. Childhood is, for the most part, a prolonged immaturity that translates into a prolonged, socially secured, and assisted opportunity for a free license to learn and to explore, to fantasize, and to realize these fantasies in the unbridled works of children's imagination. But children's free license to explore and to play is not just free and self-organized; it is also highly constrained by early core representations of objects, self, and others and by innate propensities to imitate and mirror the mental states of those interacting with the self.

Between birth and 2 months, noticeable changes occur, particularly in the social domain. By 6 weeks, infants universally begin to respond to faces with smiles that are not just automatic or linked to feeding or satiety but that are socially elicited, taking place in face-to-face

exchanges and active emotional coregulation. This is what is generally recognized as unmistakable demonstration of primary intersubjectivity or first sign of an infant's active sense of shared experience with others. These face-to-face exchanges are, in the broad sense, aimed at coregulating feelings and at creating mutual affective attunement, a *sameness of feelings* with others in a mutually affective proto-dialog and emotional entrainment that has been extensively documented in the past 30 years.

This mutual affective entrainment is typically geared toward the maintenance and coregulation of a shared happy, often exuberant, state first initiated by the adult but also increasingly initiated by the infant, particularly from approximately 7 months (Rochat, 2001; Striano & Rochat, 1999). Note, however, that such coregulation around a shared state does not require the context of face-to-face exchanges particularly nurtured in Western industrial cultures. It also occurs via different sensory channels when babies are tied to the back of an adult, days in and days out, or being carried on the hips of older siblings.

In the realm of social exchanges and intersubjectivity with a focus on shared feelings, the name of the social game is again about sameness detection. It is about the mutual monitoring of *sameness* in reciprocal affects and emotional expression, including the timing of such expression that specifies mutuality: whether, for example, the mother is more or less responsive to changes in the emotional expression of the infant and vice versa or whether the infant is more or less responsive to the mother (Bigelow & Rochat, 2006).

We now know that by 2 months infants become very much attuned to this relative mutuality of emotional responses, showing reliable negative responses when their expectation is violated, as in the case of the famous still-face situation (Tronick, Als, Adamson, Wise, & Brazelton, 1978). From at least 2 months, infants detect and overtly react to the violation of mutuality expectation; in other words, they react to the fact that others are not responding with *equivalent* emotional responses. What developmental research shows is that possibly from 2 months, and certainly by 7 months, infants create and promote similarities, hence sameness in feelings. They express the active propensity to create equivalent experiences with others.

What is intriguing is that this propensity becomes what is often identified as the central piece of cognitive and symbolic development, in particular language development. This central piece is the emergence by 9 months of *secondary intersubjectivity* with the active sharing of attention in reference to objects in the environment (i.e., joint attention; see Tomasello, 1995). Once again, this important development rests on the new active sense and monitoring by the child of equivalence (thus sameness) in the focus of visual attention between self and others. The name of the game remains essentially the same.

The sense of sameness is the broad concept used here to capture the natural inclination already expressed at birth to bridge experiences and draw analogies between things that are intrinsically distinct, between physical objects, but also between self and others. The sense of sameness not only pertains to linking physical objects, self, and people because they phenomenally look alike or share the same qualities but also to spatial-temporal relations among things and probabilistic co-occurrences of events: that something entering one end of a tunnel typically tends to reappear some time later from the other end; or that if I smile and coo toward someone I expect this person to somehow respond in comparable ways.

As mentioned previously, research demonstrates that these latter aspects (contingency and conditional probability detection) are expressed very early on. They are other expressions of infants' propensity to sense a link between things as belonging to a same set, a same chunk, or category of experiences.

It appears to be all part of the embodied propensity to sense sameness or equivalence (i.e., same value, same meaning). It is part of the analogous sense that is at the origins of concepts, symbols, and other representational signs that *stand* for something that exists in the world as separate entities: my own reflection in the mirror that I recognize and identify as the same as my embodied self. What is peculiar in human development, however, is that from around 2 years of age typical children start explicitly to recognize and identify themselves not just in mirrors but also through the evaluative eyes of others. They become *self-conscious*, what can be viewed as one of the major trademarks of our species around which developmental psychopathologies could revolve and be triggered (Rochat, 2009, 2014). But what might be the experiential (phenomenal) and representational (cognitive) origins of such development? As a preliminary discussion, we want to posit what is meant by representation, which we framed earlier as content and format of consciousness. It is a concept that can have multiple meanings across domains, including physics, engineering, neurobiology to psychology, and the cognitive sciences.

Core Knowledge and Conceptual Primitives

If from birth infants are motivated objective perceivers and actors, questions remain as to what they might construe

and represent about the world at a more conceptual level. Beyond mere sensory awareness, we now know that neonates are perceptually engaged as they feed, orient, control their posture, reach toward things, and explore objects and events, including their own body and how it affects the world. But what might they abstract and eventually memorize of what they sense and perceive of the world?

By 6 months, an abundant literature demonstrate that the typically developing infant has highly specific expectations about the world, in particular what pertains to the self, physical objects, and people (see Rochat, 2001). If those expectations are learned from experience, they are learned very fast, so fast that such learning has to be channeled by what could amount to core knowledge or some of conceptual primitives that are the evolutionary product of natural selection. Such cognitive primitives would strongly scaffold early experience, and there is now an abundance of empirical evidence pointing to such innate conceptual constraints, although the nature of such constraints remains highly controversial and source of various theories that continue to animate the field of infancy research (Carey & Gelman, 1991; Haith, 1998; Wellman & Gelman, 1992).

In relation to physical objects, numerous studies demonstrate that from at least 5 months of age, and sometime even earlier, infants construe objects as persisting in their existence when disappearing from sight (Clifton, Rochat, Litovsky, & Perris, 1991), expecting midsize objects to be substantial (i.e., to occupy space, to be spatially continuous, subject to gravity, and not existing at two different places at the same time— Baillargeon, 2004; Kellman, Spelke & Short, 1986; Spelke, Breinlinger, Macomber, & Jacobson, 1992). Infants detect who is agent and patient of an event action, inferring causality above and beyond mere associative learning (Leslie, 1982), even when the protagonists act at a distance, as in the case of chase scene between predator and prey (Rochat et al., 2004). In the first year, infants are already construing the goals and intentions of others who are acting on objects (Woodward, 2009), and by the middle of the second year they appear to anticipate the actions of others holding false beliefs about where things are in the environment (Onishi & Baillargeon, 2005). False belief understanding, hence theories of mind, typically reported as emerging across cultures between the age of 3 and 5 years (Callaghan et al., 2005), would actually project much deeper roots at an implicit level and in the context of nonverbal tasks.

The new wave of cognitive science in infancy has now established that within a few months and certainly prior to the emergence of syntactic, symbolic-based language, infants infer and hence represent a great deal of nonobvious aspects of the world. The products of such inference are what infancy researchers present and discuss as core knowledge (Kinzler & Spelke, 2007) or conceptual primitives (Carey, 2010; Mandler, 2004), infants inclined from the outset to make sense of reality with the default assumption that the world is made of entities that have hidden essence corresponding to defining (essential) ontological or constitutive characters (Gelman, 2003; Gelman & Bloom, 2000). Theoretically, what comes out of this new cognitive science of the budding child is that we might have evolved, as a species, the unique propensity to see and construe of the world in essentialist terms, constrained and guided from at least 2 months of age by what would amount to innate core knowledge or representations in the physical as well as the social domains, including the self. Traces of essentialism and core representation are now documented in infants as young as 5–6 months of age who appear to discriminate and prefer animated puppets or abstract protagonists wearing googly eyes that behave prosocially (e.g., help) rather than antisocially (e.g., hinder) (Hamlin et al., 2007). Six-month-old infants show surprise when an animated large cube backs out and shows deference to a smaller triangle, both wearing animal-like googly eyes (Thomson et al., 2011). They appear to infer social hierarchy and norms in terms of relative physical power. Same-age infants are even shown to recognize essential characteristics of social group formation by inferring that in-group members are supposed to act in similar ways (Powell & Spelke, 2013).

In relation to affectivity, recent findings uphold Bowlby's original idea that by the end of the first year and with the emergence of various forms of attachment to the primary caretaker, infants construct a representational, hence implicitly conceptual working model of their social and affective environment. One-year-olds who are either securely or insecurely attached to their mother based on the Ainsworth Stranger Situation manifest opposite expectations when viewing an animation movie with a large oval figure representing the mother was either helping or ignoring a smaller oval figure representing a baby. Securely attached infants looked longer and hence presumably are more surprised when the mother ignored the baby as insecurely attached infants showed the reverse: more surprise when the mother helped and nurture the baby (Johnson, Dweck, & Chen, 2007).

Revisiting Infantile Amnesia

First coined by Freud, the phenomenon of infantile amnesia invites to speculate that there might be a radically different mental organization at birth, or even *none*

whatsoever, newborns simply driven by unrepressed and chaotic pleasure orientation. It does indeed leave open the possibility of a different and incomparable experience to what older children and we as adults experience and represent of the world.

The memory black hole of the first months outside of the womb and in the world has naturally enticed philosophers to think of a primary representational incompetence, the incompetence of infants to create memories, even memories stored for later retrieval. This absence of conscious recollection from our life prior to the third birthday is universal. It is pervasive despite the claims of highly speculative therapies and other rather unscrupulous psychoanalysts reconstructing from patient hearsay what young infants might feel and what might be meaningful events for them.

If we consider infantile amnesia as the symptom of an original incompetence, their inability to store and represent sensory information, it is also presumably the symptom of an original incapacity to synthesize sensory impressions into the concepts that give the mind its conscious unity. Children, prior to 2–3 years of age, would be incapable of giving sensory experience its unified mindfulness. Translated in Kantian terms, infantile amnesia would be symptomatic of mental blindness. Babies' intuitions of the world and of their own body arising from sensory experience would be blind, not yet transcended into concepts and representations, not yet synthesized into bodies of knowledge that can be consciously retrieved. Historically, this is also what the founders of modern psychology assumed. Wilhelm Wundt, who established the first experimental psychology laboratory in Leipzig in the late nineteenth century, considered that infants could not help in the scientific understanding and conceptualizing of the adult mind. He writes in his *Outline of Psychology* (1897): "The results of experiments which have been tried on very young children must be regarded as purely chance results, wholly untrustworthy on account of the great number of sources of error. For this reason, it is an error to hold, as is sometimes held, that the mental life of adults can never be fully understood except through the analysis of the child's mind" (translated into English in 1907; cited in Kessen, 1965).

Progress in neuroscience might also have reinforced this intuition as we now have ample evidence that the brain of the young child continues to develop in marked ways during the first two to three years of life, particularly in the prefrontal regions of the neocortex, which are involved in the higher order synthesis of neural information as in advanced executive function, inhibition in problem solving, and intentional actions (e.g., Zelazo, 2004). Furthermore—and this is what delimits infancy from childhood—by the second year children become symbolic, increasingly proficient with language, and beginning to manifest an unambiguous conceptual sense of who they are (Bates, 1990). Their vocabulary becomes full of personal pronouns and adjectives like *I, me,* and *mine*. All these mental changes occur by the second to third year of life and correlate also to what is typically reported as our earliest, reliable memories.

From this point on, the veil of amnesia appears to be lifted. Memories are stored to become potentially retrievable and communicable in narrative forms (Dennett, 1992; Nelson & Fivush, 2004). From then on only, it would therefore be legitimate to postulate that the child possesses a mind that is explicitly conceptual, showing unity in the Kantian sense. This unity also implies a conceptual sense of who the child is as an entity among other entities, a person among other persons in the world. From the time they speak, children identify (recognize) themselves in mirrors and show embarrassment. They start to show off, begin to lie if necessary, and to engage in pretense. Arguably, the child's experience rises to mindfulness proper. It is unified over time and space. Representations of representations are synthesized and organized into abstract concepts that can be mentally manipulated at will to generate new truths and true previsions about future states of the world.

In short, historically, there has been a natural inclination, albeit with good reason, for many thinkers of the mind to believe that there might be a lack of representational unity at birth. The lack of unity would persist until children develop the ability to synthesize representations of the world that are memorable and organized along the continuum of time and space. If a concept of self is an a priori condition of unity in consciousness—as was suggested by Kant—it would be erroneous to speak of any notion of self prior to language, prior to the explicit ability to remember, conceptualize, and recognize the world symbolically, in particular within symbolic conventions. This, of course, would extend to any other non-symbolic animals, that do not possess language, namely creatures that are not capable of representing representations, not capable of organizing thoughts around a priori truths and within a continuous timeline that gives hindsight to the direct sensory experience of the world.

There are marked qualitative shifts in how and what the mind processes between birth and the onset of language, particularly when the child starts to remember an increasing number of past events in the explicit narrative formats of autobiographical memories (Nelson & Fivush, 2004). However, much research shows now that the phenomenon

of infantile amnesia is not due to a lack of unity or sense of self, as alluded to by the founders of modern psychology. In fact, infantile amnesia is becoming increasingly a misnomer given the flow of empirical evidence that demonstrates long-term procedural memory in infants of only a few months, infants who presumably should be deep into our memory black hole period (e.g., Bauer, 1996; Meltzoff, 1995; Rovee-Collier & Hayne, 2000). In addition, numerous studies show that the timing of first explicit memories (typically between 2 and 4 years) can vary greatly among individuals depending on memory content, gender, family structure, and culture (Nelson & Fivush, 2004).

It thus appears that children develop autobiographical memory progressively, incrementally, and parallel with language development. It does not emerge abruptly as if children were overcoming the obstacle of a generalized amnesia, hence a disorganized mind incapable of having organized representations of representation, not functioning rationally on the basis of a priori concepts, only finding unity and selfhood by their third birthday.

ROOTS OF INTERSUBJECTIVITY

By the second month, there is a behavioral revolution. Typical infants open up to the world in unmistakable ways. When not sleeping or crying, they spend markedly more time in a wakeful state, actively and spontaneously tracking and exploring objects, particularly faces in the environment (Wolff, 1987). When attending to faces, they begin to spend significantly more time exploring internal features, namely, eyes and mouth, compared with outside features such as forehead contours and hairline, which are preferentially attended to by infants less than 1 month of age (Haith, Bergman, & Moore, 1977). More significant is the fact that by 6 weeks of age, in a face-to-face situation infants begin to manifest smiling. Such smiling expression is elicited by the social engagement of others as they typically try to create a shared positive emotional experience with the infant.

From this point on, infants enter the give and take of interpersonal conversation—a privileged context in which they can differentiate their first-person perspective from the third-person perspective of the social partner with whom they converse. They develop a sense of shared experience or primary intersubjectivity, which in face-to-face exchanges is a first form of triadic exchanges that is turned toward the self of the infant, the infant being the prime topic of the communicative exchanges with the adult. From 2 months on and until approximately 9 months, the main topic of communication is the infant himself and not yet the objects that surround the infant and the adult (secondary intersubjectivity; see Tomasello, 1995; Trevarthen, 1979).

Sociality and Reciprocity in Typical Development

The sense of reciprocity is expressed very early in the life of the healthy child. By two months, infants start to engage in face-to-face proto-conversations, first manifesting signs of socially elicited smiles toward others (Rochat, 2001; Sroufe, 1996; Wolff, 1987). Such emotional coregulation and affective attunement are more than the mirroring process underlying neonatal imitation and emotional contagion evident immediately after birth (Meltzoff & Moore, 1977; Sagi & Hoffman, 1976; Simner, 1971). From this point on, infants express a new sense of shared experience with others in the context of interactive, typically face-to-face plays, what Trevarthen (1979) first labeled as *primary intersubjectivity*.

When infants start to engage in proto-conversation, they are quick to pick up cues regarding what to be expected next from the social partner. In general they are quick to expect that following an emotional bid on their part, be it via a smile, a gaze, or a frown, the other will respond in return. Interestingly, adult caretakers in their response are typically inclined to reproduce, even exaggerate the bid of the child. If the child smiles or frowns, we are inclined to smile or frown back at her with amplification and additional sound effects. There is some kind of irrepressible affective mirroring on the part of the adult (Gergely & Watson, 1999).

The complex mirror game underlying social cognition does manifest itself from approximately 2 months of age and from then on, infants develop expectations and representations as to what should happen next in this context. The still-face experimental paradigm that has been extensively used by infancy researchers for over 30 years provides good support for this assertion (see the original study by Tronick et al., 1978). Infants are disturbed when the interactive partner suddenly freezes while staring at them (Rochat & Striano, 1999). They manifest unmistakable negative affects, frowning, suppressing bouts of smiling, looking away, and sometimes even starting to cry. In general, they become avoidant of the other person, presumably expecting them to behave in a different, more attuned way toward them.

This reliable phenomenon is not just due to the sudden stillness of the adult, as the infant's degree of negative responses varies depending on the kind of facial expression (i.e., happy, neutral, or fearful) adopted by the adult while suddenly still (Rochat, Striano, & Blatt, 2002). Also, it appears that beyond 7 months old, infants become

increasingly active rather than avoidant and unhappy, showing initiative in trying to reengage the still-face adult. Typically, they touch her, tap her, or clap hands to bring the still-face adult back into the play, with an intense gaze toward her (Striano & Rochat, 1999).

Numerous studies based on this still-face paradigm and studies using the double video paradigm, in which the infants interact with their mother, whom they see on a TV, either live or in replay (Murray & Trevarthen, 1985; Nadel, Carchon, Kervella, Marcelli, & Réserbat-Plantey, 1999; Rochat, Neisser, & Marian, 1998), all show that early on infants develop social expectations as to what should happen next or what should happen while interacting with others. The difficult question is what do these expectations actually mean psychologically for the child? What does it mean for 2-month-olds to understand that if they smile toward an individual this individual should "normally" smile back at them? What does it mean that they pick up the fact that amplified and synchronized mirroring from the adult is an invitation for more bouts of interaction?

One could interpret these expectations as basic, possibly subpersonal, and automatic. Accordingly, face-to-face interactions are information-rich events for which infants are innately wired to pick up information, attuned and prepared from birth to attend to and eventually recognize familiar voices and faces (e.g., De Casper & Fifer, 1980; Morton & Johnson, 1991). From birth, infants would be attuned to perceptual regularities and perceptual consequences of their own actions, wired to prefer faces, human voices, and contingent events as opposed to any other objects, any other noises, or any other random events. Accordingly, this would be enough for young infants to build social expectations and manifest apparent eagerness to be socially connected as shown by studies using the still-face experimental paradigm or the double video system. But there is more than what meets the eyes of an engineering look at the phenomenon (Rochat, 2009). It is more than just mechanical and requires another, richer look to capture its full psychological meaning.

This proposal is based on evidence of major developmental changes in the ways that children appear to connect with others and reciprocate. Infants rapidly go beyond mirroring and imitation to reciprocate with others in increasingly complex ways, adding the explicit social negotiation of *values* to the process. This development corresponds to the unfolding of primary and secondary (i.e., triadic exchanges of the infant with people in reference to objects in the environment by 7–9 months), and also a *tertiary* level of intersubjectivity from at least 3 years of age. Table 10.1 summarizes the road map of various levels of intersubjectivity unfolding in typical development between birth and approximately 4 years of age.

Each transition represents a major extension. The extension from primary to secondary intersubjectivity is well accounted for in the literature (Bruner, 1983; Trevarthen, 1979; Trevarthen & Hubley, 1978; Tomasello, 1995; see Table 10.1). At the tertiary level of intersubjectivity, objects and situations in the environment are not just jointly attended to (secondary intersubjectivity) but also become *jointly evaluated* via negotiation, until eventually some kind of a mutual agreement is reached, also a crucial progress in the development of sociality and morality as we will see next.

Products of Emerging Reciprocation

When infants begin to open up to their social environment by reciprocating via smiling and cooing toward others interacting with them, and because of the obligatory propensity of others to mimic or *reproduce* with marked exaggeration what infants express (i.e., affective mirroring; Gergely & Watson, 1999), infants have the

TABLE 10.1 Levels of Intersubjectivity Unfolding in Typical Development

	Type	Context	Behavioral index	Process	Age
I	Mirroring	Face-to-face engagement	Imitation	Automatic simulation	Birth
II	Primary intersubjectivity	Reciprocal dyadic exchanges	Proto-conversation, social expectations	Emotional coregulation	2 months
III	Secondary intersubjectivity	Triadic exchanges about things	Joint attention; social referencing	Intentional communication and intentional coexperience	9 months
IV	Tertiary intersubjectivity	Triadic exchanges about the value of things	Self-recognition and embarrassment, use of possessives, claim of ownership, prosocial behaviors	Projection and identification of self onto others	20 months
V	Ethical stance	Decision regarding the value of things, what is right vs. wrong	Claim of ownership, sharing, distributive justice, theories of mind	Value negotiation with others, narration, meta-representation of reputation	From 4 years

Source: This table is based on the table included in Rochat & Passos-Ferreira, 2008.

unique opportunity to *objectify* themselves in relation to others. Face-to-face exchanges, turn taking, and the proto-conversations dominated by affective mirroring allow for self-objectification and the objectification of first vs. third person perspective. All this forms a privileged context in which infants can learn to distinguish their own and others' perspectives on the self, the basic prerequisite of intentional and referential communication. This context is the template for the intentionality expressed in relation to physical objects, intentionality that starts to be manifested by infants by the time they begin to smile in the context of reciprocal social exchanges (Rochat & Striano, 1999).

Infants might learn also to objectify themselves in the exploration of their own dynamic traces in objects they acted upon: a mobile they kicked or a ball they pushed (Piaget, 1952; Rochat, 1995, 2002; Watson, 1995). The effect of self-generated actions on the object does indeed reflect the dynamic and the amount of energy produced by the infant who can pause and contemplate traces of himself in such effects. However, in this context, the differentiation between the first- and third-person (object) perspective is possible only on a trial-and-error basis. Interactions with physical objects do not carry the bidirectionality of attention, the mutuality and tutoring guidance that a reciprocating adult typically offers to the child. Reciprocal exchanges are intrinsically referential in relation to each of the protagonists (infant and adult). They specify on-line, in a unique way, the alternating perspectives of each protagonist because of the give and take, reciprocal, and coconstructed format of conversational exchanges.

The learning of a differentiation between the first- and third-person perspective is facilitated by reciprocal exchanges. Infants can eventually generalize what they learn in interaction with others to their interaction with physical objects, rather than the reverse. It is reasonable to postulate the precedence of one format of exchange (social interaction) over the other (action on physical objects) to explain the emergence of intentionality in development, assuming of course that we do not postulate innate module for such stance.

Social partners (e.g., caretakers) work hard from the outset to reveal themselves intentional in communication and are quickly perceived as such by the infants. Children will eventually also perceive others as intentional *outside* of face-to-face communicative contexts, when observing them interacting and acting on physical objects. The generalization of an understanding of others as intentional with both objects and other people aside from the self opens up new, crucial opportunities for observational and imitative learning. These are often identified as basic mechanisms of cultural transmission that are considered, by some, to be unique to our species (Tomasello, 1999; Tomasello, Kruger, & Ratner, 1993).

Developing Self- and Social Awareness

For decades now, the mirror mark test has been used as an acid test of conceptualized self-awareness from both a developmental and comparative perspective (Amsterdam, 1968, 1972; Gallup, 1970). Self-directed behaviors toward a mark surreptitiously put on the face and discovered in the mirror would attest of self-concept, in other words an objectified sense of the self (but see also Mitchell, 1993; Rochat & Zahavi, 2011 for alternative views on the mirror mark test). What the individual sees in the mirror is Me, not another person, a feat that is not unique to humans since chimpanzees, orangutans, dolphins (Parker, Mitchell, & Boccia, 1995), and now magpies as well as elephants are also reported to pass the test (Plotnick & DeWaal, 2006; Prior, Schwarz, & Güntürkün, 2008).

The majority of children pass the mirror mark test by 21 months (Bertenthal & Fisher, 1978), although it depends on culture (Broesch, Callaghan, Henrich, & Rochat, 2011). But beyond the mirror mark test and what its passing might actually mean in terms of emerging self-concept, there is an early and universal reaction to mirrors that, in my view, is most revealing of human psychology. This reaction is the typical expression of an apparent uneasiness and social discomfort associated with mirror self-experience. The same is true for seeing photographs of one's self, or hearing the recording of one's own voice. Across cultures, mirror self-experience is *uncanny*, an expression of deep puzzlement. This is evident even by adults growing up with no mirrors and who manifest terror when confronted for the first time with their own specular image (see Carpenter, 1976). Looking at the self in a mirror puts people, young and old, in some sort of arrested attention and puzzlement. Mirror self-experience is indeed an uncanny experience (Rochat & Zahavi, 2011).

In general, aside from the landmark passing by a majority of children of the mirror mark test from around the second birthday, mirror self-experience develops to become incrementally troubling and unsettling for the healthy child. Such development is not observed by young autistic children, impaired in their reading of others' mind (Baron-Cohen, 1995), but passing the mirror mark test (Neuman & Hill, 1978). They will remove the mark from their faces when they perceive it but do not show the signs of coyness and embarrassment so typical of nonautistic children (Hobson 2002, p. 89). It appears that for autistic

children there is a different meaning attached to the mark they discover on their faces that they eventually touch and remove. This meaning would not entail the same kind of self-evaluation or self-critical stance in reference to the evaluative gaze of others expressed in typical children via self-conscious emotions. Autistic children's passing of the mirror test is not self-conscious proper and does not appear to entail any sense of reputation as defined earlier.

In her pioneer research on children's reactions to mirror and establishing (in parallel with Gallup, 1970) the mirror mark test, Amsterdam (1968, 1972) describes four main developmental periods unfolding between 3 and 24 months. In the *first period* of mainly sociable behaviors toward the specular image, infants between 3 and 12 months tend to treat their own image as a playmate. A *second period* is accounted for by the end of the first year, in which infants appear to show enhanced curiosity regarding the nature of the specular image, touching the mirror or looking behind it. By 13 months a *third period* begins, during which infants show marked increase in *withdrawal behaviors* by crying, hiding from, or avoiding looking at the mirror. Finally, Amsterdam accounts for a *fourth period* starting at around 14 months but peaking by 20 months when the majority of tested children demonstrate embarrassment and coy glances toward the specular image as well as clowning. These changes index the self-reflective and ultimately the unique self-conscious psychology unfolding in human ontogeny. Such psychology is the product of a complex interplay of cognitive and affective progress that take place during this early period of child development (Amsterdam & Lewitt, 1980), something that Charles Darwin inferred observing his own child long before the recent wave of experimental works around the mirror mark test.

In his book on the expression of the emotions in man and animals, Darwin (1872/1965) was struck by the unique and selective human crimsoning of the face, a region of the body that is most conspicuous to others: "Blushing is the most peculiar and the most human of all expressions" (p. 309).

Observing blushing in his son from approximately 3 years of age and not prior, Darwin highlighted the mental states that seem to induce human blushing:

> It is not the simple act of reflecting on our own appearance, but the thinking what others think of us, which excites a blush. In absolute solitude the most sensitive person would be quite indifferent about his appearance. We feel blame or disapprobation more acutely than approbation; and consequently depreciatory remarks or ridicule, whether of our appearance or conduct, causes us to blush much more readily than does praise. (p. 325)

These observations capture something fundamental and distinctive about humans, a unique motivation behind their social cognition: the exacerbated quest for approbation and affiliation with others, the unmatched fear of being rejected by others (see Rochat, 2009).

The expression of embarrassment in front of mirrors by 2 to 3 years is associated with the child's growing metacognitive abilities, in particular the child's growing ability to hold multiple representations and perspectives on the same thing, including the self. The recognition of self in the mirror is also for the child the recognition of how the self is publicly perceived.

From the point of view of neurophysiology, there is an apparent link between the emergence of metacognitive abilities around 2–3 years and the documented orderly maturation of the rostrolateral region of the prefrontal cortex. The growth of this prefrontal cortical region would correlate with the development of new levels of consciousness, in particular the transition from minimal to metacognitive levels of self-consciousness (Bunge & Zelazo, 2006; Zelazo, Gao, & Todd, 2007).

Elsewhere (Rochat, 2009), I interpreted the negative affective connotation of mirror self-experience (e.g., embarrassment and self-conscious emotions as opposed to positive jubilation) as expression of a universal tendency to hold an overestimated representation about the self that is at odds with what is actually seen by others, the latter truly revealed in the mirror. First-person (private) perspective on the self is generally overestimated compared with third-person (public) perspective. This interpretation is supported by the well-documented illusory superiority phenomenon found in adults (Ames & Kammrath, 2004; Beer & Hughes, 2010; Hoorens, 1993).

Arguably, such overestimation would bring about the experience of a generalized gap between private (first-person) and public (third-person) self-representations, a gap that is the source of basic psychic tension and anxiety, the expression of a generalized social phobia, and universal syndrome expressed from 2–3 years of age (Rochat, 2009).

An alternative interpretation would be that young children shy away from their reflection 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, hence to be avoided. 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, Moss, & Fadil, 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 (the looking-glass self first proposed by Cooley, 1902). They begin to have others in mind, existing through in addition to with others.

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

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 are fantasies and phantasms involved, the stuff that feeds the self-conscious mind and characterizes a metacognitive level of self-awareness (i.e., the construal and projection of what others might see and evaluate of us).

Social Dependence and Human Symbolic Psychology

For centuries the question of the origins and development of consciousness intrigued philosophers, moralists, educators, biologists, and more recently psychologists and neuroscientists: from Augustine, Rabelais, Rousseau, and Darwin to Freud and Piaget. All speculated how the experience of being in the world comes into place and is shaped in the early days of psychic life, from the moment infants come out from the obligatory, in appearance lethargic and silent 9 months gestation in the womb. Over 16 centuries ago, for example, in what is often considered the first self-narrative in the history of Western thought, Augustine in his *Confessions* expressed the idea that the origins of what one knows about the self is primarily social. Self-knowledge would be learned from others, particularly women because of the primal maternal bond:

> I give thanks to you, lord of heaven and earth .... For you have granted to man that he should come to self-knowledge through the knowledge of others, and that he should believe many things about himself on the authority of the womenfolk. Now, clearly, I had life and being; and, as my infancy closed, I was already learning signs by which my feelings could be communicated to others. (Augustine, 398 AD/2007. Confessions, 1.6.10.).

Augustine's intuition that we first learn about ourselves through contact with *the womenfolk* reflects a basic fact to which any speculation on early subjective experience should indeed refer to: that infants rely on others to live and survive. Necessary submission to the cares of others, the mother in particular, is the point of psychic origin. If neonates do their share to survive—breathing, eating, as well as orienting, approaching and avoiding—they are nonetheless born is a profound state of helplessness and dependence. This is the bottom line, particularly pronounced in the human infant who is born too soon after nine months of slow gestation (Rochat, 2001).

As already mentioned, the human birth creates a unique ecology of behavioral growth compared with other animal species, an ecology of protracted *exterogestation*, hence a particularly long and marked dependence due to immaturity (Bruner, 1972; Montagu, 1961). It is an ecology that has been constrained, among other contingent and cascading factors, by the evolution of bipedal locomotion. After nine months in the womb, the head circumference of the normally developing fetus becomes dangerously large for the mother and for itself.

Disproportionately big compared with other primate species, it also reaches a growth limit in relation to the birth canal of humans that evolved to be narrower with changes in pelvic bone configuration, reflecting itself the bipedal locomotion evolved by the *Homo* genus (Gould, 1977; Montagu, 1961; Trevarthan, 1987).

Human protracted exterogestation creates a unique case of altriciality in the animal kingdom, an unusual need for care from others and an exacerbated dependence on others to survive beyond the third year (when most children of all cultures today expand the circle of close caretakers to socialize on their own with peers in the more formal circle of school).

This state of protracted dependence is the specific context in which human consciousness and the human psyche take roots in their development. That is the original bath that we need to consider if we want to figure what it is like to be a newborn: it is first and foremost the experience of relying on generous caregivers, themselves conscious and reflective, willing to give freely and abundantly attention and care. It defines human experience at the outset. Attachment and dependence are evident in other animals. However, what is unique compared with any other mammalian species, is that human dependence is (1) protracted and (2) engages explicitly conscious (as opposed to just minimally conscious) others that have beliefs and communicate symbolically with one another.

In this primary context, how might it feel to be a newborn? What kind of sensuous experience might arise is such a great state of immaturity and dependence?

In *The Family Idiot*, Sartre's (1971/1981) biography of nineteenth-century writer Gustave Flaubert, he ponders this question at length and in remarkable depth. In the first part of this long essay ("The Constitution"), Sartre describes in detail the initial experiential state of total abandon to the cares of others. Sartre speculates that it is in this early submission to specific maternal gestures, attitudes and attention that one can find the roots of Flaubert's apparent passivity as a child and subjective disconnection as an adult, possibly also the source of his genius as inventor of the modern novel: "Gustave as a child, is not *made* to act; what he feels is dizzying submission to this constitutive nature experienced within him as the product of *others*" (p. 48; author's translation from French). He goes on a few pages later:

> The newborn, molded everyday by dispensed cares, internalizes the maternal activity of his own passive "being there", in other words the infant internalizes the maternal care activity as the passivity that conditions all the pulsions, and all the internal rhythms of desires, speeds, accumulated storms, schemas that reveal at the same time organic constancies and unspeakable wishes – in brief that his own mother, buried deep into that body, becomes the *pathetic* structure of affectivity. (p. 58)

Sartre (1971/1981) insists on the inescapable determinant of the mother as a whole person that determines the affective core experience of cared newborns. Maternal constitution, relative sensitivity, and life story is inescapably reflected in the kind of care, attention, and gestures mothers are able to dispense to their infant. Indeed, in the experiential life of newborns that revolves primarily in the passive reception of cares molded by others, there is more than the serving of basic survival needs such as food, warmth, and hygiene. There is also, as Sartre points out, the transmission of unique trans-generational idiosyncrasies or family truth:

> ... When the mother breastfeeds or clean her infant, she expresses herself, like anybody else, in her personal truth, which, naturally, sums up in it all her life, from her own birth; in the meantime, she realizes a rapport that changes depending on circumstances and people – for which she is the *subject* and that we can call maternal love. .... But, at the same time, by this love and through it, by that person, skillful or unskillful, rough or tender, the way her history made her, the child is manifested to himself. (p. 57)

In summary, Sartre (1971/1981) proposes astutely that experiential awareness of what it might be like to be a newborn is highly dependent on the subjective experience of others. It would be, in large part, socially determined and intersubjective to start with, in the context of dispensed cares. In other words, it would depend primarily on the interaction of a mother–infant experiential point of view, from which each partner would extract their own mutually defining meanings, not unlike the dialectic of master and slave: the newborn would extract a sense of imposed passivity and submission, the mother would extract a sense of duty and fulfillment in the instinctive call for maternal love and protection: a constitutive rapport of force.

Unfolding Levels of Sharing and *Conscientiousness*

With the intentional communication about objects that emerges by 9 months of age via social initiatives and explicit bouts of joint attention (secondary intersubjectivity), infants break away from the primary context of face-to-face exchanges. They become referential beyond the dyadic exchanges to include objects that surround the relationship. Social exchanges also include conversations about things outside of the relationship, becoming triadic in addition to being dyadic. Exchanges become object oriented or objectified, in addition to being the expression of a process of emotional coregulation. Infants now willfully try to capture and control the attention of others in relation to themselves via objects in the environment. At this point, however, the name of the game is limited to the sharing of attention just for the sake of it. Children measure the extent to which others are paying attention to them and what they are doing. They begin to check back and forth between the person and the object they are playing with (Tomasello, 1995), or they begin to bring an event to the attention of others by pointing or calling for attention to share the experience with them. However, such initiative ends there, and is typically not followed through in further conversation or coregulation. For infants, secondary intersubjectivity in triadic exchanges is a new means to control their social environment, in particular the proximity of others as they gain new degrees of freedom in roaming about the environment (Rochat, 2001). By becoming referential, infants also open the gate of symbolic development. They develop a capacity for dual representation whereby communicative gestures stand for and become the sign of something else (e.g., a pointing gesture as standing for a thing out there to be shared with others). Communication becomes intentional, transcending the process of emotional coregulation and affective attunement that characterizes early face-to-face, proto-conversational exchanges (i.e. primary inter-subjectivity). Yet it remains restricted to the monitoring of whether others are, or are not, co-experiencing with the child.

Nevertheless, with the emergence of intentional communication and the drive to co-experience events and things in the environment, infants learn and begin to develop shared meanings about things. To some extent, they also begin to develop shared values about what they experience of the world, but this development remains limited. For example, when facing dangers or encountering new situations in the environment, they are now inclined to refer to the facial expressions of others that are paying attention to the same events (Campos & Sternberg, 1981; Striano & Rochat, 2000). The meaning of a perceived event (e.g., whether something is dangerous or threatening) is now referred to others' emotional responses, to some extent evaluated in relation to others, but it ends there. The process does not yet entail any kind of negotiation regarding the value of what is experienced. The world is essentially divided into either good (approach) or bad (avoidance) things and events. Such basic social referencing emerges at around 9 months, in parallel to the propensity of infants to share attention with others and to communicate with them intentionally (Rochat & Striano, 1999; Tomasello, 1999).

By the middle of the second year of life, triadic exchanges develop beyond basic social referencing and the sense of co-experience with others that is the trademark of secondary intersubjectivity. The child now begins to engage in active negotiation regarding the values of things co-experienced with others. They manifest *tertiary intersubjectivity*, a sense of shared experience that rests on complex ongoing exchanges unfolding over time: things that happened in the past, are manifest in the present and are projected by the child into the future. The prototypical expression of this new level of inter-subjectivity is the expression of secondary emotions such as embarrassment or guilt.

In relation to the self, by 20 months, children begin to represent what others perceive of themselves and gauge this representation in relation to values that are negotiated. If they see themselves in a mirror and notice a mark surreptitiously put on their face, they will be quick to remove it and often display coy behaviors or acting out (Amsterdam, 1972; Rochat, 2003). They begin to pretend and mask their emotions (Lewis, 1992). In general, they become self-conscious, negotiating and actively manipulating what others might perceive and evaluate of themselves (Lewis, 1992; Rochat, 2009). From this point on (18–20 months of age), children project and manipulate a public self-image, the image they now identify and recognize in the mirror. It is an image that is objectified and shared with others, a represented public self-image that from now on will be constantly updated and negotiated in relation to others. Interestingly, by 20 months, children's linguistic expressions begin also to include the systematic use of possessives, children starting to claim ownership over things with imperative expressions such as "Mine!" (Bates, 1990; Tomasello, 1998). Such expressions demarcate the value of things that are jointly attended in terms of what belongs to the self and what belongs to others. This value begins to be negotiated in the context of potential exchanges, bartering, or donations. With the explicit claim and demarcation of property, the child develops a new sense of reciprocity in the context of negotiated exchanges of property, whether objects, feelings, or ideas. At around the same age, children also begin to demonstrate prosocial behaviors, engaging in acts of giving and apparent benevolence by providing help or spontaneously consoling distressed others (Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). Self-concept, ownership claim, and a new concern for others bring the child to the threshold of moral development and the progressive construction of an explicit sense of justice (Damon, 1994). What follows in development is a new level of social reciprocity that is increasingly organized around an ethical stance taken by the child. But this ethical level of reciprocity develops between 3 and 5 years of age and beyond as shown by our recent investigation of young children's sense of fairness in sharing across cultures.

There is a developmental trend from a reluctance to share to subtle, more reciprocal exchanges. For example, children between 3 and 5 years of age become significantly more flexible and systematic in adjusting their successive bids while engaged in bartering exchanges of stickers or toys. They are increasingly inclined to up their bids until an agreement is reached. This developmental trend is also associated with an increased understanding by the child of others' mental states, a trend that appears to cut across cultures (Callaghan et al., 2005).

As children start to claim explicit ownership and invest affects into objects of devotion, they do so by first manifesting unmistakable exclusivity in their possession, a blunt reluctance to exchange. They show overwhelming egocentrism. When the child begins to say "Mine!" she not only implies that "It is not yours," but also is explicitly stating defensive exclusivity, a reluctance to even contemplate sharing and an unmistakable claim that she wants to keep it for herself.

In cross-cultural observations (Rochat et al., 2009), we confirmed that this egocentric trend is a universal trend. We found it in 3-year-olds and to a lesser extent in 5-year-olds from all over the world, who are growing up in highly contrasted physical, social, economical, and

cultural environments. It happens in children living in rich or poor neighborhoods and in cultures fostering radically different values regarding private property. We observed this trend in children in small, highly collectivist villages of rural Peru or in small isolated fishing communities in Fiji. This same trend occurs in children growing up in violent and lawless as well as affluent neighborhoods of Rio de Janeiro; unschooled kids begging and living on the streets of Recife in Brazil; young children attending a Communist Party–controlled preschool in Shanghai, China; and in middle-class North America (Atlanta, Georgia).

In general, we found that across cultures, between 3 and 5 years, there is a robust developmental trend toward more equity in sharing. In conditions where the child was one of the two recipients, 3-year-olds tended to distribute overwhelmingly more candies to themselves, whether equity was possible or not. By 5 years, however, this trend was still evident but significantly tamed. Children continued to favor themselves and are selfish but markedly less. Interestingly this trend was the same in children from all cultures but was reduced in children growing up in small rural and collective communities (i.e., Peru and Fiji in our sample). In development, there is thus a universal drift in active sharing from massive to reduced selfishness between 3 and 5 years of age, a trend moderated by the cultural environment of the child. Despite the significance of cultural factors, the trend toward increased altruism/prosociality in sharing is remarkably robust from the time children begin to be explicit in claiming ownership.

Culture appears to play a role in the developmental pace at which the child becomes inclined to share with greater equity, but the general trend is there regardless of marked variations. In China, children were tested in a preschool that emphasized primarily group activities and sharing. Children always play, sing, and learn as members of a group, rarely as individuals isolated from the group. Such attempts are much less frequent in middle-class North American preschools, such as those of the children we tested in Atlanta. In Fiji or in Peru, the tested children lived in small, close-knit communities where public and shared properties dominate over ostentatious private ownership. When they exist, preschools in these regions are known to emphasize synchronized group activities in children.

The stability of this developmental trend is particularly striking when considering the three groups of Brazilian children. Each group grows in highly contrasted economical and social circumstances within the same national and cultural borders. A group of children lived in the poor and insecure environment of a favela in Rio de Janeiro, an environment dominated by young drug lords that terrorize and dictate law and order. Another group was composed of privileged children, of the same age, from an affluent private preschool situated just a few miles away from the favela. The third group of Brazilian children was composed of 3- and 5-year-old unschooled street kids from the city of Recife, a few hundred miles northeast of Rio. These children spent their days unsupervised by adults, begging on the street, collecting refuse, and typically spending the night with an extended family living in precarious, unsanitary slums close to public dumps.

One could easily presume that the drive to own, and not to share, in the young children of the favela, and particularly the street kids of Recife, might be different compared with the privileged children of Rio. Our research shows that it is not the case. All of these children demonstrate the same developmental trend toward a significant decrease in selfishness and increase in more equitable sharing between 3 and 5 years.

In typical development, young children become more equitable in their sharing, regardless of their economical and cultural circumstances because they enter the culture of their species (*Homo Negotiatus*), a culture that is fundamentally based on reciprocal exchanges. Hoarding and coercion are antithetical to this culture. If it exists, it is an anomaly, due to particularly stressful circumstances (war, disaster, rebellion, madness). It is not cardinal to the culture of *Homo Negotiatus*, unlike any other animal species that are not designed to have others in mind in their social exchanges and their sharing of resources.

We construct equity as well as agree on values by an active process of approximation and mutual monitoring. This process takes form within reciprocal exchanges. We do so by negotiation and ultimately by caring about reputation, namely our relative proximity with others. What happens between 3 and 5 years, is a marked progress in this process that channels children away from greed and immediate gratification. The product of this development is the emergence of a moral space in which children begin to care about reputation.

Children between 3 and 5 develop an understanding that they are potentially liable and that they build a history of transactions with others. Needless to say, parents and educators foster this development in all cultures, but this fostering is essentially the enforcement of the basic rules of reciprocity, the constitutive elements of human exchanges. Children are channeled to adapt to these rules they depend on to maintain proximity with others. From this, they begin to build a moral space in relation to others, a moral space that is essentially based on the basic rules of reciprocity. It is a moral space that is constantly in the

making, constantly revised, and in which equity is endlessly approximated by way of negotiation. Philosopher Charles Taylor (1989) notes in his book on the *Sources of the Self*: "What we are constantly losing from sight is that being a self is inseparable from existing in a space of moral issues, to do with identity and how one ought to be. It is being able to find one's standpoint in this space, being able to occupy a perspective in it" (p. 112). Consciousness and conscientiousness are indeed inseparable in typical development.

CONCLUSIONS: IMPLICATIONS FOR DEVELOPMENTAL PSYCHOPATHOLOGY

In this chapter and based on current progress in infancy research, we considered what seems to constitute the roots of typical consciousness. A large body of recent works indicate that healthy infants are born equipped to represent categorical features of the environment that are relevant for their survival such as faces (i.e., face-like displays); food (i.e., associated with particular taste or smell); but also less pragmatically, things that are of the same (i.e., selective process of sameness detection). Infants are born in a world of values. These values are represented in terms of specific attractor forces. There is a predetermined approach–avoidance polarity that channels the infant's attention and give direction to perception and action from the outset. As we have seen, newborns do not just sense the world but perceive it in terms of what it affords in for action: food, contact, novel vs. familiar experience, what should be avoided or approached. More than reflex machines limited in experiencing automatically proximal stimulations, research shows that they are perceivers of distal objects. As objective (distal) perceivers of the world, they are born implicitly aware of themselves as differentiated entities among other entities. Contrary to what was assumed by pioneer developmental psychologists like Piaget or Freud, newborns are now shown to have minimal self-awareness, not born is an initial state of fusion with the environment. In fact, one could argue that much of developmental psychopathologies and their deleterious effects affect what appears to be a given starting state of human development. Some aspects of this starting state, topic of this chapter, can have particularly deleterious consequences with the onset of neurodevelopmental disorders like schizophrenia or autism. Such instances can be viewed as the *undoing* of the typical propensity displayed very early on to engage in mutual recognition, experience self-unity as well to have a deep sense of possessing (i.e., controlling) one's own experience.

As illustration, and to conclude, we review next some of these deleterious undoing of typical consciousness. The intent is to emphasize aspects that are naturally a given from a very young age and too often taken for granted by the healthy individual. The importance of such aspects is clearly revealed in instances autism and schizophrenia where foundations of typical consciousness are undermined.

Centrality of Mutual Recognition

Kanner (1943), in his description of infantile autism, noted that these children appear to have "an innate inability to form the usual biologically provided affective contact with people, just as other children come into the world with innate physical and intellectual handicaps" (p. 23). Kanner went on to insist on what he sees as the extreme autistic aloneness of these children, their social isolation. Interestingly, for novice yet well-intended healthy adults who might try to engage a child diagnosed with autism, there is always a great deal of discomfort, frustration, and sense of being thwarted, of becoming unsettled and unsure of themselves (Greenspan & Wieder, 2006; Sigman & Capps, 1997). These children are difficult to figure out, removed, unpredictable, unreachable. Looking through or beside you, they behave as if you were transparent, *invisible*, nonexistent, *nonconsequential,* an experience that is a typical source of great discomfort for the well-intended parent or caretaker, and presumably a permanent discomfort for the autistic child withdrawn into his world.

The symptomatic trademark of autistic children is the depleted sociality experience by anybody trying to engage them and connect with them. The social current and cocreation of meanings that normally arise among communicating individuals are either hindered or plainly absent. It takes a great deal of expertise and exercises from parents, educators and therapists to contact these children, a difficult and courageous enterprise that requires sometimes infinite patience (e.g., Greenspan & Wieder, 2006).

What makes the raising of an autistic child so much more difficult and exhausting compared with raising a healthy, even hyperactive child is the fact that there is no room for mutual recognition, no room for reciprocal acknowledgment. The love parents of autistic children might express, often inexhaustibly, remains unmatched in its return. In this context, parents have difficulties recognizing themselves in the impact they have on their child. Inversely, the child is impaired in recognizing himself in what he does to his parents. Autism causes *mutual* blind mindedness, mutual invisibility, and it is a source of great

discomfort, obviously for the trying parents, but also for the disconnected child.

Given Sense of Self-Unity

At some basic level, feeling experience carries with it a fundamental sense of unity or *self-evidence*. It is that my feelings experiences of the world are mine, can only be mine, and nobody else. This is true no matter what, and to the extent that one doesn't take drugs or shows symptoms of schizophrenic autism or any other kinds of psychosis.

As continental phenomenological philosophers in the tradition of Husserl, Merleau-Ponty, Sartre, and many others but more recently Gallagher and Zahavi (2009) would claim, this self-evidence comes for free with any kinds of feeling experience. It is an implicit given. In the same way, James Gibson (1979) in his ecological approach to perception proposes that perceiving the world always necessarily entails *coperceiving* oneself as perceiver and actor in the world. One implies the other, no matter what, like the two sides of the same coin. This is a simple yet powerful intuition that is theoretically helpful, accounts for much of what we see in the development of children and in devastating instances of psychopathology like schizophrenia. For these empirical reasons, there are good reasons to endorse such implicit self-evidence that feeling would necessarily entail. However, one should acknowledge other philosophical and psychological perspectives adopting radically different epistemological starting points. These views are that the mine-ness of experience is more likely an illusion and a cognitive reconstruction rather than a necessary given. Accordingly, self-perception would be more the product of an inference and a mental representation rather than an implicit direct counterpart of any acts or direct perception, as Gibson suggested. Cognitive reconstruction views, however, appear untenable when considering very young infants as well as adults suffering mental and other self-disorders found particularly in schizophrenia but also other psychotic symptoms.

Research show that we are born with the basic intuition of what belongs to our own feeling experience and what is not. Few hour-olds infants do show unambiguous discrimination between self- and non–self-touch. For example, newborns root significantly more in the direction of another person's finger that touches one of their cheeks compared to when one of their own finger of hand comes spontaneously in contact to the same cheek. They discriminate between self-produced double touch of simultaneous cheek and finger touching and the single touch of a non–self-finger (Rochat & Hespos, 1997). This simple observation tells us, among other empirical evidence found in neonates that we are born with the potential for the implicit sense of exclusive mine-ness of experience, something that is probably the necessary phenomenal prerequisite of psychological development, its necessary subjective seed. That my feelings are mine is self-evident and does not have to be an indirect representational reconstruction. If that were the case, it is doubtful that neonates would show discrimination between double and single touch experience. Such empirical evidence would imply that there is from birth the potential self-evidence property of feeling experience.

Primordial Possession of the Own Experience

A look at the anomalous experience of psychotic adults who suffer from great cognitive disorganization and uncontrollable hallucinations within the schizophrenia spectrum, demonstrates how fundamental and actually basic self-evident mine-ness experience is, the sine qua non condition of our sanity. It shows clearly that self-evident *mine-ness* of feeling experience is the cornerstone of the ways we create meanings and bring coherence to our experience of being alive in this world: something that is ineffable (hard to put words on) and pre-reflective (implicit) by nature.

Loss of self-evident mine-ness of experience can be pathological and long lasting, as it can be temporary and provoked by drugs and other trance inducing rituals that are so pervasive across religions and cultures. Speaking tongues and other possessed states are symptomatic of self-evident feeling experience transmuted (mentally delegated) to a fictive entity that intrudes individual consciousness, be it the devil or a dead ancestor. Trance states can transform the implicit self-evidence typically accompanying feeling experience into the embodied *allo*-evidence of another. Possessed individuals are literally invaded and under the spell of another. There is experiential loss of self-control, until the individual snaps out of their trance state. Aside from religious rituals, hypnosis is a good, more secular example of trance-like state. It continues to be successfully exploited in psychotherapy and psychoanalysis, in the footsteps of Charcot (1825–1893) in his pioneer research on hysteria and other neurotic symptoms shown to be of psychological origin, as well as Freud in his early practice of psychoanalysis (Breuer & Freud, 1895/2000). Such induced temporary disturbance and loss of subjectivity is similar in some fundamental ways to chronic psychosis like schizophrenia.

Refined examination of the subjective, first person perspective accounts of hundreds of schizophrenic individuals reveals that first and foremost, schizophrenia and allied

symptoms are disorders of minimal self-experience including at its core, self-evident *mine-ness experience (*Parnas et al., 2005). It is typical for individuals suffering the atrocious ills of schizophrenia to report that although they rationally, thus explicitly know that their thoughts originate from within them and are not hallucinations proper, these thoughts are nonetheless *not* felt as generated by them. There is no implicit sense of self-agency in thinking or generating thoughts, they are thus somehow possessed rather than in possession as discussed above. It is a loss of thought *ipseity* (from the Latin word *ipse*, self), in other words the loss in the mine-ness of thinking one's own thoughts. Losing this basic and implicit sense of self is devastating, of almost unimaginable horror magnitude as probably best conveyed by Elyn Saks's (2007) vivid account of her own, very personal and detailed journey into schizophrenia:

> This experience is much harder, and weirder, to describe than extreme fear or terror. Most people know what it is like to be seriously afraid. If they haven't felt it themselves, they've at least seen a movie, or read a book, or talked to a frightened friend—they can at least imagine it. But explaining what I've come to call "disorganization" is a different challenge altogether. Consciousness gradually loses its coherence. One's center gives way. The center cannot hold. The "me" becomes a haze, and the solid center from which one experiences reality breaks up like a bad radio signal. There is no longer a sturdy vantage point from which to look out, take things in, assess what's happening. No core holds things together, providing the lens through which to see the world, to make judgments and comprehend risk. Random moments of time follow on another. Sights, sounds, thoughts, and feelings don't go together. No organizing principle takes successive moments in time and puts them together in a coherent way from which sense can be made. And it's all taking place in slow motion (p. 13)

Delusions and hallucinations are an intrinsic part of the diagnosis of schizophrenia and the self-disorganization, including voices as running commentaries on the person's behavior or thoughts, some sort of inescapable hyper-reflectivity but from a third-party perspective that invades the individual who lost basic self-evidence, the loss of an implicit trust that subjective experience *belongs* to oneself, a feeling experience that is not self-specifying anymore but rather diffused and confused with a world that is chaotic: the forceful, uncontrollable voices and intrusive thoughts that have no overarching narrative structure, no meaningful organization.

Such psychopathologies point to the fact that to function and experience the world normally, self-evidence and the basic feeling experience that one's thoughts and perceptions belong to oneself are a necessity—these are indispensible, absolute prerequisites to avoid mental invasion and the loss of minimal self-reference. How easy it is for us to take for granted the fact that these gestures, this voice, such vision *belong* to no one else and no other source than *me*. Without this basic self-evident feeling experience, we are at a loss. Losing it is indeed devastating: it is the primordial prerequisite of a healthy psychological development that starts in the womb.

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