

What is it Like to be a Newborn?

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Abstract and Keywords

This article examines what might constitute the first manifestation of consciousness in the life of an individual, focusing on the subjective starting state of newborns. It presents evidence showing that we are born with some minimal self-awareness, a kind of awareness that might even be present in fetuses depending on the criteria used. It investigates the mechanisms that might account for how self-awareness quickly evolves from being minimal and phenomenal in the context of sensation, perception, and action and discusses the innate propensity of newborns to detect sameness in the experience of things that surround them. It identifies two putative mechanisms that would support an innate propensity to detect sameness: synesthesia and the vicariousness of experience.

Keywords: consciousness, newborns, self-awareness, sensation, perception, action, sameness, synesthesia, experience

IN this chapter, we are interested in what might constitute the first manifestation of consciousness in the life of an individual. The focus is on the subjective starting state of newborns: what it might be like to be newly born in *this* world and *that* body; and whether we can refer to any of this subjective experience as a 'self'.

In general, it is easier to determine when consciousness ends than when it begins. If we shy away from dualism or any form of metaphysical transcendence, consciousness can be said to end with the absence of bodily vital signs, to the extent that consciousness is necessarily embodied. In Sartre's existentialist jargon, with biological death, *the body turns into the in-itself of inanimate things*.

Even if we believe in some form of afterlife, the awareness of what it is like to be alive *now*, in *that* particular living body, necessarily has to vanish with that body. Experience is indeed rooted in the body, existing in a relation of mutual exclusivity with it, one defining the other, thus both passing at the same time. Even in a coma, still with vital signs, and even if assisted by a ventilator, no one can say for sure that consciousness is totally gone, hence the ongoing debate as to when it is ethically acceptable to terminate care, a pro-

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found philosophical dilemma. The debate will (p. 58) continue despite progress in the neurosciences, brain imaging techniques, and the biological account of conscious states. We can only approximate whether explicit awareness is a prerequisite of consciousness or whether particular brain regions need to be active in order to be conscious. However, despite all these difficulties, when the body stops showing any vital signs, unaided or aided artificially, consciousness can be said to have necessarily ended. Death brings absolute resolution to the question.

In French, a funeral undertaker or mortician goes by the name of *croque-mort*, literally a 'dead-biter'. It is so because up to a couple of centuries ago, the *croque-mort* was the official individual in a community who determined whether the dying was still alive, forcefully biting his or her big toe on the deathbed. If the corpse remained inert, with no reaction, it could be legally buried. The acid test of physical death was thus measured by the absence of pain awareness and its obligatory reactive (behavioral) symptoms of excruciating pain (the biting of one's big toe is indeed very painful). The implicit rationale behind such cultural practice is that, with the death of our body, its decay, and the certainty of its physical dissipation, dies also our subjective 'embodied' experiential point of view of what it is like to be *Me* including the experience of *My* pain which depends on *that* body.

As a case in point, I do remember now dead persons that I have known, through the memory representations stored in my living body. I will probably be able to do so as long as it (my body) shows vital signs. The truth is that these persons cannot remember themselves because their consciousness or experience of what it is like vanished with their body some years ago. That is that.

In reverse, there are no decisive criteria as to when consciousness might begin in a living individual, newly born in particular. No absolute criteria exist regarding the beginning limits of *what it is like to be me*: is it already in the womb, at birth, or only when children start to utter personal pronouns? What qualifies living individuals (children or other animals) to possess self-awareness by having some minimal experience of what it is like to be?

In this chapter, I try to bring to bear some recent infancy research findings on the beginning limit question, once the child is born. My goal is to develop some approximation of what it might be like to be a newborn. I will present evidence demonstrating that we are born with some minimal self-awareness, a kind of awareness that might even be present in fetuses depending on what criteria we use. The focus is on what might be considered as the starting state consciousness of newborns (i.e. what it is like to be a newborn) and the mechanisms that might account for how self-awareness quickly evolves from being minimal and phenomenal in the context of sensation, perception, and action, to become within months explicit and conceptual *as well*.

I will first discuss what it might be like to be a newborn at a sensuous level: the level of feelings and emotion within the context of extreme dependence from the generous care of others (*general affective and survival context*). I will then turn to (p. 59) empirical evidence suggesting that newborns express a minimal self-awareness, in particular an

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awareness of their own body as unified and organized (*facts from infancy research*). Finally, I will present what I see as a major mental process underlying this awareness that I identify as the innate propensity of newborns to detect *sameness* in the experience of things that surround them, people in particular, but also to detect *sameness* in the subjective, embodied experience of being in the world as a feeler, perceiver, and an actor (i.e. self-experience). Based on empirical findings, I identify two putative mechanisms that would support an innate propensity to detect sameness: synesthesia and the vicariousness of experience.

1. General Affective and Survival Context of the Newborn

For centuries the question of the origins and development of subjectivity intrigued philosophers, moralists, educators, biologists, and more recently psychologists and neuroscientists: from St Augustine, Rabelais, Rousseau, 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 nine months' gestation in the womb. Over sixteen centuries ago, for example, in what is often considered the first self-narrative in the history of Western thought, St Augustine in his *Confessions* expresses the idea that the origins of what one knows about the self are 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 2007: 1. 6. 10)

Primordial submission to the authority of maternal cares

St 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: 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 (p. 60) orienting, approaching, and avoiding—they are nonetheless born in 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 relatively slow gestation (Rochat 2001).

The human birth creates a unique ecology of behavioral growth compared to other animal species, an ecology of protracted 'extero-gestation', hence a particularly long and marked

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dependence due to immaturity (Montagu 1961; Bruner 1972). It is an ecology that has been constrained, among other contingent and cascading factors, by the evolution of bi-pedal 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 to 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 bi-pedal locomotion evolved by the *Homo* genus (Montagu 1961; Gould 1977; Trevarthan 1987).

Human protracted extero-gestation 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 care takers 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 in comparison to 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 in such a great state of immaturity and dependence?

In *The Family Idiot*, his biography of nineteenth-century writer Gustave Flaubert, Sartre (1971/1981) speculates at length and in remarkable depth on this question. In the first part of this long essay ('the constitution'), Sartre describes at length 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 (p. 61) experienced within him as the product of *others*' (Sartre 1971/1981: 48; my translation from French). Sartre 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

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mother, buried deep into that body, becomes the *pathetic* structure of affectivity. (Ibid. 58)

Sartre 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 are 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 transgenerational idiosyncrasies or family truth:

when the mother breastfeeds or cleans 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. (Ibid. 57)

In summary, from Sartre the philosopher, at the end of his life, wearing the hat of psychoanalysis that for years he tended to dismiss, these reflections suggest 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.

But aside from this basic *rapport* of force that is clearly expressed at birth, certainly contributing in the determination of crucial aspects of what it might be like to be a newborn, couldn't neonates experience themselves as more than passive recipients, once they are fed and clean, alert and content, laying alone in their crib and looking around, as they all do at some point? Or what is it like to be newborn during the period that precedes care, when the infant screams his lungs out in apparent pain, discomfort, or hunger? What are those feeling experiences made of?

(p. 62) **Early private experience**

Until a few years ago, the *Zeitgeist* was to deny infants any form of worthwhile phenomenal awareness. This was not just an intellectual innuendo. In the 1940s and 1950s, surgery without anesthesia was routinely performed on infants and young children. Modern surgeons conveniently paralyzed squirming infants by injection of Curare or similar paralytic agents. Under such circumstances, adults recalled excruciating pain during

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surgery, but patients were not believed and the practice went on for twenty years. As pointed out by Dennett (1981: 201): 'The fact that most of the patients were infants and small children may explain this credibility gap.'

Less dramatic, but still revealing of the mainstream outlook on early affective life, until a few years ago (and probably still today at some hospitals) local anesthetics were not automatically applied prior to routine painful procedures on newborns such as heel prick and circumcision, even by pediatricians practicing in state of the art maternity hospitals.

Despite the fact that from birth infants cry when hungry or smile after a good feed, historically there has been a formidable resistance to attribute the rich affective and mindful life that we now know infants do have from birth, and even prior to birth during the last four weeks of gestation (see Rochat 2001 for a review of empirical evidence accumulated in the past thirty years).

Based on empirical facts from the past forty years in the booming field of infancy research, we have now 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. Not only do we better understand the experience of newborns from the perspective of psychophysics (what range of stimulus thresholds they 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, but also as fetuses during the last two trimesters of gestation. We know that newborns see colors, use dynamic information, preferring things that move, rather than things that are static. 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 ('motherese'). We know that they crave sugar and why, why they appear to innately savor sweet tastes, 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. Striking, and arguably among the major discoveries in developmental psychology over the past thirty years, is the fact 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, demonstrate comparable thresholds (p. 63) across sensory modalities. Furthermore, what they learn in the womb is readily transferable *ex utero*. Facts show that few-hour-old newborns prefer to suck in certain ways on a pacifier, to hear the voice of their mother over the voice of a female stranger (DeCasper and 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 et al. 1998 a, 1998 b).

What can be safely inferred from these now well recognized and numerous facts is that not only are newborns sophisticated learners, perceivers, and even knowers but also that they have from the start a very rich affective and emotional life. We are not born affec-

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tively '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 that would be the source of an initial '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 (see a suggestion of a different meaning of William James's famous claim in section 3 of this chapter).

We now know that newborn experience is anything but chaos. 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 screams 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 non-volitional responses like a knee jerk or the obligatory chill one feels running down the spine while stepping on what was thought to be a piece of dead wood, but in fact is a snake.

(p. 64) 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).

Daniel Stern (1991), in an unusual book entitled *Diary of a Baby: What your Child Sees, Feels, and Experiences*, took on the task of imagining what it is like to be a young child from six weeks to four years of age. 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

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of Joey at six weeks is for Stern a world of sensations. Although this world is nameless and non-objectified, not yet explicit or conceptualized, it is a world rich in 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 for and manipulated by others (see Sartre above). 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 recent discussion and distinction proposed by 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.

We will see next that 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. We will review empirical evidence strongly suggesting that from birth infants express a sense of their own feeling body as a differentiated entity among other entities.

(p. 65) 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* (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 of-

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ferred 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 (see St Augustine above) but Freud's account was the most thorough and inquisitive to be proposed on what might constitute the psycho-affective 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 (for a review see Barsalou 2008; Damasio 1995; Gallese 2007; Gazzaniga et al. 1998).

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 'auto-eroticism' 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. This will be demonstrated in the next section of this chapter focusing on empirical evidence of minimal self-awareness in the young child, from birth.

As we will see, the Freudian idea of a first drive toward 'auto-eroticism' and the view that early psychic life primarily revolves around a basic form of narcissism are (p. 66) now problematic. Auto-eroticism as a primary drive reduces early experience of being in the world to some sort of blind, circular, non-objectified and autistic quest toward bodily excitation and suppression. We now know that there is much more than blind auto-eroticism in the life of newborns: there is minimal self-awareness.

2. The Minimal Self of Newborns

The infancy literature provides an abundance of empirical observations demonstrating the existence of an early, if not innate experience of the body as an entity perceived by the infant as unified. These observations refute the chaotic view typically associated with the original blooming buzzing confusion of neonates proposed by William James over a century ago (James 1890; but see section 3 below for a different understanding of James's statement).

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We now know that infants are not born in a state of un-differentiation and disorganization with respect to perceiving the world but rather show signs that they perceive their own body as well as non-self entities as unified discrete things. Based on selected research findings, I review next some of the content of the presumed unified and meaningful self-perception and action expressed at birth, or shortly after birth. These findings indicate that newborns' perception of their own body in action is anything but disorganized, meaningless, or confused. It appears that there are innate frames to self-perception and experience. These frames correspond to biologically prescribed propensities that are embodied in action systems (i.e. feeding, orienting, avoiding), above and beyond the collection of reflexes structuring behavior at birth (Amiel-Tison and Grenier 1980; Reed 1982; Rochat and Senders 1991; Rochat 2001).

The strong behavioral propensities expressed at birth and already in the womb during the last trimester of gestation (e.g. bringing hand to mouth followed by sucking and swallowing, see Prechtl 1984) constrain subjective experience from the start, in particular the embodied proprioceptive sense of the own body as a distinct entity among other discrete entities in the environment. It also constrains what develops in relation to this minimal, perceptual sense of self. But what is the evidence in support of such assertion?

Looking at the research literature, we can extract characteristics of the *minimal self* expressed at birth and in the course of the first weeks of life, long before children begin to show signs of self-objectification, or the explicit sense of themselves as object thoughts, the next layer of conceptualizing discussed later.

These characteristics pertain to the content of subjective or self-experience at the outset, a 'proto' experience that is implicit but seen here as a first level of (p. 67) self-conceptualizing in the generic sense of seizing the essence of selfhood: what it consists of and the *gist* of its meaning, as implicit as this meaning might be (see the affective and survival context in section 1).

These characteristics do not have to be construed as innate representational modules, probably more accurately as primary representations that are *emergent* from the innate structure of the body and its propensities to act. It also means that these representations are not fixed but subject to enrichment based on learning and experience.

Subjectivity and body schema at birth

The basic emotions expressed at birth and reliably identifiable by caretakers as pain, joy, disgust, interest, or anger, are symptomatic of a rich affective life. Newborns express these emotions with their whole body, becoming spastic and tense in particular ways, emitting particular sound pitches and contours, when for example crying out of pain as opposed to hunger. A rich palette of distinct affective motives underlies newborns' bodily movements. For example, a drop of sucrose on their tongue leads them to calm down and systematically bring hand to the mouth in the most direct trajectory, coming to closure after oral biting and sucking (Rochat et al. 1988). The drop of sucrose engages the feeding or appetitive system of the infant that in turn mobilizes her whole body in orienting and

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rooting activities. These functionally purposeful activities come to rest only when something solid such as a finger or a nipple comes in appropriate contact with the face, eventually finding its way into the mouth for sucking (Blass et al. 1989).

In relation to the body as a whole, hand–mouth coordination is closely associated with the engagement of the feeding system, as in this case of the drop of sucrose on the tongue of the infant. In itself, it is suggestive that newborns do possess rudiments of a body schema (Gallagher and Meltzoff 1996). Such coordination implies some mapping of the body whereby regions and parts of the own body are actively and systematically (as opposed to just randomly) put in contact with each other, in this case hands and mouth with a coordinated spatio-temporal trajectory (hand movements, head orientation, and mouth opening, often in anticipation of hand contact).

Neonatal imitation of tongue protrusion, but also of hand clasping or head rotation (Meltzoff and Moore 1977), is another expression of a body schema whereby the sight of active bodily regions in another person (the model) is mapped onto homologous regions of the own body. Other evidence of body schema at birth is demonstrated in neonates who are turned to the side in their crib and plunged into the dark with just a thin beam of light cutting across their visual field. Newborns observed in this condition tend to bring systematically their ipsilateral (p. 68) hand and arm into the beam of light for active visual exploration (Van der Meer and Lee 1995).

In all, body schema and the active propensity of neonates to bring sense modalities and regions of their own body in relation with each other are now well documented. This, in itself, supports the idea that infants sense their own body from birth as an *invariant spatial structure*, as rudimentary and in need of further refinement as this spatial structure might be. This structure is obviously not Euclidean in the sense of not synthesized (represented) in the mind of the young infant as a precise map of accurate spatial co-ordinates and configurations. It does not yet entail that the infant has already a recognizable image of her own body (a body image). This structure is essentially *topological* in the sense that it is made of focal attractor regions on the body surface that have great degrees of freedom and a high concentration of sensory receptors such as mouth and fingers. This topology is embodied in action systems that are functional from birth and drive early behavior.

Evidence of a body schema at birth provides some theoretical ground for the ascription of basic selfhood from the outset. Other recent research shows that neonates behave in relation to their own body in ways that are different, when compared to how they behave in relation to other physical bodies that exist independently of their own. They feel and unquestionably demonstrate from birth a distinct sensitivity to their own bodily movements via *proprioception* and internal (*vestibular*) receptors in the inner ears. Both proprioceptive and vestibular sensitivities are well developed and operational at birth. They are sense modalities of the self par excellence.

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Differentiated 'ecological' self at birth

Research shows, for example, that neonates root significantly more with head and mouth toward a tactile stimulation from someone else's finger than from their own hand touching their cheek (Rochat and Hespos 1997). Other studies report that newborns do pick up visual information that specifies ego-motion or movements of their own body while they, in fact, remain stationary. These studies indicate that neonates experience the illusion of moving, adjusting their bodily posture according to changes in direction of an optical flow that is presented in the periphery of their visual field (Jouen and Gapenne 1995). These observations point to the fact that, from birth, infants are endowed with the perceptual qua intermodal capacity to pick up and process meaningfully *self-specifying* information.

Questions remain as to what might be actually synthesized or represented as an outcome of the self-specifying perceptual capacity manifested at birth. What might be the experience of selfhood in neonates? What is the subjective experience of the (p. 69) own body considering that selfhood is first embodied, only later becoming recognized as 'Me'?

Neonates experience the body as an invariant locus of pleasure and pain, with a particular topography of hedonic attractors, the mouth region being the most powerful of all, as noted by Freud (1905) in his account of the primitive oral stage of psychosexual development. Within hours after birth, in relation to this topography, infants learn and memorize sensory events that are associated with pleasure and novelty: they selectively orient to odors associated with the pleasure of feeding and they show basic discrimination of what can be expected from familiar events that unfold over time and that are situated in a space that is embodied, structured within a body schema. But if it is legitimate to posit an a priori 'embodied' spatial and temporal organization of self-experience at birth, what might be the content of this experience aside from pleasure, pain and the sheer excitement of novelty?

Neonates do have an a priori proprioceptive sense of their own body in the way they act and orient to meaningful affordances of the environment, as well as in the way they detect visual information that specifies ego motion, adjusting their posture appropriately in direction and amplitude to compensate for surreptitious changes in gravitational forces (Jouen and Gapenne 1995).

The proprioceptive sense of the body appears to be a necessary correlate of most sensory experiences of the world, that is, from birth on. As proposed by James Gibson (1979), to perceive the world is to *co-perceive* oneself in this world. In this process, proprioception, or the muscular and skeletal sense of the body in reference to *itself*, is indeed the sense modality of the self 'par excellence'.

From birth, proprioception alone or in conjunction with other sense modalities, specifies the own body as a differentiated, situated, and eventually also agent entity among other entities in the world. This corresponds to what Ulric Neisser (1988, 1991) first termed the 'ecological self', a self that can be ascribed to infants from birth.

Bounded and substantial embodied self

As pointed out by Neisser (1995), criteria for the ascription of an ecological self rest on the behavioral expression by the individual both of an awareness of the environment in terms of a layout with particular affordances for action, and of its body as a motivated agent to explore, detect, and use these affordances.

Newborns fill the criteria proposed by Neisser for such awareness. In addition, however, I would like to add that they also seem to possess an a priori awareness that their own body is a distinct entity that is bounded and substantial, as opposed to disorganized and 'airy'.

Newborns perform self-oriented acts by systematically bringing hand to mouth, as already mentioned. In these acts, the mouth tends to open in anticipation of (p. 70) manual contact and the insertion of fingers into the oral cavity for chewing and sucking (Blass et al. 1989; Watson 1995). What is instantiated in such systematic acts is, once again, an *organized body schema*. These acts are not just random and cannot be reduced to reflex arcs. They need to be construed as functionally self-oriented acts proper. Because they bring body parts in direct relation to one another, as in the case of hand-mouth coordination, they provide neonates with invariant sensory information specifying the own body's quality as *bounded substance*, with an inside and an outside, specified by particular texture, solidity, temperature, elasticity, taste, and smell.

The a priori awareness of the own body as a bounded substantial entity is evident in neonates' postural reaction and gestures when experiencing the impending collision with a looming visual object, an event that carries potentially life-threatening information.

Years ago, Ball and Tronick (1971) showed that neonates aged two to eleven weeks manifest head withdrawal and avoidant behavior when exposed to the explosive expansion of an optic array that specifies the impending collision of an object. Infants do not manifest any signs of upset or avoidant behavior when viewing expanding shadows specifying an object either receding or on a miss path in relation to them. Consonant with Ball and Tronick's findings, Carroll and Gibson (1981) report that by three months, when facing a looming object with a large aperture in the middle, as an open window in a façade, they do not flinch or show signs of withdrawal as they do with a full textured solid object. Instead, they tend to lean forward to look through the aperture.

In all, the detection of such affordances in the looming object indicates that there is an a priori awareness that the own body is organized and substantial. There is an innate sense that the own body occupies space and can be a physical obstacle to other objects in motion.

In summary, I briefly reviewed empirical observations that warrant the ascription of an innate sense of self in perception and action. What is proposed here is that it corresponds to a first implicit and minimal self-awareness. It is a perceptual awareness of the body that is framed by innate propensities to act in particular ways. It includes the early char-

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acteristics that infants perceive of their own body in perception and action as *bounded*, *organized*, *differentiated*, and *substantial*, but also *situated* (e.g. in the early detection of reachable objects) and *containing* (e.g. food ingestion and digestion, early transport of suck-able objects to the mouth).

In the generic sense used here, it is also infants' implicit awareness of the body as an agentive entity: sucking to hear a sound and obtain food, kicking in a certain way to set a mobile in motion. It is as well the awareness of the own body as a specific bounded spatial *locus* of fluctuating emotions with a permanent address in space and where from the outset a rich affective life made of pleasure and pain is experienced: the locus of a continuous string of *embodied* satisfaction and frustration.

(p. 71) Stating that newborns have minimal self-awareness is tantamount to saying that this awareness is 'innate', hence possibly modular, corresponding to a 'system' evolved by the species and that infants are born equipped with such a system. Alternatively, I suggested earlier that minimal self-awareness does not have to be construed as any kind of innate representational module. It is probably more accurate to construe minimal self-awareness expressed from birth as primary representations that are *emergent* from the innate structure of the body and its propensities to act. Accordingly, these representations are not fixed but subject to enrichment based on learning and experience.

We turn now to the wide open and crucial question of what might be the mechanism that allows infants to maintain unity in their embodied experience of the world (including the self), an experience that is constantly changing with learning and physical maturation, leading infants within months to becoming explicit and meta-cognizant of themselves when for example they begin to recognize themselves in mirrors by twenty months or become self-conscious with shame, embarrassment, humor, and self-deprecation starting the third year (see Rochat 2009).

I propose next that this mechanism is the innate propensity to detect sameness in things and people, but also in the embodied self-experience from which minimal self-awareness would arise.

3. Newborn Sense of Sameness

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 and changing.

If there is one thing that we have learned in recent years by studying babies, and there has been a huge wave of interest in studying infants in the past thirty years (Rochat, 2001), it is the fact that from birth, infants are active in processing invariant information over changes. In their inclination to scrutinize novelty hides a deep look for 'sameness'.

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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 many changes.

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 (p. 72) and trusted in a world that is by definition constantly changing, associated to a subjective experience that is fundamentally dynamic.

It is important to insist that the focus on *sameness* in the environment that I take as a core aspect of infant psychological development remains a core aspect of the human mind all through the life span. As William 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: 459).

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? On what rests the minimal self-awareness they express from birth?

Based on recent discoveries in behavioral neurosciences, I will identify two possible mechanisms that would jumpstart the innate sense of sameness expressed by newborns: (1) a starting experiential state of acute *synesthesia*; (2) the innate capacity for direct *vicarious experience* with the world. I review these processes in turn, based on recent supporting evidence.

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 timbre 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 'synesthetic' experiences that, according to existing surveys, are part of the life of approximately 5 per cent of all adults (Hubbard et al. 2005; Spector and Maurer 2009).

What is of interest to us here is the idea recently 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 inter-sensory 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 sug-

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gested by William James 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 (p. 73) 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. (James 1890: 7-8)

This experiential conflation or 'pure sensory experience' elegantly described by James, I would suggest, the symptom of a major competence, and not an incompetence as it has been taken by most infancy researchers (including myself), over the past thirty 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.

In my view this affective core cannot be simply dissociated from subjective experience, as abstract and rational as 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 and Moore 1977). 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

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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 (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.

(p. 74) 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 others, 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’.

Let us turn now to another set of findings in the neuroscience, the recent discovery of *mirror neuron systems*, which has contributed to changing the view on the nature of early experience, in particular what might characterize phenomenal experience at birth.

Innate and direct vicarious experience of being in the world

There is now abundant empirical evidence and even precise animal models that would substantiate the possibility of an experiential (phenomenological) equivalence between the observation and the execution of actions. 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 pre-motor frontal cortex of the macaque monkey discharge equally when the monkey itself performs a specific action (e.g. reaching for a peanut), or the same monkey observes another monkey—or another person—performing the same ac-

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tion (Rizzolatti et al. 1996). These cells are thus multimodal by nature, 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 (although many are still skeptical) some biological validation to the idea that there might be a deeply (p. 75) 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 in general, basic embodied intersubjectivity, as defined at the beginning of the chapter.

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 and Moore 1977, 1997).

Such imitative responses in neonates suggest that we are born with the necessary mechanism that would allow for the experience of an equivalence between the perception and the execution of actions (Lepage and Théoret 2007).

In William James's terminology from the quote at the opening of this third section of the chapter, 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 thus 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 et al. 2001).

4. Conclusions and Summary

So, what is it like to be a newborn? Many speculations have been made by philosophers, educators, theologians, and more recently by psychoanalysts, developmental psychologists, and neuroscientists. Beyond these interesting, often astute, and inspiring speculations, there is now an abundance of new infancy research providing more reliable facts on the question.

In the second section, I reviewed some of the empirical evidence suggesting that infants are not born in a state of chaotic mental confusion. Newborns are oriented rather than disoriented, organized rather than disorganized. We are not born experientially incoher-

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ent. I tried to show that infants from birth, and possibly (p. 76) even before, manifest *minimal self-awareness*: a sense of themselves as differentiated and situated entities among other entities in the world. They appear very early on to have a sense of being embodied and substantial, occupying space in an environment in which they are agent. This minimal self-awareness is expressed in spite of the passive submission to the cares of others that is dictated by the prolonged immaturity of the human infant, a unique feature of the species. This latter human feature indicates further that early minimal self-awareness is infused with meaning arising from interaction with others. Early minimal self-awareness encompasses both an interpersonal and an ecological sense of self (Neisser 1988, 1991).

In section 3 I suggested that the minimal self-awareness expressed by newborns might rest on innate mechanisms by which infants are from the start particularly attuned to 'sameness', what is familiar as opposed to unfamiliar. The attunement to sameness might jumpstart self-awareness in newborns, infants wired from birth to pick up what is the same in their successive embodied experiences, thus also, *mutatis mutandis*, wired to pick up what deviates from the familiar. I reviewed evidence of a starting experiential state of acute synesthesia as well as the plausibility of an innate and direct vicarious experience of being in the world.

Research shows that infants are born with mechanisms of inter-sensory integration and the probable existence of mirror neuron systems at birth. These mechanisms would cause both acute synestheses and the possibility of vicarious experience from the outset. They would play a major role in scaffolding and jumpstarting the sense of sameness in the context of embodied self-experience: unifying sensations originating simultaneously from the various sense modalities and providing equivalence across experiences that originate from within and without the body, movements that are either self-experienced or detected in others.

I proposed that these putative mechanisms are at the root of the minimal self-awareness expressed by newborns: ultimately what it is like to be a newborn. Obviously, these speculations need further validation; still, existing empirical evidence in the field of infancy research demonstrates that there is an exciting new avenue for empirical research on the ontogenetic origins of self-awareness, the beginning limit question of consciousness.

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Notes:

Ideas contained in this chapter, in particular those regarding the minimal self and newborns' sense of sameness, are also discussed, in a different theoretical context and with a different spin, in contingent contributions by the author to other edited volumes: A. Fotopoulou, S. Pfaff, and M. A. Conway (eds), *From the Couch to the Lab: Psychoanalysis, Neuroscience and Cognitive Psychology in Dialogue* (Oxford University Press, in press), as well as in Philip D. Zelazo (ed.), *Oxford Handbook of Developmental Psychology* (Oxford University Press, in press).

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