Body Image and Body Schema

Edited by

Helena De Preester

Veroniek Knockaert

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Introduction

Helena De Preester and Veroniek Knockaert

1. Interdisciplinarity

Bringing together separate disciplines such as phenomenology, psychoanalysis and neuroscience into one volume is certainly an unusual and perhaps a risky undertaking. This is not meant as a warning for the reader, as the meeting of the disciplines is a unique and fruitful endeavor after exchanging points of view. However, to leave the safe home base of one's own discipline and to run the risk to encounter other disciplines is not only a matter of having an open mind. Having one's own perspective placed close to other possible perspectives requires at least the courage to take into account the concrete existence of those other points of view. Interdisciplinarity is never easy, and the confronting aspect of it is all the more explicit where interdisciplinarity is still in its infancy, as is the case here.

Interdisciplinarity demands more than explaining one's own idiom to other parties. To explain terminology to each other is only surface activity. Interdisciplinarity also asks for the ability to let oneself be inspired and maybe even confused by other perspectives. It is a matter of both clarification and confusion, as the evidence of one's own point of view may turn out not to be unshakeable. One's own perspective may prove to be indeed a perspective. That such is the case does not mean that it is *merely* a perspective, and phenomenology may have taught us that it is no plea for relativism. On the contrary, a perspective is precisely constitutive of truth. To recognize the validity of several perspectives therefore means the opposite of a battle for the truth, or for proving the superiority of a particular perspective over others. In this way, an interdisciplinary meeting should not be a place for – an often disdaining – tolerance or armistice. Neither theoretical nor practical research benefits from a tolerating pluralism, in which the differences are left untouched, one next to the other. Confrontation should be sought for, as well as creative encounters opening up new paths for conceptualization, research and (clinical) practice. It is only from the point of view of another perspective that the adequacy or the meaning of one's own perspective can be accessed and that the rationale and motives of one's own perspective can be elucidated. The aim of the present volume is to stimulate, to clarify and perhaps also to confuse in the above sense.

1.1 The body: Body image and body schema

The complaint is often heard that *neuroscience* is too technical and too detailed, and thus of little use for those who wish to gain insight into more comprising and therefore more important questions. *Philosophy* is often accused of being too delirious and too abstract in order to be relevant for more concrete, and therefore also more vital, concerns. *Psychoanalysis* is considered bizarre, only for insiders, and not in the least too little comprehensible. Such prejudices, which often go hand in hand with ignorance, can only be met through an encounter with the parties at issue.

The body is the place par excellence where the parties gather. The place of the body is ambiguous, being the ground of both subjectivity, objectivity, and intersubjectivity. As a phenomenon with a sometimes perplexing plurality of registers, the body is not a research object pertaining to one particular discipline. The body requires several perspectives to intervene. Consequently, an adequate approach of the body has to be multi-perspectival. However, there are no clear-cut boundaries that distribute the task over various disciplines. *Neuroscience* is not solely occupied with objectivity; clinical angles and attention for experience allow revealing the impact of brain functioning on the subject and subjective, in this case bodily, experience. *Phenomenology* has an impressive tradition of examining the constitution of both objectivity (and the objective body), subjectivity (and the subjective body) and the establishment of intersubjectivity (in which the body plays a crucial role). In *psychoanalysis* the subject, and subjectivity, is explicitly thought of as an effect of intersubjectivity (or the Other), whereas this intersubjectivity is conceptualized as a symbolic social bond. Moreover, it contributes considerably to a better understanding of embodied (inter)subjectivity. Whereas philosophy has the overall tendency to treat subjectivity in its generality, psychoanalysis focuses on the particularity of the subject and the body.

In this volume, the focus is on the issue of body image and body schema. They are the conceptual anchors of this series of contributions. The three disciplines each have a peculiar connection to body image and body schema. This is most striking for neuroscience, which deals with the concepts of body image and body schema within a neurological context since the beginning of the 20th century. Halfway the 20th century, phenomenology explicitly takes up the concepts via child psychology, and a phenomenological account has been and still is elaborated. The source of child psychology is shared with psychoanalysis, which comments the body image at length in the discussion about the mirror stage.

Notwithstanding common inspiration, phenomenology and psychoanalysis do differ in their conception of the subject. Next to that, the neuroscientific or neurological usage of philosophical conceptions or a too hasty reference to the discipline of phenomenology sometimes appeals for a more cautious or mastered use of philosophy in the sciences. Vice versa, efforts to obtain a more informed philosophy or phenomenology may help solving a number of philosophical debates.

Body image and body schema have no fixed status; they are conceptualized in different ways and give rise to a multiplicity of possible applications. Very often, the distinction between body image and body schema is used as a *heuristic* tool in setting up a philosophical discussion and in exploring in a philosophical way the experience and functioning of the human body. In neuroscience, body image and body schema can function as *explanatory* tools, e.g. as guides in interpreting experimental data. At the same time, they can ask for further explanation in relation to the interfaces, interactions, and mutual influences of body image and body schema or in relation to their possible dissociation. In psychoanalysis the body image has first and foremost a *clinical* importance. It is addressed and constructed throughout the free associations of a subject in analysis and witnesses of a subject's particular history on the one hand and of the particular logic of his or her interaction with others on the other hand.

A confrontation of those particular usages – heuristic, explanatory or explorative – leads to a questioning of the terms themselves, with at the horizon a search for a common ground that can be useful for neuroscience, phenomenology and psychoanalysis.

1.2 Towards a dynamic structuralism?

What then could be the common ground on which neuroscience, phenomenology and psychoanalysis can co-operate? In our opinion, a plausible candidate is "dynamic structuralism".[1] A dynamic-structuralist background may even be decisive for the several contributors to understand each other.

What does such a background involve? The combination of dynamics and structure appears to be an oxymoron, because something process-like is combined with something rather fixed. The contributions from different perspectives teach us, however, that such a paradoxical guise is not necessary. On the contrary, dynamics and structure complement and even require each other.

A dynamic point of view is implicitly or explicitly present in the three disciplines. It is clearly present where the plasticity of neuronal organization is emphasized and the idea of a map-like organization with fixed boundaries is weakened. The brain is highly dynamically organized in that it adapts upon experience and is capable of an organizational solution different from the usual one in case of pathologies or within exceptional conditions.

A dynamic philosophical account, phenomenologically inspired, joins this neuroscientific emphasis on dynamics. The experience of the living and lived body calls for a dynamic approach, in which the dynamic kinetics of the body are taken into account. Being an intentionally directed system, the embodied subject is situated in time and is always engaged with the other and with its surroundings. These interactions, in which the moving body plays a crucial role, have been described and explored since the beginnings of phenomenology. Recent phenomenologically inspired approaches take those phenomenological concerns at heart, but not without topical motivation.

Psychoanalytic conceptions of the body adopt a dynamic perspective as well. From a psychoanalytic perspective the body is considered as a continuous retroactive reconstruction. The interactions between a subject and its environment have priority. The dynamics of the body and broader of the subject are also articulated in terms of desire, i.e. a certain intentionality driven by a lack.

The dynamic approach of the three disciplines is characterized by a focus on a particular kind of openness, situated on different levels of bodily organization: the motor body, the living and lived body, and the particular, embodied subject.

To the extent that the dynamics of the brain, experience and the subject are organized, the emphasis on dynamics is in accordance with a structuralist point of view. Body image and body schema can be considered in terms of structures in the neuronal organization and/or in bodily experience. However, we must be cautious here. Structure is not to be conceived of as something thing-like in the brain, or as a kind of rigidity or fixity in bodily experience. To talk about structure is to talk about a structuring *effect*, i.e. a structuring effect in neuronal organization, in experience or in the formation of the subject.

Neuroscience clearly shows that the motor capacities of the dynamic, kinetic body do not constitute an unorganized, freely flowing event, but are rather highly organized and structured processes. If the body schema is defective, the motor body loses its capacity to activate structured motor patterns. Moreover, cases of dissociation of body image and body schema show the breaking apart of a structure in which body image and body schema co-operate. More common experience, e.g. training in playing an instrument, shows that the body can acquire new motor structures. Nevertheless, re-structuring of the motor body and of body image also proves very difficult, as in the case of phantom limbs.

Furthermore, phenomenology shows that the body image conceptually, perceptually and emotionally inhabits and structures the body. The free-flowing experience of the motor body differentiates into conceptual, perceptual and emotional layers that each exhibit a specific structure and in turn structure the body. This implies that the body in its body-schematic aspect is no longer accessible in its "pureness", but is always mediated via several structured perspectives onto the own body. This mediateness does not mean that the body has become an object, which must be approached in an externalist way. It does mean that the accessibility of the own body has become a critical issue.

Phenomenology and psychoanalysis share this emphasis on the structuring effect of the body image. Regarding the formation of the subject, psychoanalysis shows how the lack and the Other have a structuring effect on the subject. This is made explicit through the theory of the mirror stage, in which a new structuring of the subject is described. In the mirror stage, the real lack motivates the infant's interest in its image in the mirror, and the desiring Other determines the perspective of the infant on its image. In this sense the mirror stage constitutes a new structuring of the subject in that it introduces something radically new: it alters the subject's relationship to its body and to the Other, and thus alters the subject itself.

In the three disciplines, the structural approach stands in a dialectical relationship to the dynamical approach: structure organizes and constrains dynamics. Without a structural closure, the dynamic openness could never be active in a directed, creative way, and the conditions for the constitution of an embodied subject would be absent.

2. The headlines

2.1 Embodiment, speech and mirror neurons

In the first three contributions, mirror neurons play a particular role. Firstly, Stamenov reconsiders the function of the mirror neuron system and connects it to the rise of the body image. Secondly, De Preester examines the reference to the phenomenological tradition in the mirror neurons theory and considers the philosophical-conceptual background of it. Thirdly, Bazan and Van Bunder take inspiration from the mirror neurons theory and uses its findings for backing up her motor account of speech. The three contributions also are connected because of the presence of the voice and speech. Stamenov states that self-awareness is sustained by speech and is part of the body image, while self-consciousness is sustained by language and is not part of it. De Preester uses the issue of the voice and speech in order to clarify distinct phenomenological pathways. Bazan and Van Bunder focus on speech as a motor phenomenon, and elaborate upon the connection with emotion.

Stamenov opens with a consideration of the body schema as a set of neural "representations" of the body and the bodily functions in the brain. The body image, then, consists of explicit mental representations of the body and bodily functions and leads to body image experience. He investigates the ways of implementation and functioning of both body schema and body image, and their possible interfaces. That is done according to three criteria. (1) Are they a single unified structure or a set of fragmentary patterns? (2) Are they a well-formed pattern or a dissipative manifold? (3) Are they self-identical or do they function on first-come-first-serve basis? Consistently, Stamenov defends and argues each time for the second option. But if we are indeed in possession of multiple body schemas and body images, how could we ever manage to envisage a founding, grounding interface between them? A grounding interface would provide us with the gut feeling of stable embodiment and unified self-experience. According to Stamenov, the unity we feel is due to the holism of the physical body itself and to the nature of the integrative mechanisms of awareness and consciousness. Still, the integration mechanisms have to be specified, and three possible scenarios are presented for how body schema and body image relate to each other: a "vertical", a "horizontal", and an "extraction scenario". In a vertical scenario the body schema is implemented in the brain as a well-defined pattern and provides the conditions for the emergence of a body image representation. The recent hypothesis of the "neuromatrix" exemplifies this account. This hypothesis, however, denies the fact that the supposed holistic body schema consists of dissociable components, depending on the tasks to be performed with its mediation. Consequently, an attention process is still required in order to provide the proper focus on the somatosensory and sensorimotor signals. Moreover, there are problems in distinguishing and relating body awareness and self-consciousness. The former is capable of being anchored in inner or outer voice experience. The latter, in contrast, is not considered being part of body schema and body image; it becomes instantiated in two basic ways: as a perspective (e.g. in imagination or memory), and as an anonymous personal pronoun *I* in language structure. In the horizontal scenario, both body schema and body image are localized as areas in the brain. There is, however, a coordination problem in the case in which one perceives oneself and both body image and body schema become activated (unlike when one perceives somebody else). It is here that Stamenov introduces the inborn mirror neuron system as an "extraction program" triggering during ontogenesis the development of one's own body image. Stamenov argues that this is the primary function of the mirror neuron system. The mirror neuron system might serve as an inborn mechanism for connecting some of the brain areas responsible for the representation of the body. Thus, the extraction of a root version of a body image from the inborn body schema toolkit is the primary function that the mirror neuron system is designed to perform.

From a phenomenological perspective, the issue of the mirror neurons is continued by De Preester, who shows that in the mirror neurons theory, there is an implicit mixture of two conflicting phenomenological "logics", a husserlian and a merleau-pontian one. Both logics are approached via the phenomena of speech and the voice. In a first part, Husserl's two versions of the establishment of intersubjectivity are presented. A first version proposes a similar body image of ego and other ego as the basis for intersubjectivity. A second version recognizes the difficulties of that approach and switches to the similarity between the own sounding voice and the voice of the other as the basis for intersubjectivity. Based on Derrida's critique, it is shown that both versions use a similar logic, in which there is a primacy of the presence to oneself. This means that, in order to arrive at intersubjectivity, the analogy between ego and other presupposes an ego present to itself. This presence to oneself is direct with regard to kinesthetic sensations (cf. movement in general, including movements for speech), less direct with regard to the body image in the visual modality (cf. Husserl's first version), but almost equally direct as kinesthetic sensations in the auditory dimension (cf. Husserl's second version). Alternatively, not the presence to oneself, but the directedness to a common intentional object is primary in the constitution of intersubjectivity in Merleau-Ponty's logic. This common intentional object is central in his account of action understanding, imitation and intersubjectivity. The analogy with the other is no longer established based on a similarity of which one of the terms is situated in the order of the ego. Instead, there is a common term found in the external world. This common term is an intentional object intersubjectively shareable from the start. Consequently, imitation of the other takes place when a subject tries to arrive at the same result or the same intentional object as the other. It is when the subject discovers that, in aiming at the same result, it makes the same movements as the other, that identification can emerge. Here, identification or the recognition of similarity is no longer a precondition for intersubjectivity, but a result of it. Finally, it is shown that in the mirror neurons theory, both a merleau-pontian and a husserlian logic are at work, respectively in the characterization and in the explanation of the functioning of mirror neurons.

The contribution by Bazan and Van Bunder explores the issue of speech further. It proposes a tentative neurophysiologically framed approach of the Freudian unconscious, based on clinical, phonological and neurophysiological arguments, partly inspired again by the mirror neurons theory. Basically, the unconscious is considered as functioning on the basis of linguistic (phonological) organizing principles. Clinical reports indicate that in a state of high emotional arousal linguistic fragments are treated in a decontextualized way. That can lead to the isolation of phoneme sequences which are able to resort emotional effects independently of their actual meaning. This decontextualized way of language processing has a neurophysiological counterpart in object understanding (in distinction to action understanding), and is psychoanalytically akin to primary processing. Isolated speech fragments are therefore considered as objects which, similarly to non-linguistic objects, undergo emotional conditioning and establish an idiosyncratic linguistically structured emotional memory. Against the background that language processing is a motor event, linguistic fragments that carry high emotional valence are more readily inhibited, as they are thought to be more readily subject to threaten bodily integrity. The inhibition prevents motor realization, but in seeking for release, the inhibited linguistic fragments function as attractor for phonemically similar substitutes that are not censored. These substitutes are verbalized and as a result, the speech of the subject is particularly concerned with the verbalizations of these substitutive phoneme sequences. In summary, the Freudian unconscious is conceived of as the instantiation of a linguistic action space which is idiosyncratically organized by particular phonemic "phantoms" operating as attractors for the subject's (linguistic) actions. With this neurophysiologically inspired hypothesis, Bazan and Van Bunder prepare the reader for the next section, which approaches the body from a neuroscientific perspective.

2.2 Dissociation of body image and body schema and ways of embodiment

The following contributions show that being embodied is a complex phenomenon with distinct but interrelated layers, which can nevertheless be dissociated. Those possible ways of dissociation are presented in a number of neuroscientific contributions by Paillard, Rossetti et al. and Mishara. The focus on different possible ways of embodiment and several ways in which the structuration of the body can happen is also explicit in the psychoanalytical account by Sauvagnat and the phenomenologically inspired contribution by Depraz.

Based on his long expertise in neuroscientific research concerning body image and body schema, Paillard offers a neural basis for the distinction between body image and body schema. He does so in terms of configural versus vectorial encoding of bodily space. This dual framing of body space is based on a body-centric space coordinate system (target space) versus a world- or object-centric space (shape space) coordinate system. Spatial relationships are processed in a dual way, and the sensorimotor body schema as well as the configurally coded body image derive from such a dual processing mode. Paillard develops the dual processing of space into a "what" versus "where" dichotomy, rooted in two visual systems, respectively for visual forms and for operating in action space. He gives us the neural basis for a vectorial and a configural encoding of body space, in which the parietal lobe plays a major role (cf. ventral and dorsal stream processing). Evidence from deafferented patients for a dual body mapping is twofold. On the one hand, the phenomenon of perception without the ability of location is presented. On the other hand, the converse dissociation is presented, i.e. location without the ability of perception. This blind touch is considered an equivalent of blind sight in the tactile modality. The data thus support Head and Holmes' original distinction between a postural schema and a body image. Paillard's contribution offers insight into the development of the above distinctions. It testifies of a part of the history and development of neuroscience and, intertwined with it, of an illustrative personal career.

From a similar, neuropsychological perspective, Rossetti et al. analyses the relationship between body schema and body image. He does so by offering neuropsychological evidence for the dissociation of conscious and non- conscious body representations. This dissociation occurs in the case of numb sense (described by Paillard as blind touch). Non-conscious body representations are highly specific to action, and a strong top-down influence of body image on body schema can be found. Further, Rossetti describes cases of unilateral neglect, in which patients nevertheless exhibit some form of unconscious knowledge about their bodily deficit. In those cases as well, there is a relationship between body image and body schema, one that is nevertheless more difficult to identify. Anosognosia, for example, can improve through vestibular stimulation. This may be due to acting on the body schema, and this may be sufficient to permit higher effects on body image consciousness. The case of stimulation on the sensorimotor level (e.g. with prism adaptation) also testifies of a bottom-up influence of the body schema level onto cognitive representations, such as body representations. There must thus be a great deal of permeability between body image and body schema. Moreover, body image and body schema are no static givens, but display dynamical interactions.

Mishara approaches the impairment of bodily self in schizophrenia, from both a neuroscientific and a philosophical perspective. He rightly warns for a too hasty usage of philosophical concepts to bolster neuropsychological models. This is illustrated with Sartre's dichotomous description of the human experience of the body (*en-soi* and *pour*-soi) and the parallel conceptualization in terms of morbid objectification and morbid de-objectification for psychotic depression and schizophrenia (cf. Minkowski, Sass). There is, however, no experimental evidence to constrain the investigator from making completely antithetical philosophical conceptualizations based on the same clinical data. Moreover, there is the danger of trying to fit the complexity of clinical and experimental data into the neatly ordered conceptual oppositions of philosophy. Yet, a cautious use of philosophical approaches may contribute to the development of novel approaches to schizophrenia. Therefore, Mishara prefers to follow a more demanding road. Based on the distinction between a vision-for-perception/vision-for-action system, the role of the parietal cortex, the distinction between the ventral stream/dorsal stream and the distinction between body image and body schema in bodily experiences of schizophrenic patients are approached. More precisely, patients with schizophrenia suffer from an inability to avail themselves of the sensorimotor transformations of shifting frames of reference. They employ a compensatory body-schematic strategy to compensate for the loss of unity of the body image. Body schema, however, is itself disrupted in schizophrenia. More in particular, being affected by the experiential field exhibits a deficit. A cautious use is made of the Sartrean dichotomy, and it is shown that Husserl's study of prenoetic processes is concordant with this specific outcome. Moreover, this contribution has the merit of counterbalancing the recent emphasis on self in terms of self-representation, self-referentiality, hyper-reflexivity or pre-reflective awareness.

Whereas Mishara focusses on the bodily self in schizophrenia, Sauvagnat examines body structure in psychotic and autistic children. The first problem addressed is that of the diagnosis of autism. Sauvagnat convincingly shows how the opposition between infantile psychosis and autism has been overestimated for ideological reasons, and more importantly that this led to an underestimation of body-structure disorders in autistic children. Nevertheless autistic children suffer from several typical difficulties concerning their body image going from sleep disorders, feeding problems over encopresia and enuresia to the absence of transitional objects and imitation disorders. All these symptoms express the difficulty of the autistic subject to experience its body as a closed, controllable totality. Interesting in Sauvagnat's approach of this problem is the way in which he brings this in relationship with the psychotic language disorders that also characterize autistic children – disorders such as the refusal to be directly addressed, the absence of a symbolic frame of reference of the patient's body, stereotypes and echolalia. Sauvagnat then proposes some critical phases in the continuing structuration of the child's body and confronts the normal/neurotic development with the experiences of the psychotic/autistic child. In normal infants from very early on body structuration is influenced by the capacities of interaction and expressivity and by the structuring role language plays in the perception of the outside and the inside world. Moreover, Sauvagnat emphasizes that the interventions of the mother during feeding and cleaning are of crucial importance to establish a sort of closure of the body. He proposes to call this originary function the primary bodily nomination. Without this nomination the mirror stage – elaborated in the interventions by Le Gaufey, Knockaert & Steenhoudt and Van Bunder & Van de Vijver – becomes problematic. Subsequently autistic/psychotic children have problems using designative words and the first person pronoun. Instead of this, echolalia often prevails as a means to avoid de-personalisation by linguistic turn-taking and an attempt to maintain a sort of bodily continuity. As in the case of anorexia, it becomes clear here that having a body is not a natural event at all.

From a different, phenomenological perspective, Depraz also presents distinct ways of being embodied. She suggests a strong link between risk and embodiment. Being embodied is being able to take risks, that is, being open and exposed to the unknown. Living beings are mainly characterized as moving beings. Nevertheless, Depraz argues for a distinction between two modes of being embodied: a risky way and a secure one. This distinction correlates with the distinction between *Leib* and *Körper*, and the two ways of being embodied are found in both body image and body schema. The distinction is used to engage in a renewed description of animal embodiment in contrast with vegetal embodiment. The analysis is, however, complex, and not just putting animals at the risk side and plants on the security side. In her analysis, Depraz relies on the crossroads between phenomenology and biology, like in the work by von Uexküll, Merleau-Ponty, Jonas and Varela. Moreover, the characterization of living beings as moving beings is more precisely articulated with a relational component. Being embodied is being related. According to Depraz, embodiment is permeability: receptivity and openness. Being embodied is a particular mixture of exposition and stabilization, which endows each living being, animal or plant, with its singularity. In emphasizing the permeability of living beings, Depraz opens up a dynamic perspective on embodiment.

2.3 Dynamic interpretations of body image and body schema

The following contributions give an explicit and detailed account of the dynamic approach which remains rather implicit in the previous chapters.

Petit helps to remove a misunderstanding which has important consequences and is rooted in a persistent, representational background. He inquires whether the opposition between the fixity of anatomic *Körper* structure and the free fluidity of the meaning patterns of *Leib* subjective experience is not on the verge of vanishing. Neuroscience has shaken of its former belief in a rigidly somatotopic representation of the peripheral organs of the body within the frontiers of definite somatosensory mapping territories of the cortex and thalamus. Instead, there is a recording of constantly moving functional activation patterns. There is representational plasticity, shaped and modulated to a considerable extent by the unique experience of the organism in its environment. Petit illustrates this with examples of reorganization of functional structure following deafferentation and topographical changes induced by experience, both in the somatosensory and the motor cortex. He brings together the flow of functional activity of the brain and the flow of lived experience of the body in an attempt to bridge or narrow down the gap between activation and meaning patterns. Since the discovery of the representational plasticity of the cerebral tissue, the idea that there is a projective relation between the body and the central Penfield homunculus is no longer appropriate. The brain is no brain-machine, but there is a dynamic interaction between the body, the brain and the world, which is absent from traditional representational ideology. Recent research moves into the direction of functional neuro-dynamics and neuro-plasticity. Consequently, neuronal determinism is no longer a plausible point of view, and the idea that there are "maps" in the brain is no longer adequate. A dynamic account is far more suitable for the phenomena at issue. Petit sees in the above a fine analogy with the transcendental constitution of the own body in genetic phenomenology. This improbable encounter between a neurodynamic and a genetic phenomenology might break the circle of representation, which still holds neuroscience imprisoned in the paradigm of the mechanical brain and the body representationally intellectualized.

Sheets-Johnstone puts the terms and the concepts of body image and body schema into question, both from the point of view of languaging experience (the terminological issue) and of being true to the truths of experience (the conceptual issue). According to her, there are intrinsic weaknesses in the terms, and a replacement of the terms that do empirical and conceptual justice to the phenomena at issue is proposed. We are kinesthetically alive and kinetically attuned as infants. In that, movement is not sensational and not punctual, but a dynamically felt temporal phenomenon, a "kinetic melody". To move is a tactile-kinesthetic and kinetic happening. Yet neuroscientific studies tend not to investigate the fundamental ways in which self-movement anchors our cognitive and affective lives; too often it is just an afterthought. In contrast, life in animal kingdom starts with movement, with an intrinsic dynamics by which animate movement organizes itself and does so on the basis of the immediate kinetic possibilities of the moving organism itself. Body image and body schema are hypothetical entities conjured to do the trick of explaining how we do what we do. They are too mechanical, and we have to stop looking for or designating some *thing* that will answer to a capacity or function, giving the thing the status of an object by spatializing it, locating it in the brain, thereby putting it on the map, however hypothetical the map, or the thing itself (body image, body schema). Yet, nature should be understood dynamically, and Sheets-Johnstone gives a vigorous plea for that. "Body image" is too visually conceived of. We must instead focus on the basis in the corporeal-kinetic intentionality, on our bodily-kinetic experience. Embodiment suggests a container sense of experience, but we experience ourselves as animate and animated. The kinetic dynamics that in the most fundamental sense constitute bodily experience cannot be captured by an essentially static, visually anchored, and thing- or object-tethered terminology. Concerning the term "body schema", Sheets-Johnstone prefers "corporeal-kinetic patterning", because the notion of schema fails to capture the dynamics. The dynamics are not "things" in the brain, but transitory spatio-temporal phenomena, corporeal-kinetic patternings. Although reification concretizes body image and body schema, the temporal aspect evades.

From a present-day phenomenological perspective, Gallagher replies to objections raised against the use of the concepts of body image and body schema. First, he presents evidence from ontogenesis and pathology for the conceptual distinction. Second, he pays attention to more recent objections that have been raised against the usefulness of the concept of body schema. The objections come from both a neuroscientific (cf. Jeannerod) and a phenomenological (cf. Sheets-Johnstone) corner. Both sets of criticisms complain that the concept of the body schema is too static, and that to adequately explain movement and intentional action, a more dynamic concept is needed. According to Gallagher, the body schema is already a dynamic concept and is best understood in this way. Gallagher defends his point of view based on Merleau-Ponty and Arbib, and argues that recent criticisms miss the mark. According to the author, the criticism is terminological, and not conceptual, since there are clear ways to think of body schematic processes and even of the body image as dynamic processes. Gallagher offers abundant references to the literature at issue, and a nice overview of what happens in the field, especially concerning body schema.

2.4 Clinical approaches and the mirror stage

The dynamic perspective of the preceding section is maintained in the following contributions, but explicitly thought in structuralist terms. More in particular, the structural conditions of the constitution of the subject constrain the dynamics of the embodied subject. This is exemplified via the theory of the mirror stage as a crucial structuring moment in the formation of the subject. It also shows that the access to the body is mediated, i.e. that the body is intersubjectively constituted. Moreover, the importance of a clinical approach is recognized. In such an approach, the speech of the subject and the way the subject reports about his or her bodily experience takes a central place. That a neurophysiological account also creates room for intersubjectivity and a clinical approach is shown by Cole, who closes the volume.

In the contribution by Van Bunder and Van de Vijver, the metaphysical background of the concepts of body image and body schema is scrutinized. The body image has a reflective status, i.e. it takes the own body as its object. The body schema is non-representational and non-reflective. The status of reflectivity is, however, in need of clarification. What does it mean that the body image takes the body as its object? What is the status of reflection here? And what reasons are there to assume that the own motor body is directly and evidently experienced as a moving object, present to itself? The point of view in which the body is at some point evidently present to itself is identified as stemming from a metaphysics of presence. But does the reflection leave the presence of the body to itself unaltered? Can the own body be unambiguously and positively identified on the basis of its direct experience? According to the authors, it is rather the case that the own body is a reconstruction after the facts. This option witnesses of a metaphysics of non-presence, and is closer to a dynamical, interactive perspective. In such a point of view, dynamical interactions have priority and the experience of the body is unavoidably mediated, such that a direct access to the own body through experience is impossible. Van de Vijver and Van Bunder look at what can be learned from Merleau-Ponty and Lacan on that point. What is the exact nature of the "own" body? First, it is shown in what sense Merleau-Ponty and recent phenomenological research (in this case the work by Gallagher) are different. Next, it is shown how the body image is a matter of identification, not of representation, in the mirror stage. The relation we have to our body is, from the mirror stage on, mediated by the image. As a result of the body image as identification, the meaning attributed to it by Lacan and Merleau-Ponty is different from the meaning we find in current phenomenology. The body image does not result from representing some aspect of the body, such as the moving body, but from the recognition of the image in the mirror. It can be said that according to current phenomenology the body image is constructed as a representation, while according to psychoanalysis the body image already exists and is, so to speak, waiting until someone identifies with it. Moreover, the body image has a unifying character, and is not partial and fragmented. Therefore, the mirror stage can be seen as an event that alters the interaction between system and environment, because even the relation to the own body changes. The autonomous functioning of a previous level is put to a stop. That has consequences for the unmediated access to the own body. Once the mirror stage passed, the access is no longer unmediated. In the mirror stage, the child gains consciousness of the body as a totality, and this happens at a time when the motor functions are not fully integrated. The imaginary mastering is thus anticipatory of the real mastering.

In line with Van Bunder and Van de Vijver's reasoning, Le Gaufey addresses the reflective status of the body image. In his thorough comment of Lacan's invention of the mirror stage he developes the idea of the body image as a unity that is created through an (instantaneous) identification with an image in the mirror. The unity and the status of what is in front of the mirror are no pregiven entities: they do not exist before the identification. The identification thus anticipates on a unity that does not yet exist for the 'infant' that is transformed by it. It is in this sense that we can consider the mirror stage as a sort of metaphysical moment, i.e. as the introduction of something radically new, the ego as the very reflection of a reflection. Again we thus find how a direct access to the own body through experience is impossible. Then Le Gaufey scrutinizes Lacan's re-articulation of the mirror stage in terms of the dimensions of the real, the symbolic and the imaginary. With the help of an optical schema with two mirrors we can now distinguish not only the image in the mirror and what stands in front of it, but also the eye as the point from which the body is seen. What determines this place? This new question brings a certain detail of the mirror stage to focus: the turning around of the infant before the mirror towards the adult next to him and the fleeting glance at his eyes. It is the gaze of the Other that is interiorized here, through a sign, an *einziger Zug*. This single trait, sign of the Other's assent, helps the subject adjust his setting in the subsequent operation of the mirror. Another word for this single trait – a unity that cannot be partitioned – is the ego ideal. The unity in the mirror is also called the ideal ego. Important here is that this latter unity has to be linked to the assent that the infant looks for outside of the mirror and the image itself.

Knockaert and Steenhoudt address the relationship of anorectics towards their bodies. In the first part, anorexia is situated within the singular dialectic between a subject and an Other, articulated in terms of need, demand and desire. The latter are three essential dimensions in the psychoanalytic theory of the coming into being of a subject. An important implication of this theory is that the relationship of a subject to its body is an indirect one, mediated through the symbolic interpretations of the Other. Through these interpretations the needs of an infant become symbolic demands, demands that are fundamentally ambiguous. On the one hand they are a demand for a concrete object of satisfaction, and on the other they are a demand for love, for the presence of the Other. This ambiguity makes the birth of the desire of the subject possible, when it is confronted with the Other's absence or lack. It is this lack that is lacking in anorexia. The anorectic is confronted with an Other that is always there, and consistently interprets her demands as a need. In this way the subject cannot be confronted with the lack in the knowledge of the Other. The anorectic's refusal of the interpretations of this Other is an attempt to break the hold the Other has on her. The anorectic thus becomes a skeleton to make a hole, a lack in the Other. In the second part the authors articulate the implications this has for the body image or the ideal ego and the ego ideal of the anorectic. Both instances are the result of identification, respectively an imaginary identification with the image in the mirror and a symbolic introjection of a unary trait outside the mirror – i.e. the assent of the Other that was commented on by Le Gaufey. Anorexia is characterized by a murdering dialectic between the ego ideal and the ideal ego. On the level of the ideal ego narcistic rivalry and agression – directed against the own body and life – prevail, they colour the subject's struggle to create a difference between itself and the other, to escape psychic death. On the level of the ego ideal death appears as the unary trait in the Other. The anorectic reads the desire of the Other as the desire that she would be dead. Paradoxically then, it is as if for the anorectic only death can provide psychic life.

Geerardyn and Walleghem present Dolto's remarkable clinical theory on the *unconscious* body image. Dolto developed this theory throughout her psychoanalytic work with children. She discovered how the unconscious body image expresses itself in a symbolically structured way in the drawing, the modelling work and the play of a child. This by no means implies that it can be simply distilled out of the drawing or the play. The body image can only be reconstructed through the child's speech associations that accompany the former activities – as is clearly illustrated in the several vignettes that are commented upon in the article. Dolto's body image is thus first and foremost a *spoken* image. Although the main focus of Dolto's theory is the body image, she does differentiate it from the body schema. Whereas the body schema, as an anatomical entity, characterizes an individual as a representative of the human species independent of time and space and is in principle identical for every human being, the body image is described as a particular entity, constituted throughout a subject's intersubjective history. Dolto considers the body image as a living synthesis of our emotional experiences, a dynamic image or the tension of an intention. It implies an orientation to the future, to surrounding objects and people. It exhibits a desire characterized by a structural lack, pointing to the unknown. Important here is the interaction between body image and body schema. As Cole and also Rosetti argue, there is a permeability between body image an body schema, they interact dynamically. Dolto shows how a pathological body image can disturb the functioning of an intact body schema, and vice versa. The most stunning is the clinical finding that a damaged body schema can go hand in hand with a normal body image, if a child is allowed to play verbally with its body in interaction with significant others. Again this emphasizes the structuring role of the symbolic order: it is the subversion of the body schema through language that conditions the birth of the (unconscious) body image. In line with Cole and others, the body image is thus socially or intersubjectively constituted in Dolto's theory.

Cole's contribution closes the volume. From a different, neurophysiological perspective, Cole exhibits an equal degree of sensitivity for what the subject reports about his body and his bodily experience. Cole offers us neurophysiological evidence for the direct effects of sensory input on perception of the body image. Loss of a sensory input, e.g. during or after anaesthesia, may even temporarily affect body image in complex ways. The case of phantom limbs and the evidence that one can feel touch from a purely visual stimulus are also important illustrations in this issue. It turns out that the body image is very malleable in relation to changing sensory input. It is a kind of plasticity essential in everyday life (an issue also treated by Petit). This is also illustrated via the experiences Cole relates us of people who live without sensation or movement after spinal cord injury at the neck, in order to explore the way in which body image is dependent on the wider environment. That the body image is clearly differentiated from the environment is an oversimplification. Limitations in movement change the environment profoundly. Body image (and self-esteem) is not only dependent on the physical body, but also on physical access. Moreover, body image is not merely subjective; it is socially or intersubjectively constituted.

We wish the reader a pleasant and inspiring tour in the body image and body schema landscape. Beyond this wishing-well, we hope the present volume encourages professionals in turning a collective interest in the topic of the body into a shared interest.

Note

1. Our use of "dynamic structuralism" is inspired by Van de Vijver (2000).

References

Van de Vijver, G. (2000). Identification and Psychic Closure: A Dynamic Structuralist Approach. In J. L. R. Chandler & G. Van de Vijver (Eds.), *Closure, Emergent Organizations and their Dynamics* (pp. 1–12). New York: The New York Academy of Sciences.

Part I

Embodiment, speech and mirror neurons

Body schema, body image, and mirror neurons

Maxim I. Stamenov

1. The concepts of body schema and body image, and the problem about the mind/brain/body interface(s)

The concepts of body schema and body image were and are used in different ways. In this article, I will posit that the "body schema" is a/the set of neural "representations" of the body and the bodily functions in the brain. On the other hand, I will use the concept of "body image" for explicit mental representations of the body and bodily functions. The activation of the body schema in the brain is supposed to lead to body image experience (in this case some additional conditions may apply).

I will consider the ways of implementation and functioning of the body schema, body image and their possible interface(s) from a certain vantage point, namely to what degree the referents of these concepts can be instantiated as:

a. a single *unified* structure vs. a set of *fragmentary* patterns. I will claim that neither schema nor image are instantiated by a unified frame or are aiming at an overarching unification. Just to the opposite, all body-schematic "representations" of the body in the brain and images of the body in the mind are fragmentary and do not sum up to a single overarching hierarchy;
b. a *well-formed pattern* vs. an *opportunistic dissipative manifold*. The idea about a well-formed pattern may have different instantiations, e.g., as a "neuromatrix". I will maintain here, however, that at any level of their development, implementation and functioning, both the schema and the image are forming a sort of opportunistic manifold that does not sum up to a real or virtual well-formed single pattern. Thus, *the*-body-in-the-mind slogan must not be taken literally; and

c. *self-identical* vs. functioning on *first-come-first-serve basis*. I will maintain that there is no self-identity in the instantiations of the schema and image that could potentially serve as implementation of *the* embodied self. Just to the opposite, the position of explicit "embodied self" on every single occasion becomes usurped on the first-come-first-serve basis by some fragmentary body image.

I should point out that the assumption that to the unity, well-formedness and self-identity of the physical body must correspond a unity of the body schema in the brain and of the body image in the mind is much more pervasive than one may assume on first acquaintance. This belief may have different instantiations, e.g., as a belief in:

i. a self-identical, unified, well-formed body schema in the brain and a body image in the mind corresponding to it during on-line normal adult experience;
ii. a minimal unified body schema (neuromatrix) and a well-formed body image it generates when activated;
iii. a virtual unity of the body schema and image to be enacted and integrated at different levels as a single hierarchy during the ontogenesis of the human individual potentially aiming at a complete integration of the outcome of exteroceptive, interoceptive and proprioceptive information processing into an explicit cognitive representation of one's own body.

In the course of my article I will try to show that none of these beliefs can withstand critical scrutiny. In the final part of the article I will face a troublesome residual problem: If we indeed are in possession of multiple body schemas and body images, how could we ever manage to envisage a founding, grounding interface between them? It must be something like a "grounding interface" both in ontogenesis and on-line, isn't it? Even with the opportunistic many-to-many correspondence between schemas and bodies, it should be the grounding interface that would be still supposed to provide us with the gut feeling of stable embodiment and unified self-experience.

2. The concept of body schema

Comparing the two concepts – of schema and image of the body – we may notice from the very beginning that the body schema was and is used in a much more specialized way and is less popular. A search in the specialized database of the American Psychological Association *PsycInfo* shows that in it there are only 162 articles dealing with "body schema" and 5,897 articles dealing with "body image". In this situation, it is not difficult to guess that the latter term is used in a broader set of senses, in a more fuzzy way and closer to everyday usage. This status quo may also suggest that it would be much easier to define the nature of the body schema compared to body image. Unfortunately, this is not the case, as we will see below.

2.1 The two foundational body schemas – the body schema and the superficial schema

Head & Holmes (1911/1912), who are credited with the introduction of this concept into the scientific discourse, made the distinction between the following two senses of "body schema":

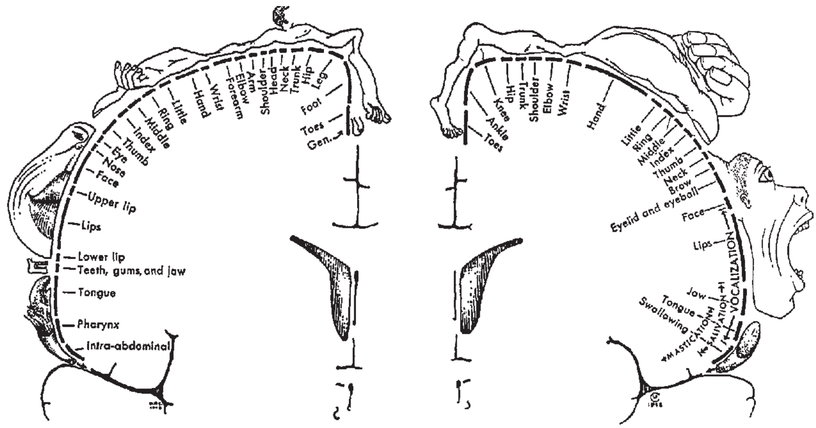
a. the "body schema" as a combined standard against which all subsequent changes of posture are measured before these changes enter consciousness; and
b. the "superficial schema" (a schema concerning the locality of spots on the body) as a central mapping of somatotopic information derived from the tactile information.

Both of these schemas were distinguished by Head & Holmes (1911/1912) from the body image. They cannot directly support the body image because:

i. they are modular and encapsulated from each other, i.e., they cannot provide the basis for the formation of an unified (multimodal) body image;
ii. they serve the function of automatically guiding the motor movement coordination (body schema) and the orientation into the interface between the body surface and the world of external objects (superficial schema); and
iii. the outcome of their performance is not accessible to consciousness.

2.2 The body schema of Wilder Penfield

The most famous up to the present day "representation" of the way the body schema is implemented in the brain is due to an illustration coming from the work of Wilder Penfield and his associates. Its popularity is due, to a quite significant degree it seems, to the idea of the authors to show the way the body is implemented in the brain by the means of the anthropomorphic image of the so called "sensory and motor homunculus" (cf. Penfield & Boldrey 1937).



Sensory homunculus. Motor homunculus.

Figure 1. The sensory and motor homunculus of Penfield & Rasmussen (1950: 214–215).

This image (or variation thereof) continues to find a place in the neuroscience textbooks even to the present day without the warning Penfield & Rasmussen (1950: 214) found appropriate to add later on that "such drawings may easily become confusing if too much significance is attributed to the shape and comparative size" of the corresponding body parts. In the edition of 1950, an attempt was made to correct the confusion in question by including an underlying indication of the extent of representation (see Fig. 1), as well as avoiding to represent the "homunculus" as an integrated human body-like shape.

In analysing Figure 1, we find out the following features that characterize "the body set in the brain":

a. Each of the two homunculi does not form a human body gestalt on its own count;
b. Each of them is representing the human embodiment in a "rag-bag" form of a set of fragments;
c. In both homunculi, two body members seem to be represented in an impressively exaggerated way (compared to their actual size in the physical body) – the hand and the mouth; and
d. The set of fragments constituting the sensory and the motor homunculus do not fit isomorphically onto each other (compare, e.g., the "representations" of mouth and hand in both of them), although "the sensation of each part on the postcentral gyrus and the movement of that part on the precentral gyrus are related to each other as though there were horizon-

tally arranged connecting fibers extending from one bank of the Rolandic fissure to homologous in the other" (Penfield & Rasmussen, 1950: 214). They also add that

> although there is usually a close correspondence between somatic sensory and motor representations, the correspondence is not complete. It must be remembered that the representation of sensation refers to specific areas and parts while the motor representation refers to movements of those parts. Different movements of the same part may have different localizations (p. 215).

The "image" of the body in the brain is impressively nonanthropomorphic and fragmented. Neither the motor nor the sensory homunculus can function as a body schema that can become "the neural correlate" of a body image in the way we usually experience ourselves. Looking at it, we should probably ask ourselves first not how it comes together but rather why the brain found it necessary to "represent" the body in such a dissociably fragmented way along different dimensions? If a Martian is given the task to reconstruct the human body from its "map" in the brain, he really would have a hard time. For its proper functioning, the "brain's body" requires imposition of structure and coordination that must come from elsewhere. This is the lesson we get in analysing the way of "representation" of the body in the primary somatosensory and sensorimotor cortex.

2.3 The innate body schema as a blueprint of the "physical self"

Although Head and Holmes (1912) already posited the plurality of body schemas that are furthermore not directly accessible to conscious experience, the belief in a single body schema instantiated in the brain, capable of being inherited as a configuration and giving rise to the experience of being embodied remains with us up to the present day. According to Melzack (1990), the observations of aplasic patients, i.e., patients with congenital limb deficiency or amputation in early childhood that report phantom limb experiences, can be summarized in four points:

i. The experience of a phantom limb has the quality of reality because it is produced by the same brain processes that underlie the experience of the body when it is intact;
ii. Neural networks in the brain generate all the qualities of experience that are felt to originate in the body. Inputs from the body may trigger or modulate

the output of the networks but are not essential for any of the qualities of experience;

iii. The experience of the body has a unitary integrated quality which includes the quality of the "self", the feeling that all the parts of the body are uniquely one's own;

iv. The neural network (the neuromatrix) that underlies the experience of one's physical self is genetically determined but can be modified by sensory experience (Melzack 1990: 90).

Melzack et al. (1997: 1603) repeat the claim that "there is a convincing evidence that the neonatal brain is genetically programmed to develop neural networks that subserve the perception of the body" along the following lines:

a. There is a neural representation, or neural network, of the body that, when active, gives rise to perceptual experiences of our body;
b. The neural representation in question is distributed in the sensory cortex and the areas throughout parietal lobes; and
c. The neuromatrix is, in part, innately determined (Melzack et al. 1997: 1619).

In its more recent formulation the hypothesis about the "neuromatrix" was expressed more cautiously and, thus formulated, loses much of its controversial appeal. Even in this form, however, it remains difficult to be proven, especially the thesis (a) – that there is a neural network of the body that whenever activated always "projects" a mental experience of being embodied. The thesis (c) is also no less problematic from the point of view of trying to prove which components of the "the neural representation in question" are innate and which are not.

At the end of this section let me add that in the most recent literature dealing with body schema (cf. Nelson 2002, for the state of the art overview) one may put in the title "the brain's own body image" in singular (please note the metaphoric use of "body image" for body schema in this case), but what one studies are always different components and/or configurations thereof and their potential overarching unity never comes into question. Another trend aims to show that the supposed holistic body schema consists of dissociable components depending on the tasks to be performed with its mediation (cf. Schwoebel, 2002). The unity of the body schema remains taken for granted in cases like these without risking to assert that explicitly, as Melzack did.

2.4 The body "representation" in the brain

A challenging alternative hypothesis about the way of implementation of the body image in the brain that does not map directly to one's own body schema (in the sense of Head & Holmes 1912) and potentially adds an additional perceptual (visual) homunculus to the previous set of sensory and motor ones (cf. Penfield & Rasmussen 1950), was suggested recently by Downing et al. (2001). They have found a distinct cortical region in human visual cortex that responds selectively to images of the human body. This region is localized in the *right lateral occipitotemporal cortex* of the human brain. The authors suggest that this region they name "extrastriate body area" (EBA) serves as a *specialized neural system for the visual perception of the human body*. It is a distinct visual region not overlapping with the other specialized ones already identified – those for human faces and for places.

Downing et al. (2001) point out that this specialized system for processing the visual appearance of the human body may play a functional role in the realization of following tasks:

a. to identify individuals, perhaps under the conditions in which face recognition is not possible;
b. to perceive the position and/or configuration of another person's body, perhaps as part of a broader system for inferring the actions and intentions of others;
c. to perceive the configuration of one's own body, for example in the guidance of actions (Downing et al. 2001: 2472).

In this way, both the body image (= EBA) and the body schema (= primary somatosensory cortex) become localized in distinct brain regions.

Downing et al. (2001) are not the first authors that made an attempt to localize the way of implementation of the body schema and the body "representation" (image) as two separate components that are both localized in the brain as an interlocked circuit. Berlucchi & Aglioti (1997: 561) before them suggested that *the* brain mechanism for body self-awareness may be subserved by the coordinated action of a neural network consisting of *primary somatosensory cortex* and the *right posterior parietal lobe*. There is, however, a residual problem one must face in order to give higher credence to this type of account – namely, how the interface between the two posited distinct brain regions becomes established unifying them into a single framework in the case I am monitoring myself doing something, unlike the cases when I observe other humans enacting the same pattern of behavior, i.e., how one's own body image is discerned from others' body images by the brain. My own hypothesis how the interface is established and the extraction of the body image from the inborn "body schema toolkit" proceeds will be given below.

3. The concept of body image

Unlike body schemas, the body image is envisaged as *available for conscious experience* and as *possessing an integrated, unified multimodal character* due to the simultaneous representation of visual, tactile and motor information of corporeal origin (Head & Holmes 1911/1912).

Schilder (1935/1950: 11) offered an early influential definition of this concept: "The picture of our own body which we form in our mind, that is to say, the way in which the body appears to ourselves" or alias "the spatial image, which everybody has about himself" (p. 7). He also strongly insisted on the gestalt quality of the body image, including the libidinal and emotional part of man's life but also the subconscious physiological postural model (body schema in Head & Holmes 1912 conception) and the surface model of the body (Head & Holmes's 1912 superficial schema).

At some point, one of the distinguished researchers in the field Seymour Fisher (1990: 18) came out with the idea that there is no such entity as "*the* body image"; there is rather a set of body images that serve a set of purposes mediating the relationship of the organism to different stimuli with as well as without concomitant awareness of this mediating function of the body representations. This alternative was reformulated by Pruzinsky & Cash (2002: 7) as the "multidimensionality" of body experience without a body image, i.e., there is no body image, there are body images.

If this is the case, we find ourselves in an impasse from a different point of view: If our body images are "multidimensional", how may it come about that each of us experiences her/himself all the time as an instantiation of a single three-dimensional self-same body image? This intuition is so deeply ingrained and feels so sure and right that it must have a reason and explanation of its own.

3.1 How the body awareness becomes embedded in the body

Kinsbourne (2002), who offered an insightful treatment of the problem of the way one experiences her/his body as a unified whole in the immediate psychological present, also finds it appropriate to cite Schilder (1935/1950: 11) to the effect that the body image is "the three-dimensional image everyone has about himself", adding that it is a "three-dimensional one as seen from a certain perspective". This approximation to a visual gestalt can be felt as an integrated percept, without separately experiencing the contributions of touch, position sense, and balance. The body image becomes an object of attention in fleetingly foregrounding a body part (component) during pauses in action.[1] A component of the current "body image mix" can be also the autonomic arousal aspect of at least certain stronger emotional states which are experienced as sensations attributed to the body (e.g., palpitation, faster heart pulse, the burning sensation of a face reddening, etc.) (Kinsbourne 2002: 22).

The body image thus seems to depend on the application of attention to oneself (due to this application arises a body image with a distinct figure/ground structure; cf. below); otherwise the body image still remains with us but as "an ill-defined somatosensory background, in which the body's parts are not registered individually" (Kinsbourne 2002: 22), i.e., they do not come to a well-defined body image structure, but to a fuzzy set of bodily related experiences. The "ground level" of body image, I would like to insist at this point, is that of a rather ill-defined, dissipative (fringe) somatosensory experience, but not that of a three-dimensional image of oneself (in the way one sees and imagines a second or a third person) and this contradicts the claim of Schilder (as well as Kinsbourne himself) about body gestalt experience.

The processes of body control, of body actions and reactions, remain unconscious and automatically carried out unless and until the mechanism of attention is directed toward and amplifies the previously unconscious or marginally available to awareness somatosensory signals into a certain configuration of a *figure* (that is picked up and "magnified" by the focus of attention) and a "somatosensory background" (*ground*) (Kinsbourne 2002: 22):

Attention (Figure Pickup)
↑↓
Somatosensory Background (Ground)
↑↓
Somatosensory Signals (Background)
↑↓
Body (Unified whole)

In the psychological present, the figure/ground configuration forms the current version of body image and the background of somatosensory signals the current version of body schema. It is important to acknowledge properly that bodily awareness is multimodally integrative and has figure/ground, not part/whole structure. The figure has psychological gestalt properties. The ground, however, is not a gestalt or part thereof; it is rather a dissipative structure driven by situation selection from the set of the currently available somatosensory signals. The latter form, on their side, a larger neurophysiological "background" dissipative structure embedded within the neurophysiological whole of the body itself (including the brain). I should point out explicitly that the unity, well-formedness and self-identity of any single instance of the body awareness (image) is due to the physical body itself. To put it in a slogan-like way: One does need a body image (a body in the mind), because one is embodied.

3.2 The voice experience of *cogito ergo sum* as a component of the body image

The subtlety of the relation between perception and execution of speech, thinking and embodied self-consciousness was acknowledged already by William James:

> [...] the "Self of selves", when carefully examined, is found to consist mainly of a collection of those peculiar motions [described before this passage as "different movements of e.g., jaw-muscles, brow, glottis, etc."; addition mine: M.S.] in the head or between the head and the throat. (James 1890: 288)

Compared to other perceptual modalities (notably the visual one) and the motor behaviors, the speech perception and performance possess some unique characteristics:

i. The rate of fluent speech perception is estimated to be between 15 and 25 phonetic segments (approximated by the letters of alphabet) per second. All other types of stimuli in the mind are processed with the rate of 7 to 9 segments (chunks) per second according to Miller (1956). The speedup is due to the development in the brain during human phylogenesis of a specialized processor for articulate speech different from the processors dealing with all other sorts of sounds and noises around us;
ii. On the motor side, the speedup becomes possible due to the specificity of the human supralaryngeal vocal tract and the capacity to control its performance. The fast performance, apparently also helps to maintain in the specialized echoic memory longer stretches of sounds per time unit, thus further broadening the potential for speech processing in the working memory (cf. Lieberman 1991: 37–38, 59, 106 for further discussion).

The high speed on both perceptual and motor side, their high level of automatic coupling makes speech the most sophisticated perceptual-motor pattern that is monitored on a permanent basis (with oscillations to and from) by humans. We all happen to think and talk very predominantly with a concomitant awareness what we are hearing and what we are doing. This is the most demanding type of explicit cognitive activity the humans engage on a regular basis. The loop between hearing an inner voice and tracking one's intentions in thinking forms the fastest in time resolution and the most sophisticated loop for self-identification of the Cartesian type of *cogito ergo sum*. It should be remembered that the *cogito* is not a "flying spirit" and "intangible mind". It is usually implemented in the qualia of the inner or outer voice. It is possible to track and control thinking as "one's own" predominantly on the basis of speech awareness. Something more, in forming a loop between perception, motor behavior and tracking of intention, the experience of inner or outer voice provides for a self-sufficient circuit for the implementation of both self-awareness (in the immediate present) and self-consciousness (in planning and controlling one's own longer-term behavior). Self-awareness and self-consciousness can become coupled on a regular basis in verbal thinking only. The experience of inner or outer voice amounts to the most integrative and complex embodied self-consciousness.

3.3 The voice experience and the dual-feedback monitoring architecture of human self-consciousness

The research team of Willem Levelt (Nijmegen) has shown in certain significant details how speech perception and performance have evolved into a unique framework for embodying the self. In adults inner and outer speech processes are supported online by a specialized *dual-feedback cognitive architecture*. Two separate specialized brain circuits provide opportunity for monitoring one's own speech performance which serve apparently different purposes:

a. One monitors *outer speech* for errors like slips of the tongue, incorrect pronunciation, or inappropriate intonation patterns;
b. The other monitors *inner speech* more on the level of what one *intends* to say on the conceptual-intentional level (both in the case one plans afterwards to utter behaviorally or when one thinks for himself/herself; cf. Levelt 1989: 460–463; Levelt et al. 1999; Postma 2000). In other words, this is the level of planning and control of one's thinking-for-speaking.

Levelt (1989: 470) correspondingly distinguishes in his model an internal loop and an external loop in monitoring of speech. In external speech two more modules are enacted – those performing *actual articulation and actual audition* – which are not needed in the case of performance of internal speech (*execution of phonetic plans for speech*). The mechanism of attention can oscillate between them and monitor and control what is going on both during the planning and execution stage of speech performance.

Recent experimental data of Wheeldon & Levelt (1995) and Levelt et al. (1998) indicate that the phonological word representations which form the basis for self monitoring of inner speech are accessed about 200 ms prior to the actual execution of the motor speech articulation, thus confirming the theoretical prediction (for further discussion of the nature of self-consciousness as related to language, cf. Stamenov 2003).

4. The body image and the embodied self

Very early the concepts of the "body image" and "body self", "embodied self", "body ego" and the like started to be used interchangeably.

An influential early definition of the nature of the ego as related to body image genesis and development is due to Freud who traced *the* origin of the ego as ultimately derived from bodily sensations, chiefly from those springing from the surface of the body. It may be regarded as a mental projection of the surface of the body representing the superficies of the mental apparatus (Freud 1923: 253). Apparently, the stepping stone for the ego formation in Freud's conception might be taken to be due to a mental projection of the superficial schema of Head & Holmes (1911/1912). The point remains that the development of a certain aspect of the body image is found automatically to act as a vehicle, scaffolding, and/or direct implementation of a version of the "self" (in Freud's model of mind, however, there are two more agencies that may be attributed self-properties – the id and the super ego – i.e., the ego is not unique and well-defined on its own as the only mental projection of the body schema).

Two other early authorities discussing the nature of the body image – Lhermitte & Tchehrazi (1937) and Lhermitte (1942) – "play" with three different variants of this concept:

i. *l'image de soi* that can be rendered in English as "self-image" or "self-awareness";
ii. *l'image corporelle*, "body image"; and

iii. *l'image du mois corporel*, "image of embodied me".

Krueger (2002: 33) who works in the psychodynamic tradition, defines the "body self" as follows:

> The body self seems to consist of a group of images that is dynamically and preconsciously centered on body experiences. A body image is a conceptual composite of all sensory modalities; the individual's sense of cohesion is also a conceptualisation, because the entire body cannot be simultaneously retrieved from memory.

On the one hand, we find that it is very difficult to dissociate the development of the body image from the development of the self. On the other hand, we may find it much easier to accept the "multidimensionality" of the body image; we however would find it hard to consider the possibility of a multiply embodied self. After all, what would it mean to claim that "I" am "many"? The unity of the body image in many cases is taken for granted because of the implicit or explicit association with the embodied self. If we give up the availability of such a construct endowed with the properties of unity, well-formedness and self-identify in the brain and in the body awareness, the idea about the body image as an "opportunistic manifold" becomes much easier to live with.

5. Fragments of the embodied self vs. the invisible symbolic self

The *embodied self* is represented in awareness always by some aspect, component, or part of the body-image opportunistic-manifold. Some part stands for the intuited and/or inferred whole (that on inspection turns out never to be there).

The *symbolic self* , on the other side, is instantiated in two basic ways:

a. as a perspective to some virtual (past or future) situation and event in the world in the format of spatial cognition (imagination);
b. as the anonymous personal pronoun *I* in language structure. The *I* is represented in language, but it has no visual or imaginary referent (body image or embodied self) to which it can refer (in the way *chair* refers to "chair"). The referent of *I* is, thus, invisible. It "embodies" the whole that on inspection never turns out to be there.

The potential unity of the embodied self is achieved in *self-awareness* through the link to the body from "below". The unity of the body as a well-defined whole is not an outcome of an integration at that level (as discussed in Section 3.1). Self-awareness is, however, integrative in a different sense – in being multimodal.

The potential unity of the symbolic self is achieved in *self-consciousness*, i.e., outside of the limits of the "specious present", by the support of the symbolic (invisible & unified) self that "has it all" from language structure, discourse, and narrative. Self-consciousness implements the mechanism for monitoring of desires, beliefs, and intentions. It seems, however, impossible to have self-consciousness without a link to a quale implementing self-awareness. This becomes clear when one realizes that one can become conscious that one thinks about something very predominantly through becoming aware of the inner voice talking within oneself. For further discussion of the complex topic about the way of implementation of symbolic self-consciousness cf. Stamenov (2003). In our context, it is important to remember that self-consciousness effectively cannot exist without a (oscillatory) link to self-awareness that is hooked to some qualia related to aspects of opportunistic body image functioning.

6. How to trigger the extraction of a body image from a body schema: The MNS scenario

We saw that "the body in the brain" amounts to a set of body fragments "represented" in the somatosensory areas of the brain, so to say, rag-bag. They do not fit together into any sort of well-formed "neuromatrix" that can serve as the foundation for developing a body image. On the other hand, we have a brain area that seems exclusively, or at least preferably, dedicated to processing body image (cf. Downing et al., 2001). It remains still unclear how the interface between the two posited distinct brain areas (and possibly some additional others) becomes established unifying them into a single framework in the case I am monitoring myself doing something, unlike the cases when I observe other humans enacting the same pattern of behavior, i.e., how one's own body image is discerned from others' body images by the brain? I think that the link between the brain areas that are responsible for body representation is established by another inborn brain mechanism – the Mirror Neurons System (MNS) (cf. Stamenov & Gallese 2002, for an overview).

The class of mirror neurons (MNs) possesses some highly specific characteristics:

i. MNs respond both when a monkey (or a man) performs a particular action and when the same action performed by another individual is observed;
ii. All MNs discharge during specific goal-related motor acts. Grasping, manipulating and holding objects are the most effective actions triggering their motor response. About half of them discharge during a specific type of prehension, precision grip (prehension of small objects by opposing the thumb and the index finger) being the most represented one. The most effective visual stimuli triggering MNs' visual responses are actions in which the experimenter or a second monkey interacts with objects with their hand or with their mouth;
iii. Neither the sight of the object alone or of the agent alone are effective in evoking the neuronal response. Similarly ineffective is imitating the action without a target object, or performing the action by using tools;
iv. In over ninety percent of MNs a clear correlation between the most effective observed action and their motor response is observed. In one third of them this correlation is strict both in terms of the general goal of the action (e.g. grasping) and in terms of the way in which it is executed (e.g., precision grip) (cf. Fogassi & Gallese 2002 for primates; cf. Rizzolatti, Craighero & Fadiga 2002 for humans).

MNS appears to form a cortical system that "matches" observation and execution of two quite specific types of motor actions enacted with hand and mouth, respectively. It seems to be unconscious, automatic, and inborn. This makes the MNS a highly peculiar and controversial mechanism. Attempts were made to relate it to all higher human cognitive capacities like instrumental and social intelligence (including the theory of mind, imitation and role playing) and linguistic communication (cf. Stamenov & Gallese 2002, for a set of discussions, proposals and interpretations). What we are still missing is an account what sort of a function the MNS may serve that we share with apes and primates.

Gallese (2000) suggests that the primary function of the evolved MNS was to achieve on-line control of the execution of behavioral actions. The latter actions consist as a rule of more than a single motor movement and for this reason require planning. This can be achieved by the following "distribution of work" in implementing MNS: in a particular sector of the premotor cortex, the area F of a monkey, there are two distinct classes of neurons that code goal-related hand movements, and which differ in their visual responsiveness – mirror neurons respond to action observation, while canonical neurons to object observation. Thus we have two distinct populations of grasping-related premotor neurons. Once the features of the object to be grasped are specified and translated by canonical neurons into the most suitable motor program enabling a successful action to be produced, a copy of this signal is fed to mirror neurons. This signal would act as a sort of "simulator" of the programmed action. The function of this action simulation is that of predicting its consequences, thus enabling the achievement of a better control strategy. On the one hand, it serves the purpose of prognosis of the outcome of the action; on the other hand, the simulation binds the action to the body member capable of executing it (while previously it was represented in relation to the features of the object only).[2]

This account may provide a component in the much needed functional explanation how such a system like MNS could have ever developed, but I do not think that on-line control of the execution of behavioral actions is the primary function of the evolved MNS. What still remains to be explained is why the feedback from observation is fed to control structures before the differentiation is made who is doing the action – "me" or "my monkey". It does not look reasonable to program a system to activate the control structures responsive for planning each time one sees anybody doing something that looks like a token of certain quite specific classes of actions. The point that this may help afterwards develop imitation, social learning, etc. would amount not to a functional but to a teleological explanation, a type of explanation which is not favored (when acknowledged) in cognitive sciences.

Here I propose that *the extraction of a root version of a body image from the inborn body schema toolkit is the primary function the MNS is designed to perform in apes, primates and humans alike*. If we consider the specificity of the MNS from this perspective, its peculiar characteristics start to fit each other in a logically consistent way:

a. The link between EBA and the somatosensory cortex becomes established by the MNS *because* the latter does not make a difference between who enacts the two types of actions – by hand and by mouth – "me" or "my monkey". It is because the MNS does not distinguish between first, second, and third person (self) that it manages the extraction of the body image through mere exposure. The difference who does the action is figured out later on during the course of ontogenetic development, e.g., when the baby masters the online control of the execution of behavioral actions (for example, grasping a toy and trying to put it in the mouth);
b. the MNS is triggered by experience (observation) but does not lead to any awareness on the side of the subject (infant). It is enacted automatically, in a modular way, unconsciously, without any possibility of generating and

sharing of experience (empathy or sympathy). As it is implemented as a class of neurons, it is highly plausible that it is inborn (hereditary) and becomes active immediately after birth. Thus, it can support the highly remarkable as-if imitative performance of the newborns (cf. Meltzoff & Moore 1977);

c. The MNS tracks and in a multiple way maps the relation between just two quite specific types of actions (basically, grasping and manipulating small objects) capable of being performed by two specific body members (hand and mouth). In this sense, it is both highly selective and integrative. The hand and mouth performance and their coordination appears to be of foundational importance for establishing the primary patterns of body schema and image alike along multiple lines:

    i. The innate MNS may be involved in the hand and mouth movements of the foetus in the womb, i.e., could become active even before birth. Kinsbourne (2002: 27–28) notes that in infants there is already available synergy between hand movement and mouth opening. If one component of the synergism is activated, then the remaining parts "play out centrally in the brain", even if the limb that would normally implement the action in the periphery (as in aplasia) does not exist. The mechanism in charge of this "playing out centrally in the brain" would be the MNS;
    ii. The hand and mouth implement two basic inborn reflexes – of grasping with hand and sucking with mouth – and the MNS may help activate them and use them for inclusion in higher-order motor performance;
    iii. With the support of MNS, the infants are capable to "imitate" hours and minutes after birth movements by mouth and by hand (Meltzoff & Moore 1977);
    iv. The MNS may help calibrate the links between the "representations" of hand and mouth in the sensory and motor homunculus after birth (cf. Penfield & Rasmussen 1950);
    v. The hand and mouth connection via MNS may help coordinate the way of performance of face area and body area in the brain in perceiving faces and bodies (cf. Downing et al. 2001);
    vi. In establishing via different lines mappings, coordinations and associations of hand and mouth performance, the MNS may provide one of the grounding conditions for the later development of a rudimen-

tary "body ego" as suggested in the psychoanalytical context (cf. Hoffer 1949, 1950);

In sum, the copying of hand and mouth actions by the MNS during observation may trigger a whole set of mappings and calibrations in the brain and the coordinated operation of certain mental faculties from the very birth of the human individual. This triggering experience is due to mere exposure and remains highly specific and fragmentary (compared to the general body movement potential);

d. The body image extraction by MNS is dependent on observation of third-persons acting in the world, but not necessarily on directly interacting (communicating) second-persons (for the newest experimental evidence, in this respect, cf. Ferrari et al. 2003). This is a sort of "minimalist" requirement for triggering the system into action. The infant monkey or human is programmed to act as if thinking "even if and when you do not interact with me, your very appearance before my eyes will be enough for me to become like you";
e. the MNS is locked deictically to the immediate present. It is enacted in response to an actually observed here-and-now behavior, i.e. it apparently does not need the sophisticated cognitive support from the long-term memory and/or from the general-purpose working memory;
f. The extraction of the body image configuration by MNS runs independently from the mechanisms of awareness and consciousness. It is in this latter sense that the foundations of body image seem to become established independently from the way of performance of (self-)awareness, (self-)consciousness, and intentional control of action.

On the one hand, the matching is quite specific. On the other hand, it establishes the stepping stone for fitting to each other some basic components of the body schema into an evolving body image. This is, of course, only the first, triggering step in the extraction of (a version of the) body image from the body schema toolkit in the brain. It is *sine qua non* dependent on the action of the newborn human being in the world that is not just a world of objects (to be eaten or manipulated), but a world of individuals "like me" whose image I am supposed to internalise.

I must emphatically make here the point that while establishing some basic connections necessary for the development of different versions (replicas) of a body image, the MNS does not implement or presuppose for its performance the existence of an embodied self or of an implicit controlling "executive self".

Otherwise, we will have to accept the possibility that some version of the self is inborn, one or other way. The MNS implements the elegant way nature found out in order to get along without a hereditary, persisting self or agent structure of any sort whatsoever. *It is instead a system whose primary function during the ontogenesis of the corresponding individual is to trigger the foundational mapping and calibration of (fragments of) other's body image onto one's body schema.*[3]

The "extravagant" MNS was designed, indeed, to perform an extraordinary function – to initiate the extraction of the soul from the body (to use a pre-scientific way of expression). Nothing curious that scientists found MNs so important along different lines. They are important, and in a more foundational way than suggested up to the date.

7. Conclusion

In this article I made the point that the true way of formation and functioning of body schema, body image and embodied self alike is that of "opportunistic manifold".[4] An opportunistic manifold is such that any part can stand for the whole while the set of all parts does not necessarily come to a single well-formed self-identical whole.

If this is the case, we have a residual problem: How the schema and image manage to relate to each other ontogenetically and on-line in such a way as to make us feel well-defined and unified as embodied beings in an incorrigible way? Looking for a plausible answer, I made the point that the unity we feel is due to the holism of the physical body itself and to the nature of the integrative mechanisms of awareness and consciousness. Still, the possible ways of integration at the interface between body schemas and images remain to be specified, at least in first approximation. Above I discussed two basic and one "mixed evil" scenarios that may model the interface between schema and image:

i. a "vertical" scenario;
ii. a "horizontal" scenario; and
iii. an "extraction" scenario.

According to the vertical scenario, the body schema is implemented in the brain as a well-defined pattern. Whenever activated, it provides the mind with the necessary (and sufficient) conditions for the emergence of a body image representation. The most pregnant example of such a scenario in the current context is the neuromatrix hypothesis of Melzack (1990). The activation of the body schema in the brain, however, cannot be a sufficient condition for the generation of body image – the emergence of the latter requires the proper focusing of the attention framework in the brain on the widely varying combinations of somatosensory and sensorimotor signals coming from one's own body. Furthermore, this scenario may have problems in distinguishing and relating to each other body awareness and self-consciousness, the latter being usually anchored in inner or outer voice experience that is not standardly considered as a "part" of the body schema and image.

According to the horizontal scenario, both body schema and body image "representation" are localized as areas and circuits in the brain itself. When the body schema is activated alone, it remains unconscious and its performance is regulated automatically in carrying out some activity by the individual. When the visual body "representation" is activated alone, we perceive somebody else as animated body, i.e., as body displaying biological motion. When both body image and body schema become activated in a coordinated way, we have an explicit representation of our own bodies in the mind.

The problematic part of the second scenario is how the body schema and body "representation" become coordinated with each other in the brain when one perceives oneself, unlike the way when one perceives somebody else. It is here that I find appropriate to include the inborn MNS as an "extraction program" triggering during ontogenesis the development of one's own body image from two (or more) inherited configurations – of a body schema (a la Penfield) and of a body "representation" in the brain (a la Downing et al.). I claim, further, that this is the primary function of MNS, i.e., the function it was originally designed for to serve in apes, primates and in the man alike. It establishes the stepping stone for the ontogenetic development of the set of the body schema and body image configurations and mappings.

Notes

1. I am unable to resist making here an additional point that may further complicate the problem of the way of access to awareness of different versions of body image and embodied self. Recently van den Bos & Jeannerod (2002) distinguished between "body ownership" (= based on somatosensory experience) and "acting self" (= based on proprioception of intentional movement) and demonstrated experimentally that the sense of acting self serves as a stronger cue in self-recognition. The suggestion of Kinsbourne that one can "feel the body" (only) during the pauses of action may be interpreted as pointing out that one can get to the level of "body ownership" experience only when the "acting self" is not interfering with and masking it. This would imply an architecture of the body image where different layers of

body-related signals do not compete on equal basis for access to awareness but can/must be superimposed and the "higher" are capable of masking the "lower" versions of it.

2. The point about the primacy of mastering the control of one's own behavioral actions in relation to "understanding" the actions of others is re-iterated again in Rizzolatti, Fogassi & Gallese (2001: 666).

3. One could go even further and claim that the "mapping and calibration" in question are, as a matter of fact, a descriptive equivalent of imprinting(-like) mechanism.

4. Gallese (2001) introduced the idea of "shared manifold" as a hypothetic set of MNS-like mechanisms forming the neurophysiological basis of intersubjectivity and empathy. The here offered concept of "opportunistic dissipative manifold", instead, refers to the way of formation and functioning of one's own body image.

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Two phenomenological logics and the mirror neurons theory

Helena De Preester

1. Introduction

In this paper, two issues are discussed. First, two different phenomenological logics[1] are distinguished, respectively a husserlian and a merleau-pontian one. Second, a mixture of those partly conflicting logics in the recent mirror neurons theory is pointed out.

The paper is divided into the following sections. First, a shift of emphasis in Husserl's conception of the mediating term between two subjects is introduced. The modality of the visible body (body image) is replaced with the modality of the own sounding voice. This shift enables us, in the second and third section, to elaborate upon his conception of intersubjectivity. Husserl's point of view on the establishment of intersubjectivity is situated in a metaphysics of presence, in accordance with Derrida's analysis (1967).

The fourth section presents an alternative to that husserlian conception, and goes into Merleau-Ponty's alternative phenomenological account. The point of departure is again speech and the voice, in order to arrive at Merleau-Ponty's account of motor activity in general. A next section goes into the issue of learning new behaviour and imitation, in order to look at the establishment of intersubjectivity in Section 7. In that way, two basically different phenomenological points of view on intersubjectivity are distinguished. Each point of view uses a proper logic.

In the final section, those two phenomenological logics enable us to consider the recent mirror neurons theory.[2] The mirror neurons theory offers a theory of action understanding, imitation, intersubjectivity and the evolution of speech. As explicit reference is made to the phenomenological tradition (to Merleau-Ponty's *Phenomenology of Perception* in particular, cf. Rizzolatti et al.

2001), it is investigated which kind of logic is operative in the mirror neurons account. It is shown that there is a conceptual-theoretical discrepancy between the way mirror neurons are characterized and the way those characteristics are used in the explanation of action understanding and imitation. This discrepancy precisely rests on two different phenomenological logics implicitly present in the mirror neurons theory.

2. The mediating term between ego and other: A shift in emphasis

> It seems, from my observation, that in the child the self-produced voice, and then, analogously, the heard voice, serves as the first bridge for the Objectification of the Ego [Ichobjektivierung] or for the formation of the '*alter*', i.e., before the child already has or can have a sensory analogy between his visual Body and that of the 'other' and, afortiori, before he can acknowledge to the other a tactual Body and a Body incarnating the will.
>
> (Husserl 1952: 101, Footnote 1)

This critical remark differs in important respects from Husserl's usual view on the constitution of intersubjectivity. In the *Cartesian Meditations* (1950), intersubjectivity is the result of an operation of a (non-discursive) analogy between my experienced motor body and the visually perceived body of (what will turn out to be) another psychic subject. The operation or event of analogy is, very briefly, as follows. As a subject with a psychic layer, I experience my body as a stratum of kinesthetic sensations, due to the movements I make. When I visually perceive a body which resembles my body, I perceive the other not as an object, but as an animated body, in the same way as I am a living body. The seen body of the other appears immediately as a body having a stratum of kinesthetic sensations and therefore as carrier of a psychic I. Hence a feeling of empathy and the basis of intersubjectivity arise.

In the footnote at issue, however, Husserl critically says that the child cannot already have the required visual access to its own body. Therefore, the analogy between its own body and that of the other cannot happen on the basis of the resemblance between its own visual body and the visual body of the other. In other words, there is no body image present, on the basis of which the resemblance with the visual body of the other can be perceived. The mediation between the kinestheses (to be situated in the order of the body schema) of two subjects cannot happen on the basis of the visually based body image. A fortiori, the tactual – Husserl does not use the word kinesthetic here[3] – body of the other cannot be inferred[4] on the basis of the tactuality of the own body. In other words, the own body cannot yet serve as a term in the analogy, at least not the own body as a *visual* body or the body in the order of the body image. The 'mechanism' that translates between the own kinesthetic body (body schema) and the visual body (body image) of the other should not be searched for anymore, because the body of the other cannot be perceived as a body resembling the own (visual) body.

But how then is the basis for intersubjectivity established? In what other way can the connection between ego and other be accounted for? Another "mechanism" for empathy or for the operative analogy is necessary. Husserl thinks this is to be found in the role of the *voice*. The self-produced voice offers kinesthetic sensations and contributes to the constitution of the own psychic Ego. In addition, the auditory perception of the voice of the other serves as the first basis on which the inference to the other as a psychic being is made. The auditory modality of the voice replaces the modality of vision. The voice has a very special status: it offers at once kinesthetic sensations and *direct* auditory sensations. Kinesthetic sensations and auditory sensations of the own voice are far more closely linked with each other than the kinesthetic and visual sensations of the own body. It may be said here, at least initially, that "speech schema" and "speech image" are far more intimately linked than "body image" and "body schema". The concepts of body image and body schema should be differentiated into several organizational layers, of which the dimension of speech (respectively speech image and speech schema) constitutes a distinct layer. It may be that body image and body schema cannot be treated as monolithic phenomena, but need internal differentiation.

In the next section, the peculiar status of the voice in Husserl's phenomenology is further elaborated. That will be done along the lines of Derrida's (1967) analysis.

3. The privilege of the speaking voice

According to Derrida, the living sound of the voice, or speech, has a very intimate connection with consciousness. For Husserl, the possibility of speech constitutes the privilege of consciousness. Derrida does not refer to Husserl's critical footnote from *Ideas II*. There is, however, this one big similarity between Husserl's remark about the voice in the footnote mentioned and his *Logical Investigations* (1900–01), on which Derrida's comments are mainly based (in particular on the first *Logical Investigation*). In both, the *immediateness* of the own voice plays a crucial role. The context in which the immediateness of the own voice is central differs nonetheless. The *Investigations* focus on the *Bedeutung* (meaning) in connection with the voice in soliloquy. *Ideas II* focuses on kinesthetics and the immediate auditory feedback from the voice.

However, the footnote in *Ideas II* partially explains why speech constitutes the privilege of consciousness. The voice is of a particular character, because it offers the speaking subject an *immediate* access to its own spoken words via the auditory feedback it gets. A number of passages in Derrida's *Speech and Phenomenon* (1967) precisely unfolds the presuppositions and consequences of Husserl's conception of the immediate presence of the own voice to the speaking subject.

When I speak, I hear myself speaking. Both the signifier – animated by my signifying intention – and this signifying intention are present to me. I hear myself, i.e. at the same time I perceive both the sensible form of the phonemes and I understand my own expressive intention. This functioning of hearing-oneself-speaking is a kind of *auto-affection* which is completely unique. The subject that speaks, affects itself without making a detour in the exteriority of the outside world, or, more generally, a detour in that which does not belong to itself. Every other kind of auto-affection necessarily has to make a detour. If I see myself (e.g. if I see a part of my body or if I see myself in a mirror), what is non-self enters into the auto-affection, such that the process of auto-affection is no longer pure. To see oneself requires a distance (space) or a medium (mirror). To hear-oneself-speaking, on the contrary, is experienced as *pure* auto-affection: the subject is in a nearness or closeness to itself in which all space or mediation is reduced. The subject is *immediately* affected by its own expressive activity. To hear oneself and to see oneself are phenomenologically speaking two entirely different ways to relate with oneself.

The auto-affection of hearing-oneself-speaking is the possibility of subjectivity or the *for-itself*. No consciousness is possible without the speaking voice. The voice is the presence of the subject to itself. The speaking voice *is* consciousness, because it fulfils the essence of consciousness, i.e. the presence to oneself, the *for-itself*.

The similarity between Husserl's remark in *Ideas II* and Derrida's interpretation of the first *Logical Investigation* stops here. Whereas Husserl is speaking of the *mundane,* i.e. real, empirical, sounding voice in the footnote from *Ideas II,* Derrida searches for the underlying *metaphysical* conception of the voice in Husserl's work. The voice which is intimately connected with consciousness is not the bodily sounding voice, i.e. the voice in its sonorous aspect. It is not the physical voice in the world. To the contrary, it is the *phenomenological* voice, of which the bodily or sonorous manifestations are merely non-essential features. The phenomenological voice is the intentional animation which turns a word into a signifying word. In other words, in order to signify, the voice does not have to sound, does not need the empirical world of really spoken words. The body of the signifier, i.e. the word in its sonorous dimension, is not essential in order to intentionally mean. The signifying subject does not need the word in its empirical dimension in order to signify. Therefore, in its most extreme version, even if this empirical world is absent, the phenomenological voice continues to speak, continues to be present to itself (i.e. it 'hears' itself, but not in the empirical world), and continues to understand itself. In such a situation, consciousness is most present to itself, thus Husserl in Derrida's interpretation.

4. Consequences for intersubjectivity and communication

Let us return to the situation in which we are speaking, i.e. in the empirical world, in a communicative situation. An expression, i.e. a sentence of really spoken words, incarnates the intentional signifying activity of the subject. The hearer has no immediate access to that intentional signifying activity, whereas I, the speaker, do have immediate access to my own signifying intentions. My signifying intentions are for the other only *indicated* by means of my utterances, whereas I am immediately conscious of what I express. For me as a speaker, the detour via the empirical body of words is not necessary.

In communication, by consequence, my words are more than pure expressions; they are also – and necessarily so – *indications*, because of the fact that they indicate for the other that I am speaking, i.e. that I have signifying intentions. Thus, communication is no pure expression, because words function at the same time as indications. As already said, the other has no originary intuition of my experience. That renders the process of expression indicative in the case of communication.

My signifying intention is for the hearer not conveyed in an intact and complete way, because it has to cross the body and the empirical voice. Everything in my speech which is destined to make the other acquainted with my experience is necessarily mediated by something empirical or physical. This mediation draws each expression into an indicative process. In the case of communication, words also behave as indications and therefore the immediate presence to oneself is disturbed. Communication is contaminated by indications and can no longer be *totally* expressive, because it has to make an appeal to the empirical world. The order of indication prevents the immediate presence to oneself.

As a consequence, it is only when communication is suspended that pure expressivity is regained. In order to restore pure expression, the relation with the other has to be suspended. This means, and this will be important in the next section, that the process of expression does not owe anything to the existence of the empirical world, included the empirically spoken word. It also means that the solitary subject does not need indications in order to have a relation with itself. The reason is the immediate presence of conscious life to itself.

But what if this immediate presence which Husserl presupposes turns out to be false? According to Derrida, the immediate presence is an impossibility. Each and every process of signification *necessarily* involves an indicative element. According to Derrida, pure expression is fictitious. Presence to oneself is in fact constituted by an originary non-presence. Derrida replaces the husserlian metaphysics of originary presence with a metaphysics in which an originary non-presence is constitutive of each and every presence. As a consequence, there is a necessary and constitutive role for the empirical world, the other, and the body. The phenomenological voice loses its constitutive role for solitary consciousness, present to itself.

Before we turn to the next section, there is one remark left. Although there is a shift of emphasis from vision to hearing, and although to hear oneself and to see oneself are phenomenologically speaking two different ways of relating to oneself, both husserlian solutions to the problem of intersubjectivity can be situated within Derrida's analysis. The solution based on the voice is, however, more suited for making the underlying logic clear.

In the following section, we turn to Merleau-Ponty, who exemplifies a way of thinking in which presence to oneself is mediated by non-presence. Again, the focus is on the role of speech.

5. Merleau-Ponty's phenomenological point of view on speech and its consequences

On several occasions, Merleau-Ponty criticizes the classical intellectualist view, in which a word, spoken or written, has no significance in itself. A word is merely the empty wrapping of an intellectual process. A subject that properly *speaks* is not at issue in intellectualist thinking; only a subject that *thinks*. The account given by Husserl – at least in the derridean analysis – instantiates such an intellectualist point of view. Even more, the empirical word *contaminates* pure expression.

Merleau-Ponty, in contrast, examines the phenomenon of speech in another way. He asks why a subject is in a state of ignorance about his own thoughts to the extent that he has not formulated them. Someone who speaks does not think *before* he speaks, and neither does he *while* speaking. His speech precisely *is* his thinking, and meaning is produced or secreted by speech.[5] The same is valid for the hearer.

> There is, then, a taking up of others' thought through speech, a reflection in others, an ability to think *according to others* which enriches our own thoughts. Here the meaning of words must be finally induced by the words themselves, or more exactly, their conceptual meaning must be formed by a kind of deduction from a *gestural meaning*, which is immanent in speech.
>
> (Merleau-Ponty 1945: 208)

In contrast to the view presented in the previous section, words are the access par excellence to the signifying intentions of others; there is no cleavage between the word as indication and the meaning expressed in it. Words are instead *inhabited* by a kind of existential significance inseparable from them. Thought is not something "internal" and does not exist independently from words. Yet, we can be misled and think that thought does exist separately from words, in as far as there is thought that is already constituted and expressed, and which we can recall to ourselves in silence. Due to that we have the illusion of an inner life.

Merleau-Ponty's view on speech strongly resembles his more general view on motor or body-schematic processes. For speaking, we do not have verbal images at our disposal, no more than we have representations of movement for the execution of actual movement. In other words, I do not have to represent external space and my body in order to move the latter in the former. Similarly, I do not have to represent a word in order to know it and to express it. What we have at our disposal concerning a word is its articulatory and sonorous style. And that is sufficient: I have the articulatory and sonorous essence of a word as one of the modulations of the possible uses of my body. The use and understanding of a word is a bodily and even body-schematic matter.

In understanding someone else's movements or in understanding someone else's speech, there is a *synchronizing modulation* of me, which causes my understanding of the other. This "synchronizing modulation" is not a matter of inferring someone else's thought, but rather a change in existence.

> Just as the sense-giving intention which has set in motion the other person's speech is not an explicit thought, but a certain lack which is asking to be made good, so my taking up of this intention is not a process of thinking on my part, but a synchronizing change of my own existence, a transformation of my being. (Merleau-Ponty 1945: 213)

Merleau-Ponty expresses a similar viewpoint in the case of gestures:

> The communication or comprehension of gestures comes about through the reciprocity of my intentions and the gestures of others, of my gestures and intentions discernible in the conduct of other people. It is as if the other person's intention inhabited my body and mine his. The gesture which I witness outlines an intentional object. This object is genuinely present and fully comprehended when my powers of my body adjust themselves to it and overlap it. (Merleau-Ponty 1945: 215)

Three elements should be stressed here. First, Merleau-Ponty emphasizes the reciprocity of the intentions and gestures. Communication is achieved when I can identify the intentionality of the other with my own intentionality. Second, the gesture is not approached in its physical shape, but in its outlining of an intentional object. Third, the point of convergence, i.e. where intersubjectivity is reached, is the intentional object of the gesture.

According to Merleau-Ponty, speech is also a kind of gesture, or more generally, a kind of behaviour. It is a way of existence, which fits into this pattern of reciprocity.

> The phonetic "gesture" brings about, both for the speaking subject and for his hearers, a certain structural co-ordination of experience, a certain modulation of existence, exactly as a pattern of my bodily behaviour endows the objects around me with a certain significance both for me and for others. (Merleau-Ponty 1945: 225)

> We must therefore recognize as an ultimate fact this open and indefinite power of giving significance – that is, both of apprehending and conveying a new form of behaviour, or towards other people, or towards his own thought, through his body and his speech. (Merleau-Ponty 1945: 226)

The last quote also stresses that behaviour or speech convey something new, not only to the other, but to oneself as well.

Merleau-Ponty talks in the context of speech about "phonetic gestures", and resists an intellectualist conception of words. Is speech then merely a motor phenomenon? It is not, if we take into account that speech is a kind of *behaviour*, and that behaviour in the merleau-pontian sense of "existence" is a category that transcends the dichotomy between motor phenomena and intellectual processes. Speech, just like behaviour in general, is neither an operation of intelligence, nor a motor phenomenon. It is "*wholly motility and wholly intelligence*" (Merleau-Ponty 1945: 226). Merleau-Ponty's reflections on speech are part of his attempt to arrive at a new conception that transcends the subject/object, word/concept, intellectual/motor, body/mind and other classical dichotomies. As a consequence, from the viewpoint of Merleau-Ponty, we can never arrive at consciousness as a presence to oneself. Such a view is a heritage from Cartesian dualistic metaphysics.

> We have become accustomed, through the influence of the Cartesian tradition, to disengage from the object: the reflective attitude simultaneously purifies the common notions of body and soul by defining the body as the sum of its parts with no interior, and the soul as being wholly present to itself without distance. These definitions make matters perfectly clear both within and outside ourselves: we have the transparency of an object with no secret recesses, the transparency of a subject which is nothing but what it thinks it is. The object is an object through and through, and consciousness a consciousness through and through. (Merleau-Ponty 1945: 230)

For Husserl, thinking in a Cartesian tradition, communicative speech has to traverse the body and the empirical world, but this is at the expense of the presence to oneself, or at the expense of the purity of the signifying intentions.

For Merleau-Ponty, Cartesian thinking is no longer possible. Therefore, *in order to signify,* speech and its meaning necessarily traverse and cross the body. Speech, like the living body, is neither for-itself, nor in-itself, and resists the distinction between word and concept, or sign and signified.[6]

6. Learning new behaviour and the problem of imitation

Before we turn to the consequences of Merleau-Ponty's point of view for intersubjectivity, we briefly look at how the child learns new behaviour, and in what sense imitation is important for its acquisition. It will help to clarify the issue of intersubjectivity.

As Merleau-Ponty considers speech as a kind of behaviour, the problem is treated in its generality here. How does the child arrive, after having seen a gesture or having heard an expression, at making an equivalent gesture or expression, taking the seen or heard as a model? Is it the case that something visually or auditively perceived has to be transformed into something motor? In that case, it is necessary that the child understands what causes the behaviour of the other, in order to reproduce the cause. But does this double activity of inferring the causes and then reproducing them really exist? Does the child first move up to the cause of the gestures in order to then reproduce the conditions of the gesture? According to Merleau-Ponty this is not the case. Imitation is not an *analyzing* activity.

Let us first focus on the case of imitation of movements, or rather, behaviour. The same problem as with Husserl is encountered: what is the mediating term in the analogy between self and other? What is the intermediary between the perception of ourselves and the visual perception of the other, if it is not the *representation* of movements? For the child, the visual perception of itself and the kinesthetic perception of the other are lacking (cf. Husserl's footnote). According to Guillaume (1969), by whom Merleau-Ponty is inspired, the child imitates the *result* of the seen action on the basis of its own means and *then* discovers that it produces the same movements as its model. Thus, the mediating term between ego and other is the *external world*, the *objects of action* toward which the other is directed, just as I am directed toward them. To imitate is not to do the same as the other, but to arrive at the same *result*.

Accordingly, we do not dispose of our bodies as a mass of sensations, doubled by a kinesthetic image, but we dispose of it as a systematic means to go toward objects. Imitation is a matter of *common goals*, and the other is not in the first place seen as a body, but as *behaviour.* The child experiences its body as a permanent and global capacity to produce gestures endowed with a certain sense. Imitation presupposes the capturing of the behaviour of the other, and at the side of the I, a subject which is not contemplative, but motor, an 'I can' (cf. Husserl's 'Ich kann'). The perception of the behaviour of the other, and the perception of the own body via the body schema are two aspects of one single organization which realizes the identification between me and the other. In *Signes* (1960), Merleau-Ponty says that the perception of the other evokes the abilities of my own body, as if it were my gestures or my behaviour. Speech is such a kind of behaviour. I am given to myself as a certain grip on the world, and in the other we see a familiar way of intercourse with the world.

7. The mediating term between ego and other: Common body or common object?

In this section, the way intersubjectivity is established in Merleau-Ponty's point of view, inspired by Guillaume (1969), is presented. In opposition to the classic problem of solipsism, for Guillaume the question is how the child can construct an ego, starting from the other. For the child, it is the other who invests the primary and essential place; the other is the mirror on which the child hooks itself.

But is the solution by Guillaume not too similar to the logic Husserl uses? The perception of the behaviour of the other makes us conceive of the other as a subject too. I witness the behaviour of the other, and my own body is the means to understand that behaviour, my corporality is the capacity to understand the corporality of the other. I grasp the goal-directed aspect of the behaviour of the other, because my body is capable of the same goals. The style of my gestures and of the gestures of the other is the same, and renders what is true for me true for the other too. The style is what I imitate.

But, Merleau-Ponty says, the operation of grasping the existence of the other is more than a *perception* of its style. There is a kind of pairing (*Paarung*): a body meets in another body its counterpart, because it realizes its own intentions and suggests new intentions to me. The experience of the other makes me transcend my own ego; it is an *intentional transgression,* not a logical operation, but a vital one. This addition to Guillaume does not render the solution less husserlian; the concept of *Paarung* is after all husserlian too (cf. his *Cartesian Meditations*). The basic difference between Merleau-Ponty and Husserl has to be found elsewhere.

For Merleau-Ponty, to understand the behaviour of the other does no longer require that the body of the other first acquires – via a husserlian analogical apperception based on my living or psychic body – the meaning of a living or psychic body. In other words, the identification with the other is no longer presupposed to explain the understanding or the behaviour of the other, but rather results form it. For Husserl, the mediating term between ego and other is the living body, and both body schema and body image are required in the analogy. On the basis of that analogy, I come to identify with the other and I become able to understand and imitate the other.

For Merleau-Ponty, in contrast, the mediating term between two behaviours is a common intentional object. Due to having the same intentional object, I come to imitate the other, because I try to arrive at the same result as the other. However, this does not presuppose identification with the other; identification rather *results* from having a common intentional object and similar means to aim for it. It is important to distinguish between these two logics – a husserlian and a merleau-pontian one. This becomes particularly clear in the recent mirror neurons theory, in which both logics are implicitly mixed.

8. The mirror neurons theory: Imitation and understanding of actions and speech

It is remarkable that recent neurological research comes across a number of topics similar to those considered by Merleau-Ponty: resonant behaviour and action understanding, in relation to imitation and speech. Those topics are similarly connected in Merleau-Ponty's work and in mirror neurons research. In other words, there is a striking resemblance between the interpretation of mirror neurons and the merleau-pontian conception of action understanding.

> (...) an action is understood when its observation causes the motor system of the observer to 'resonate'. (...) In other words, we understand an action because the motor representation of that action is activated in our brain. (...) the idea that we understand the other through an 'internal act' that recaptures the sense of their acting was defended by several philosophers, especially by phenomenologists. (Rizzolatti et al. 2001: 661, the accompanying footnote refers to Merleau-Ponty 1945)

But are things that straightforward? In what follows, the rather implicit assumptions of the mirror neurons theory in philosophical terms are examined. We ask whether those implicit assumptions really are in accordance with Merleau-Ponty's phenomenological account, and whether they are coherent. First, the characteristics of mirror neurons are briefly presented. Second, the issues of action understanding, imitation and speech are taken into consideration.

8.1 Mirror neurons and their characteristics

"How do we assign a meaning when we observe someone performing an action, say grasping an object? How is the process of understanding given in the brain?" (Fadiga & Gallese 1997: 267). The answer to this question for the neural basis of action understanding lies in the existence of a common neural substrate for both action observation and execution. That neural basis is first observed in monkeys, but there are reasons to believe that a similar mechanism is present in humans (cf. Rizzolatti et al., 2001: 664).

According to the mirror neurons theory, a visually perceived action is mapped onto its motor representation in the nervous system. This mechanism may enable individuals to recognize actions made by others, because the neural pattern elicited in their premotor areas during action observation is similar to the one internally generated to *produce* that action, hence the name "mirror neurons". In other words, the role of mirror neuron activity is to match an external, unknown event to an internal, known event. This mechanism may also be at the basis of the evolution of speech (cf. infra).

Two of the most important properties of mirror neurons are the following. First, the discharge of mirror neurons correlates with an *action,* rather than with the individual movements that form it (Rizzolatti et al. 1998). This means that they code movement in rather abstract terms, i.e. in terms of the relationship between the agent and the *object of action*. They only become active if a particular type of action (e.g. grasp, hold, ...) is executed to achieve a particular type of *goal* (e.g. to take possession of a piece of food, to throw away an object, ...) (Gallese 1999). Second, and related to that, the observed gesture must have a goal, and in order to activate a mirror neuron, this goal must be achieved by means of hand-object interaction[7] (Fadiga & Gallese 1997).

8.2 The function of mirror neurons: Action understanding

Several hypotheses are put forward about the function of mirror neurons. One of those functions is the above mentioned "action understanding". By "action understanding", the authors mean "the capacity of individuals to recognize biological motion and to discriminate the observed actions one from the other" (Fadiga & Gallese 1997: 273). Rizzolatti et al. (1998) emphasize that it is about "action", and not merely about movement.

> By "understanding" we mean the capacity that individuals have to recognize that another individual is performing an action, to differentiate the observed action from other actions, and to use this information to act appropriately.
> (Rizzolatti et al. 1998: 188)

Gallese adds (1999: 167): "What makes of a movement a motor act is the presence of a goal." Rizzolatti et al. (2001: 661) state: "By action understanding, we mean the capacity to achieve the internal description of an action and to use it to organize appropriate future behaviour." These nuances in emphasis will turn out to be important.

We have seen that action understanding would arise on the basis of the fact that the same motor pattern that characterises the observed action is evoked in the observer and activates his motor repertoire. The mirror neurons act as a "resonant" system. We understand actions when the visual representation of the observed action is mapped onto our motor representation of that action. The observation of the action causes the motor system of the observer to "resonate", and this makes up the understanding of the observed action.

Is this resonance a merleau-pontian resonance, as the reference to the phenomenological tradition suggests? Merleau-Ponty also talks about a "synchronizing modulation". Let us turn again to what is important for Merleau-Ponty in the comprehension of gestures.

First, we recall the emphasis on the reciprocity between intentions and gestures (the resonance). This seems to fit with the general characterization of the "resonating" mirror neuron system. Second, the emphasis on "action" instead of the gesture in its physical shape is also present in the mirror neuron theory. Third, the definition of a gesture in terms of a goal, i.e. an intentional object, is present in both accounts.

But let us have a closer look. It has been said that we understand actions when the visual representation of the observed action is mapped onto our motor representation of that action. The observation of the action causes the motor system of the observer to "resonate", and this constitutes the action understanding. Such an interpretation of the way mirror neurons function is, however, rather husserlian than merleau-pontian in style. This interpretation may be reformulated and it may be said that the visual perception of the other is mapped onto our kinesthetic representation, and that this identification results in understanding the other.

For Merleau-Ponty, in contrast, the common goal or the *intentional object* is primary. In the mirror neurons theory, the goal is also explicitly present, namely in the characteristics of what a mirror neuron is. A mirror neuron is a neuron that codes over an *action*, and an action is essentially characterized by a *goal* (cf. supra). However, in the explanation of action understanding itself, the notion of goal moves into the background. Action understanding is no longer explained in terms of common goals, although the characteristics of mirror neurons point into the direction of such a possibility. In contrast, what prevails in the explanation of "action understanding" is the identification between observer and observed, via the mapping of a visual image onto a motor schema. Understanding arises from this identification, in opposition to the view of Merleau-Ponty, for whom identification is a *result* of understanding the other, such that it is impossible that an identification mechanism is at the basis of understanding. To make this clearer, let us turn again to the topic of imitation.

8.3 The function of mirror neurons: imitation and learning new behaviour

Rizzolatti et al. (2001) observe that the activation of mirror neurons during action observation does not serve a motor function. Mirror neurons, however, may mediate between the perception and the imitation of an action. In other words, mirror neurons allow imitation to take place. The mechanism of imitation is divided into three submechanisms, all of which require the mirror system: retrieval of a motor act, construction of a sequence of motor acts, and refinement of the motor act or the motor sequence. This, however, is only applicable to acts, i.e. simple actions. For more complex acts, i.e. "actions", we need a more complex mechanism. "Actions" are not previously present in the motor repertoire of the observer. Therefore, the observed behaviour should be dissected into a string of simpler, sequential components that are already in the observer's repertoire. New behaviour is thus composed from an available repertoire of motor schemas. The system of mirror neurons would provide the neural basis to recognize and segment an observed action into components.

The key for imitation is the following: each time we execute an action, there is an internal sensory copy of the executed action, which anticipates the consequences of the action. In the case of motor representations which are evoked by observation, however, an internal sensory copy would also be present. Imitation then can be achieved by a mechanism that connects this sensory representation with the representation of visually observed movements that have to be imitated, and subsequently the relevant motor representations are reactivated.

Thus, in the case of imitation, the same logic is at work as in "action understanding". The seen movements have to be identified with something familiar, i.e. belonging to the own motor repertoire, in order to be then executed. In the case of more complex acts, actions, what is seen has to be analysed in its more simple components, but the logic behind the procedure is the same.

It is remarkable that, in the case of imitation, all talk of goals has disappeared, although the mirror system, i.e. the mirror neurons and their characteristics, is necessary for each submechanism of imitation. The proposed procedure describes exactly what Merleau-Ponty questions, namely whether it is the case that in imitation something visually (or in the case of speech, something auditory) has to be transformed into something motor. According to Merleau-Ponty, this is not the case. Moreover, according to Merleau-Ponty, imitation is no *analyzing* activity. Again, there is not first identification of my body with the body of the other, but rather vice versa: identification is a *product* of imitation, and imitation is not to do the same as the other, but to arrive at the same result, i.e. to reach the same *goal*.

At this point, the relation between mirror neurons theory and merleau-pontian phenomenology becomes critical. Although the characterization of mirror neurons is merleau-pontian in spirit, the logic used in mirror neurons theory resembles more a husserlian than a merleau-pontian logic. Moreover, one might wonder *why* the goal-directed characteristics of mirror neurons are no longer mentioned or used in the explanation of imitation.

8.4 Mirror neurons and speech

In this final section, the point of departure, speech, is revisited. In the classical view, Broca's region is considered playing a role in speech control, and not in hand movements control. Clinical data and empirical data, however, suggest that Broca's region also plays a role in the control of hand movements (Fadiga & Gallese 1997). Moreover, there is evidence that Broca's region is the homologue of area F5 in monkeys. The linguistic specialization may have arisen from a more ancient mechanism that was related to the generation and understanding of motor acts. Evolutionary processes may have favoured the capability to execute and interpret hand and mouth communicative gestures. The association of gestures with sounds, then, would have led to the capability of developing a communication based on "verbal gestures". At the beginning of the evolutionary process, actions of other individuals were only visually perceived, later, they could have been associated to sounds generated by laryngeal phonation.

A mirror system for the kind of communication based on hand and mouth gestures may provide support for theories which base the evolution of speech on *movements* rather than on the auditory modality. In such a view, the motor element has a primacy, because both hand gestures and "verbal gestures" have a motor origin.[8] The motor theory of speech perception (Liberman & Mattingly 1985) is supported by this view. This theory says that the capability to understand the verbal communication is not based on sound analysis, but on "understanding" the phonetic gestures of the speaker. The mirror neurons theory fits with this view and gives the neural substrate for the operation of speech perception. Broca's neurons, which are similar to those involved in hand/mouth movement recognition in monkeys, would code for phonetic gestures (Fadiga & Gallese 1997).

Rizzolatti et al. (1998) include a stage of imitation in the evolution toward speech. This is very briefly how they see the evolution toward speech.

> We argue that: (l) the mimetic capacity inherent to F5 and Broca's area had the potential to produce various types of closed systems[9] related to the different types of motor fields present in that area (hand, mouth and larynx); (2) the first open system to evolve en route to human speech was a manual gestural system that exploited the observations and execution matching sys-

> tem described earlier; and (3) that this paved the way for the evolution of the open vocalization system we know as speech. (Rizzolatti et al. 1998: 192)

Thus, the discovery of the mirror system suggests that there is a strong link between speech and action representation, and that the motor dimension is primary.

This view on the origin of speech fits well with a merleau-pontian view on speech: speech has its motor origins and to talk of "verbal gestures" or "phonetic gestures" is, as we have seen, an alternative for theories which cannot give an account of the speaking subject and for whom the word is but a mere empty wrapping of the concept.

Yet we should keep in mind that neither "action understanding" nor "imitation" have the same content in the mirror neurons theory and the approach of Merleau-Ponty. There is a different interpretative logic at work. This is not a matter of mere detail, because it covers a different view on identification and the way intersubjectivity comes about. Those differences arise from a deeper difference in phenomenological logic.

9. Conclusion: Intersubjectivity and the mediating term

Let us recapitulate. We started from Husserl's idea that the establishment of intersubjectivity cannot happen on the basis of an image of the own body not yet accessible by the subject. Therefore, the modality of the visible body is replaced with the modality of the own sounding voice. Second, Derrida's interpretation of the voice and speech in Husserl's phenomenology was presented. From this, the consequences for intersubjectivity and communication were inferred, and it was the shift of emphasis from the modality of vision to the auditory modality that enabled us to do so.

The shift of emphasis, however, does not conceal that one and the same logic is valid in both modalities. This logic can be formulated in terms of a primacy of the presence to oneself. The analogy between ego and other presupposes an ego present to itself. The presence to itself has two components, one direct, one rather indirect. In Husserl's classical solution, the presence of the subject to itself is direct with regard to kinesthetic sensations, i.e. the subject has a direct access to its body via kinesthetic sensations. The access is indirect with regard to the body image, because vision has to cross space or has to rely on a mirror. In his alternative solution, the presence of the subject to itself is direct with regard to the kinesthetic sensations of the articulatory apparatus, and almost equally direct with regard to the sound of the own voice. Based on this presence to oneself, the bridge to the other is made. A (non-discursive, perceptual) analogy arises between what I see or hear from the other and those aspects of myself that are already familiar to myself (for the issue of access, cf. also Van de Vijver & Van Bunder, this volume).

An alternative to this phenomenology (or metaphysics) of presence was presented via Merleau-Ponty's phenomenology. We started again from the modality of speech, which fits into Merleau-Ponty's more general point of view on human motor activity. The common intentional object turned out to be central in Merleau-Ponty's account of action understanding, imitation and intersubjectivity. The point of convergence between ego and other is a shared intentional object. It is because of this shared intentional object that a subject arrives at imitating the other, because it aims at the same intentional object. It is only as a *result* of trying to reach the same intentional object, in doing the same as the other, that there is a basis for identification with the other. It is the *intentional object* which functions as mediating term between ego and other. For Husserl, in contrast, the perceptual awareness, be it visual or auditory, of the other functions as mediating term. This can easily be translated into mirror neuron terms: I recognize the behaviour of the other *as* behaviour, because it resembles mine, thanks to a match of what I visually perceive with a motor schema of my own.

But the crucial difference lies in the fact that for Merleau-Ponty behaviour is a projection into the world, toward an intentional object or a goal,[10] and this world and goal can be intersubjectively shared from the start. The mediating term here is the world and a common situation which is meaningful for both. The situation calls forth similar behaviour. Meaningful or goal-directed behaviour performed by the other may call forth the possibilities of my own body. Once the similarity of goals is recognized, identification can take place, but not sooner than that. There is an identification of corporality *because* both bodies witness of the same goal, and it is not because I have identified my body with someone else's body that I am able to aim at the same goal.

The mirror neurons theory actually uses both kinds of logics, without clearly separating between both. On the one hand, in talking about the characteristics of mirror neurons, a merleau-pontian style of thinking is used. On the other hand, the hypotheses about the functions of mirror neurons, in terms of action understanding and imitation, rather follow a husserlian style of reasoning. To implicitly use two partly conflicting accounts may render the mirror neurons theory less stable in its theoretical-conceptual underpinnings;

yet the philosophical-conceptual means to demarcate between both accounts are present.

Notes

1. The term "logic" is used here in a loose sense, referring to a style or pattern of reasoning, rather than to a set of rules for correct thinking.

2. In the strict sense, there is no "mirror neurons theory", but only a certain discovery and a set of hypotheses about the meaning of this discovery.

3. "Tactual" does not mean "referring to what is sensible", but "referring to what is able to sense", and is hence close to the phenomenon of kinesthesia.

4. Where the terms "analogy" and "to infer" are used, this is not meant in the sense of logical inference, but refers to a special kind of analogy that happens in the domain of perception and "all at once".

5. This is only valid for authentic speech, i.e. speech that formulates something for the first time, and not second-order expression, which forms the larger part of empirical speech. Only the first kind of speech is identical to thinking.

6. Merleau-Ponty is inspired by de Saussure, who questions the massive distinction between sign and signification. This distinction does no longer exist in speech, although it seems present in institutionalized language. For de Saussure, language is a system of differentiations in which the relation of the subject with the world is articulated. Thinking actually resides in the inner operations of language (cf. Merleau-Ponty, *Résumés de Cours, Collège de France 1952–1960*, and Merleau-Ponty, *Signes* 1960).

7. Mirror neurons are mainly located in the ventral premotor area F5, a part of the premotor cortex. In general, area F5 is characterized by the presence of neurons that code goal-related motor acts, such as hand and mouth grasping. Some of them are purely motor neurons, others, such as the mirror neurons, also respond to visual stimuli.

8. For the motor aspect of speech, cf. also the contribution by Bazan in this volume.

9. Closed systems have a small, fixed repertoire; in open systems, the elements can by combined to yield an open repertoire of meaning.

10. This does not mean that there are no minimal requirements concerning the body of the other in order to recognize an action of the other as directed toward a goal. One may say that at least a similar body schema is required. This may also explain why intersubjectivity is there from the start: similar body schemas are *capable of* a similar world and similar goals.

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Some comments on the emotional and motor dynamics of language embodiment

A neurophysiological understanding of the Freudian unconscious

Ariane Bazan and David Van Bunder

1. Introduction

In this paper a tentative neurophysiologically framed approach of the Freudian unconscious that would function on the basis of linguistic (phonological) organizing principles, is proposed. A series of arguments, coming from different fields, are taken together. First, clinical reports indicate that in a state of high emotional arousal linguistic fragments are treated in a decontextualized way, and can lead to the isolation of phoneme sequences which, independently of their actual meaning, are able to resort emotional effects. Second, phonological and neurophysiological arguments are given to make the case that language processing – be it producing, receiving or imagining language – is a motor event. A crucial distinction is proposed: while contextualized processing correlates on a neurophysiological level with action understanding, and is psychoanalytically akin to secondary processing, decontextualized language processing has a neurophysiological counterpart in object understanding and is psychoanalytically akin to primary processing. Third, isolated speech fragments are therefore considered as objects which, similarly to non-linguistic objects, undergo emotional conditioning and establish an idiosyncratic linguistically structured emotional memory. Phoneme sequences which in this way come to carry high emotional valences are thought to be more readily subject to threaten the bodily integrity, and therefore more readily inhibited. When this inhibition leads to the prevention of effective realization of the voluntary motor output, this is thought to result in the sustained high levels of neuronal activation which seek for release by attracting substitutes that are phonemically similar to the censored speech fragments though they are cognitively non threatening. As a result, the speech of the subject would be particularly concerned with the verbalizations of these substitutive phoneme sequences. In summary, the Freudian unconscious is conceived as the instantiation of a linguistic action space which would be idiosyncratically organized by particular phonemic "phantoms" operating as attractors for the subject's (linguistic) actions.

2. With high emotion language breaks into fragments

It is thought that in conditions of high emotional arousal, language is more readily processed in a decontextualized way, falling apart into fragments, from isolated phrases over words to phoneme groups and phonemes and these fragments are thought to gain an organizational autonomy in the process. This is illustrated with a number of clinical observations.

2.1 Que faire?

In a letter to Fliess, Freud (1897/1986) briefly describes the following case:

> A little interpretation came my way (...). Mr. E. had an anxiety attack at the age of ten when he tried to catch a black beetle (...). The meaning of this attack had thus far remained obscure. Now, dwelling on the theme of "being unable to make up one's mind", he repeated a conversation between his grandmother and his aunt about the marriage of his mother (...) from which it emerged that she had not been able to make up her mind for quite some time; then he suddenly came up with the black beetle, which he had not mentioned for months, and from that to ladybug [Marienkäfer] (his mother's name was Marie); then he laughed out loud (...). Then we broke off and next time he told me that before the session the meaning of the beetle [Käfer] had occurred to him; namely: que faire? = being unable to make up one's mind ... meschugge!
> You may know that here a woman may be referred to as a nice "beetle". His nurse and first love was a French woman; in fact, he learned to speak French before he learned to speak German. (...) (Freud (1897/1986: 316–331)

It seems that Mr. E. in his analysis describes a childhood anxiety attack while trying to capture a black beetle – or "Marienkäfer" – of which the meaning had thus far remained obscure. When the meaning of this reveals itself to him during the analysis, this does not however result from a semantic analysis of the context of the anxiety attack, but was established by a formal connection between the attack episode and another theme that is a potential existential threat to Mr. E. Indeed, at one point Mr. E. describes an episode in which his mother's inability to make up her mind concerning her marriage is the central topic. It is easily understood how this equates to her indecisiveness concerning Mr. E.'s father and therefore can affect Mr. E. at an existential level, namely that of his affiliation identity. There is however no semantic association between this concern and the threat experienced from the beetle, but the link between both becomes clear through a formal, literal analysis of the language used to describe the events. Indeed, it is Mr. E. himself who at one point rereads "Käfer" as "Que faire?" (French for "what am I to do?"), and thereby rereads the object of his anxiety attack, namely the beetle, as a question expressing his mother's inability to choose. It seems that the literal form of the word or word group here functions as a carrier of affects, more or less independently of its semantics and of the global sentence or pragmatic context the words are used in.

2.2 The Ratman

The importance of the literality of the patient's language by which he or she describes his or her own fears, distastes, preferences, problems, symptoms, dreams and associations has been acknowledged by Freud from his early works on (1900/1975; 1901/1960). However, it is Jacques Lacan (1957/1999), benefiting from de Saussure's structural linguistic theory, who formalized these ideas and introduced the concept of the signifier. In Saussurean semiotics a signifier refers to the "sound-image" (or other form of vehicle) which conveys a signified or meaning (de Saussure 1915/1967). It is therefore the phonological sound or orthographic appearance of a word or of a fragment of speech in general.[1] In a psychoanalytical framework, signifiers are attributed important organizational roles in a subject's emotional and mental life. This principle is beautifully illustrated in Freud's case study of the Ratman (Freud 1909/1955).

The Ratman consulted Freud because he suffered from a great obsessive fear. Being in the army, he had heard a senior officer speaking of a certain torment: a pot containing rats was turned upside down on the buttocks of the victim and they bored their way into the anus. The Ratman feared that either his father or a girl he fancied would be subjected to this torment. The fact that his father had died a couple of years before, illustrates the nonsensical character of his fear. Still the idea repeatedly imposed itself on the Ratman, mostly as a threat. He felt the compulsion to do this or another thing in some precise ways lest his fear would come true.

The irrational character of this fear only becomes understandable when put into the context of the Ratman's life history. Apparently, a central preoccupation at that time was related to a pending choice between two possible spouses. Indeed, while already in love with another lady, the Ratman's mother had informed him, shortly after his father's death, that one of her cousins had declared himself ready to let the Ratman marry one of his daughters. The Ratman therefore found himself confronted with a dilemma concerning who to marry, which is '*Heiraten*' in German. This '*Heiraten*'-problem however also directly referred to the Ratman's father. Shortly before his father got acquainted with his mother, the father had made advances to a pretty but penniless girl of humble birth. The Ratman's father finally exchanged this girl for his mother who was brought up in a wealthy family. The actual dilemma of the Ratman was therefore similar to that which had been his father's: the choice between his love and the wishes of his family.

On a further level of analysis, another, probably crucial reading of the signifier "Rat" also became clear. At one point, the Ratman relates how, as a child, he had a governess with whom he took a lot of liberties: "When I got into her bed I used to uncover her and touch her, and she made no objections." (Freud 1909/1955: 161). He also remembers that a little later she got married to a *Hofrat* (a title indicating a certain status) and was from that point on addressed to as *Frau Hofrat*. The words "*Heiraten*" and "*Hofrat*" therefore betray how the signifier "rat" is endowed with references to the Ratman's love life and to his father. The further appearance of the signifier "rat" during the progress of the analysis, such as in *Spielratte*, a financial debt of the father due to gambling and in *Raten*, the money he has to pay for the sessions,[2] elaborates upon this pattern.

In the series of meaningful life events reported in analysis a constant factor progressively appears and seems to repeatedly reappear. However, it does not insist as a semantic constancy, but it does so as a speech fragment, namely the signifier "rat". The Ratman's obsession with the rat torment indeed seems to make sense if the "rat" is not understood in its semantic reading, referring to a rodent, but as a signifier, a phonological speech fragment that is able to refer to different semantic realities but then endows these realities with the same, or reciprocal, emotional qualities regardless of the context. The coherence of the different life episodes, which at first glance might seem completely unrelated, is accounted for by their organization around this one specific signifier, the word "rat" and the obsessive fear precisely arises at this very junction at which these different life episodes come together.

2.3 Patient F. and the 'f'-series

The fragmentation of speech is thought to similarly occur at the level of speech sounds or phonemes, and this is illustrated in a couple of excerpts from a clinical case study, the 22 years old F. who is a residing psychiatric patient.[3] The patient is diagnosed with a thought disorder psychotic syndrome and substance abuse (so called double diagnosis). At the moment of the treatment he is sobered from substance abuse but is treated with anti-psychotic and anti-depressant medication.

F. has a four year younger sister, *Sofie*. When he was seven, another new born sister, *Stefanie*, was adopted. The adoption was not done in legal terms, and several months later the mother took her child back. When he is nine, a new sister, *Steffie*, is adopted. The family structure of the patient is further characterized by numerous position confusions and incestuous relations, between his mother and her father and between uncles and aunts (brothers and sisters) on mother's side. After several months of work F. finally uncovers several probably traumatic, family episodes, also testified by others in hetero-anamneses. During the spring of 2002 he comes to relate a number of incestuous episodes with his sisters, which he obviously feels very guilty of. During the months of May he is subject to severe anxiety attacks and a (three minutes) excerpt of a session on 16.05.2002 in which he first opens up about some experiences with an incestuous character, goes as follows:[4]

> Nature determines everything. Everything comes from nature. Everything has an *eff*ect. (...) Colors have an *eff*ect. (...) Metals don't bend, inox bends. It has *eff*ects due to circumstances. A guy and a girl have an *eff*ect on each other. This is the meaning of life, the *aff*ection, this is per*fe*ct. When done with *ef*fect, it is very well done. The teacher says it is per*fe*ct. (...) Everything has an *effect*. Proteins, all of them, from one to twelve, they have an *eff*ect. To eat [in Dutch: *Fret*ten]. Djezus To eat [*Fret*ten].

F., who is otherwise coherent in his speaking, produces this seemingly incoherent fragment that at first sight doesn't seem to make any sense. What is remarkable in this fragment is the repetition of the phonemes /ěf/. It is suggested that this is not uncorrelated with the repetition of this same phonemes in both his own first name and that of (all) his sisters, Sofie, Stefanie and Steffie, who were also in this period of anxiety the first role players of the traumatic memories he was uncovering.

At the end of the excerpt something seems to happen: a link is made suddenly from "proteins" (F. fanatically took dried proteins everyday to make his muscles grow) to "*fret*ten" and that word seems to strike him, like he had never heard it before: he says in Dutch: "Fretten. Miljaarde. Fretten", starts to laugh and is finally silent upon this, the session is closed.[5] It is as if suddenly F. fully consciously hears the sounds that make up the word "*fretten*" and is struck by this.[6]

3. Language fragments are objects

3.1 Language as a motor act

Language, be it spoken, received or imagined is proposed to be essentially a motor event.

3.1.1 *Spoken language*

Studdert-Kennedy (2000) argues that speaking involves the repeated combining of the discrete actions or gestures of six functionally independent articulators (lips, tongue blade, body and root, velum and larynx). He defines a speech gesture as a fixed configuration of commands prescribing the intended action status for these diverse articulators in order to form a specific speech sound unit. The phoneme or gesture segment however is not the only type of speech motor organization. Studdert-Kennedy and colleagues (Studdert-Kennedy 1991; Studdert-Kennedy & Goodell 1995) indicate a development sequence for the origin of segments, proposing *the holistic word* as the initial unit of linguistic action. The word is said to be holistic because its composing gestures are not yet represented as independent phonetic elements that can be marshaled for use in an unbounded set of other contexts (Studdert-Kennedy 2000: 280). As an automatic consequence of sorting and stacking phonetically similar words, it is then thought that independent gestures eventually emerge.

Davis and MacNeilage (1995) present the syllable, or "frame", as an early fundament in the shaping of speech, as characterized from an articulatory point of view by the opening and closure of the mandible. MacNeilage (1998) argues that frames may derive from ingestion-related cyclicities of mandibular oscillation associated with chewing, sucking and licking which took on communicative significance as lipsmacks, tonguesmacks and teeth chatters.

3.1.2 *Perceived language*

The "Motor Theory of Speech Perception" (Liberman & Mattingly 1985) proposes that the auditory properties of a spoken segment can not be labeled phonetically without specifying their articulation. In other words, to identify speech listeners must access their motor system. There has been a recent neural instantiation of this theory by Rizzolatti and Arbib (1998). These authors report that in monkeys a part of the premotor cortex (F5) contains neurons – the so-called "mirror neurons" – that discharge both when the monkey grasps or manipulates objects and when it observes the experimenter making similar actions. They also show that there are mirror neurons in F5 that respond both when the animal makes lipsmacking movements and when it observes them in others. Of particular importance is the fact that area F5 in the monkey is the probable homologue of Broca's area in humans. There is some parallel argumentation that the origins of human language might be situated in manual gesture rather than in vocalization (Corballis 1999). Recently, Callan et al. (2002) have shown that the presence of such mirror neurons in human speech motor areas may explain why lip-reading enhances the intelligibility of what a person is saying. This finding adds strength to the argument that speech evolved from a primitive gestural system of communication and indicates on a neurological level the participation of the human motor system in the intelligent decoding of received speech. Similarly, Zatorre et al. (1992, 1996) have argued that the mapping of the incoming speech stream onto the linguistically relevant units activates Broca's area.

3.1.3 *Imagined language*

Several studies have found evidence for the activation of Broca's area in linguistic tasks that do not involve any overt speech (e.g. Friedman et al. 1998; Ryding et al. 1996; Wise et al. 1991). McGuire et al. (1993, 1996) provide evidence that in normal subjects inner speech activates Broca's area. Data also show that auditory hallucinations in schizophrenics are related to the subvocal production of speech (Green & Preston 1981; Bick & Kinsbourne 1987; Liddle et al. 1992) as if they were in fact producing speech and misattributing its origin (e.g. David 1994). Moreover, brain activity recorded during verbal hallucinations is similar to that observed during production of inner language and auditory verbal imagery in normal subjects (Cleghorn et al. 1992; Silbersweig et al., 1995).

3.2 Language fragments are objects, not actions

3.2.1 *A difference between actions and objects*

A neurophysiological difference. Object and action observation, most prominently tool (use) observation – and to a lesser extent voiced object and action naming – all seem to activate premotor circuits that would be involved in the actual use of the object (Grabowski et al. 1998; Grafton et al. 1997). Grafton et al. comment:

> (...) it is possible that premotor activation (dorsal and ventral) play a role in describing the object meaning via fronto-temporal recurrent circuits. To categorize an object, it is not enough to have a description of its visual characteristics; it is necessary also to understand its use. The premotor activations may subserve the motoric aspects of object semantics. (Grafton et al. 1997:235)

These authors therefore point to a role for the motor circuitry in the semantics of both objects and actions. However, recently separate neurophysiological pathways for object and action understanding were disentangled. Indeed, the monkey ventral premotor area F5 can be functionally parceled in two sectors of neurons that code for goal-related hand movements (cf. Gallese 2000): mirror neurons are clustered in one sector (cortical convexity), and so-called "canonical neurons" in the other (within the inferior limb of the arcuate sulcus). These neurons differ for their visual responsiveness: while both classes are functioning during active manipulation of objects, mirror neurons selectively respond to action observation, while canonical neurons selectively respond to object observation and are *not* activated by action observation (cf. Gallese 2000).

There is, in our view, a crucial distinction that is coded for here: object observation, *independently of the context the object is presented in*, results in the activation of their canonical neurons, i.e. of the motor circuitry that the characteristic use of that object would imply. Suppose, for example that scissor observation activates a characteristic "cutting" motor circuitry, thereby signaling the typical use of this object to the observer (and hence, part of the object's meaning). Scissor observation, even in a context where the scissors are *not* used for cutting, but e.g. for pushing or grasping another object, is thought to be capable of activating the cutting motor circuitry, even if not appropriate in the given context, and it is thought this would be mediated by canonical F5 neurons. At the same time, since the mirror neurons are supposed to be activated by the *intention, goal or aim* of the movement, independently of the means by which this movement is executed (cf. Gallese 2000), the "pushing" or "grasping" (and not the "cutting") mirror neurons are supposed to be activated upon observation of this gesture. It is therefore proposed that the cognitive results of the activation of these motor circuits are qualitatively categorically different: canonical neuron activation subserves the semantic understanding of the *object*, while mirror neuron activation is central to the comprehension of the intention of the other ('s *action*).

A psychodynamic difference. This difference is crucial from the viewpoint of a mental apparatus. Object observation gives rise to neuron activity in a decontextualized way, independently of the relational disposition of objects and agents. Action observation, in contrast, gives rise to neuron activity in function of the intended goal of the agent, and is therefore critically dependent on the relational disposition of objects and agents. It is therefore conceived that object observation induced canonical neuron activation is induced by the sole attributions (or features) of the observed object, independently of its intentional or relational position and that, as such, it is akin to a Freudian primary process kind of activity (cf. Freud 1895/1966; 1900/1975; 1915b/1957). Rapaport (1951: 708) summarizes the primary process concept as follows: "Where the primary process...holds sway...everything belongs with everything that shares an attribute of it...". Primary processes are thus characterized by automatic association processes based upon feature similarities. Action observation induced mirror neuron activation, in contrast, is sensitive to the relational configuration of the situation and as such, akin to Freudian secondary processes. Secondary processes, indeed, are those characterized by reality verification, thereby implying that the actually applying contextual conditions and relations are taken into account (Freud 1895/1966, 1900/1975, 1915b/1957).

In summary, while motor neuron circuitry activation is central in the proposed understanding of both actions and objects, objects are conceived as isolated elements grasped on the basis of their attributes (cf. primary process), while actions are understood as relational concepts grasped by an understanding of their intention on the basis of the positional configuration of the global context in which they are observed (cf. secondary process).

3.2.2 *A difference between linguistic actions and linguistic objects*

Linguistic objects. In "On aphasia" Freud (1891/1978: 77–78) makes a crucial distinction between the "object associations" (in German "Objektvorstellung") and the "word concept" ("Wortvorstellung"). In the original version therefore, Freud indicates both levels as *Vorstellungen* – i.e. (re-)presentations – indicating a certain similarity in status between both. Freud further notes:

> The word, then, is a complicated concept built up from various impressions, i.e., it corresponds to an intricate process of associations entered into by elements of visual, acoustic and kinaesthetic origins. However, the word acquires its significance through its association with the "idea (concept) of the object" ["Objektvorstellung"], at least if we restrict our considerations to nouns. The idea, or concept, of the object is itself another complex of associations

> composed of the most varied visual, auditory, tactile, kinaesthetic and other impressions. (Freud 1891/1978: 77–78)

For Freud (1891/1978: 73–77), the "word presentation" implicates an acoustic component, "the acoustic image" and a motor component or "speech movement representation", the kinesthetic feedback of the articulatory system. This word presentation level has a finite number of components and is as such to be distinguished from the "object presentation" level. This object level has an infinite number of components, including the visual, acoustic and tactile recordings of the object. The object "banana" e.g. is coded as the collection of impressions of its visible features, of its taste and odor, of its texture, but automatically associated are also the motor patterns of peeling, eating or crushing it. Therefore, the point Freud (1891/1978) is making, is that humans do not simply have a neurological level where the features of e.g. the object "banana" are coded, they also have a distinct neurological level where *the features of the word* "banana" are coded. Moreover, Freud (1891/1978) in his scheme indicates that *words* are, *similarly to any other type of object*, coded as the collection of impressions of their perceptual and motor features. Word-features are therefore, according to Freud (1891/1978), coded in much the same way as the features of any other type of (non-word) object. There is no a-priori reason why in first instance the sounds of language should be treated by our brains in any kind of way different from other objects, present in the material space.

This point of view bears some similarities with Caramazza's schematization (1996) of the work of Damasio et al. (1996) on the lexical nature of language. Damasio et al. (1996) report that some patients with focal brain lesions loose the capacity to *name* objects of defined categories, like plants or tools, while they obviously still know the object itself, since they are able to describe it. Damasio's group therefore indicates a possible neural basis of what was predicted by (psycho-)linguists, namely the lexicon (e.g. Levelt et al. 1999), i.e. a material storage for "words in our heads" (Frost 1998). The particularity of the work of Damasio et al. (1996) is the finding that words of the same category (like plants, tools, and persons) are neuroanatomically grouped together in multiple regions of the left cerebral hemisphere, outside the classic language areas. Similar findings are described by Caramazza and Hillis (Caramazza & Hillis 1991; Hillis & Caramazza 1995) for grammatical classes of words. Caramazza (1996: 486) comments these findings as follows: "(...) category-specific naming failures can be attributed to a deficit in *lexical* retrieval and not in *semantic* processing." This view implies that category labels (like "tools/plants/etc." or "nouns/verbs/etc.") are coded lexically or at the level of the "words" and not or not only semantically or at the level of the objects. The lexical level might be conceived as the level that features the words as the neurophysiological objects *in se*. It is most probably phonologically coded (e.g. Frost 1998), or holds the information for the phonological assembly of the word (cf. Levelt 2001). For these reasons, it seems in our view similar to Freud's word presentation level (Freud 1891/1978), where words are similarly treated as objects, coded as their sound image and articulation pattern.

Linguistic action perception competing with linguistic object perception. If we now take these different observations together and imagine a particular situation in which the "Ratman" for example hears the sentence: "There is a rat in the kitchen." As detailed higher, perception of this sentence is thought to induce motor phoneme activation. This phoneme activation is then thought to participate in two cognitive processes, namely the perception of the speech act and the perception of speech fragments (objects), much like object use observation is recorded to induce both perception of the object (canonical neurons) and perception of the object use (mirror neurons). While perception of the speech act would allow for access to the *intention* or contextual meaning of the speaker, it is proposed that in high anxiety contextual decoding has to compete with a decontextualized activation induced by the speech fragments. Instead of participating to a meaningful syntax, the speech act is then not or less perceived as such but "degrades" to the perception of isolated speech objects, such as words or phoneme groups. In the psychic system of the Ratman e.g. contextual processing of a sentence such as "There is a rat in the kitchen." would have a hard time competing against an autonomy of associations induced by the fragment /rat/.

3.3 Language fragments and emotional memory

3.3.1 *Emotional memory*

When we consider language fragments as objects, it makes sense that, similar to other objects, phoneme sequences are subjected during maturation to an "emotionally conditioning" process as proposed by Ledoux (1993, 1994).

Central to his theory is the wedge-like splitting of the neuronal trajectory of a single input train into two pathways, one subcortical or limbic and the other neocortical. The limbic trajectory accounts for the rapid affective evaluation of the stimulus in function of a memory system established by conditioning while the neocortical trajectory accounts for the slower rational (contextual) analysis of the same stimulus. The wedge-like splitting in the thalamus indicates that both pathways, while being intensively intertwined, nevertheless function in a relative autonomy from each other. The limbic pathway moreover is both phylogenetically old and ontogenetically early: the systems are functional before birth and immediately start establishing an emotional memory on the basis of conditioning of raw input material. The neocortical trajectory is both phylogenetically more recent and ontogenetically late: cortical maturation is not achieved until six to ten years after birth. Therefore, it is only with some delay that an articulate mature "cognitive" analysis of the input material can be fully achieved and stored in the semantic fields.

A central structure in the limbic pathway are the amygdala which analyze auditory input in order to identify stimuli which are emotionally significant (e.g. food, predator, sex partner). Upon detection, they activate brainstem structures and modulate hypothalamic activity so that the organism can take appropriate (behavioral and vocal) action (LeDoux 1996; Rolls 2000). Moreover, Ledoux (1993, 1994) has shown how the amygdala, in interaction with the hippocampus, act as an interface for the encoding into memory of a level of fear (or autonomic and behavioral readiness) corresponding with respective incoming (auditory) stimuli. In humans, the amygdala receive direct input from the auditory areas in the temporal lobe, interact with the cingulate gyrus and project not only to Wernicke's area, but continuing through the inferior parietal lobule, also to Broca's area (Gilles et al. 1983). Not surprisingly, the human amygdala were shown to participate in the enhancement of both perception of and memory for emotionally arousing stimuli (Adolphs et al. 1997; Anderson & Phelps 2001; Cahill et al. 1995). Linguistically, they respond to complex auditory affective stimuli including words and sentences (Halgren 1992; Heit et al. 1988; Isenberg et al. 1999). It is therefore tempting to propose that, like other objects, the language object is as appropriate an input stimulus as another and is therefore also considered to be subject to emotional conditioning (at the level of the amygdala).

3.3.2 *Language fragments are encoded in an emotional memory*

The first constituting elements of the maturing linguistic system have been described as holistic words – or for that matter, any holistic phrase – before even the emergence of fully articulated phoneme segments (Studdert-Kennedy 2000). This means that the first steps towards articulated language are given by a cultural environment. Moreover, this environment is in these early years directly emotionally active, since its effects are then still unmitigated by the influence of the not yet mature neocortex. We therefore can assume that in each individual, language matures with a particular emotional history. Though it is clear that different languages bear different phoneme, intonation and prosodic patterns, the point we wish to make is that this emotional linguistic memory is more than only culture specific. It is an idiosyncratic linguistic memory and is colored by important circulating "signifiers" in the history of the individual and of its family.

In an ontogenetic perspective this results in the constitution of an emotional language memory in which particular phoneme sequences are linked to particular levels of emotional activation in function of a particular history. Since this emotional activation is situated at a subcortical level, it is thought to happen in a relative independence of the neocortical semantic operations, where the same linguistic input would be disambiguated in function of the context. It is therefore thought that in presence of a given linguistic input, the phonological structure of this input is in itself and with a relative autonomy capable of activating a certain level of emotional arousal, while at the same time and in parallel higher order processes are disambiguating the linguistic input in line with the given context.

In contrast to the semantics, which serve the purpose of communication and thereby function upon a common or shared understanding of its signification, the emotional signification is private or, at the most, shared within the same "emotional" community like e.g. the core family. That is, phoneme choices are irrelevant for semantic communication – it doesn't matter if you say "father" or "dad", their semantic definition is the same. In terms of emotional activation, however, there might be a world of difference between "father" and "dad", but this will depend upon the particular person and its history.

In summary, it is proposed that phonology, by the biology of its circuitry and of its maturation, acquires a particular emotional significance in each individual, that is thought to be stored in an emotional memory system and codes for the need for recruitment and intervention of bodily (autonomic) systems upon activation (by hearing, speaking and/or internal ruminating) of these phoneme sequences.

4. A hypothetical model for the dynamic unconscious

4.1 Repression and phantoms: Intentions not acted upon

In his model of the dynamic unconscious[7] Freud (1915b/1957: 202) defines repression in operational terms: "A presentation which is *not put into words*, or a psychical act which is *not hypercathected*, remains thereafter in the Unconscious." Repression therefore might be characterized by a state of "cathexis" without effective musculatory enactment of this cathexis, be it the musculatory enactment of a linguistic (namely articulatory) or of a non-linguistic motor output. A tentative physiological translation of this dynamic can be drawn. It has been established (Roland et al. 1980) that mere planning of a movement sequence (without execution) activated the supplementary motor area (SMA), whereas planning of the same sequence followed by execution activated both the SMA and the primary motor area (see also Roland 1984; Fox et al. 1987). Focusing on the desired goal of an action, Jeannerod also suggests that SMA neurons, encoding the desired "final configuration" of the body, would continue firing "until the final goal has been reached" (Jeannerod 1994: 201). He adds:

> One possibility would be that these neurons encode final configurations (of the environment, of the body, of the moving segments, etc.) as they should arise at the end of the action, and that they remain active until the requisite configuration has been attained. This sustained activity would represent the reference (the goal) to which the current state of execution of the action would be compared (Jeannerod 1990). These neurons would accordingly remain activated as long as the represented action was not completed, including in situations where the execution was blocked. (Jeannerod 1994: 201)

One way in which the desired-for body configuration (i.e. the intention) and the actual body configuration are compared is through the so-called "comparator" model first postulated by physiologists to account for the compensation of the visual system for retinal displacement during voluntary eye movement (the corollary discharge model, Sperry 1950; the efference copy model, Van Holst 1950). However, it appears that sensory predictions produced in conjunction with the motor command are not restricted to eye movements but also provide perceptual stability in the context of all self-produced actions (see e.g. the central monitor model, Frith 1992 or the internal forward model, Wolpert 1997) According to these theories, the comparator is a specialized structure which receives action-related signals from internal and external (sensory) sources. During a self-generated action, internal signals, which are a copy of the commands sent to the effectors (and which therefore reflect the desired action), are sent to the comparator. These internal signals (or efference copies) create therein an anticipation of the consequences of the action. When the action is effectively executed, sensory signals generated by the movement or reafference signals (such as proprioceptive or visual information) also reach the comparator. If these sensory signals match the anticipation of the comparator, the desired action is registered by the system; if they do not, a mismatch between the desired and the produced action is registered.

Putting Jeannerod's and these considerations together, one might deduce that the mismatch between intended and achieved action thereby "fuels" or drives the sustained activation of the SMA neurons. Importantly, Jeannerod also suggests that in the case "where the action could not take place, the sustained discharge would be interpreted centrally as a pure representational activity and would give rise to mental imagery." (Jeannerod 1994: 201). This hypothesis would thereby provide for a satisfactory explanation to a number of clinical observations. For example, it is thought that the sustained activation of SMA neurons due to a right frontomesial lesion in patient E.P., reported by McGonigle et al. (2002), is the cause of her intermittent experiences of a supernumerary "ghost" left arm in the so-called "action space". The central representational hypothesis of non-realized but yet intended movements would also fit with the explanation proposed by Ramachandran for the understanding of phantom limb experiences, especially those implying "the vivid gesticulation and other spontaneous movements" of these phantoms (Ramachandran 1994: 314). Indeed, Ramachandran (1994) posits that "the sensations arise from reafference signals derived from the motor commands sent to the phantom" (Ramachandran 1994: 314; where "reafference" is actually to be understood as the efference copies, since they are "*derived from the motor commands*").

For all these reasons, the contention that repression is characterized by the lack of musculatory realization of the cathexes might be understood on a neurophysiological level as a sustained mismatch at the level of the comparator, resulting in sustained SMA neurons activation (e.g. for the articulation of the repressed word presentations), and thereby resulting in the emergence of linguistic "phantoms" which would be of an articulatory or phonological nature.

4.2 The dynamic unconscious: A linguistic action space organized by phonemic attractors

For Freud, however, repression always is the result of two forces, one pushing a representation, while the other is attracting it:

> It is a mistake to emphasize only the repulsion which operates from the direction of the conscious upon what is to be repressed; quite as important is the attraction exercised by what was primarily repressed upon everything with which it can establish a connection. (Freud 1915a/1957: 148)

Once the cathexis is withdrawn from the presentation that has to be repressed, this cathexis is transferred to a substitutive word-presentation that is associated with the repressed presentation. Importantly, these associations seem to function on the basis of linguistic or verbal similarities: condensation, metaphor, assonances, punning associations, etc. (Freud 1900/1975: 596). Therefore, it is these substitutive word-presentations which are thought to act as the attracting forces at work in repression: in their capacity of representing previous acts of repression they operate by attracting new material and thereby function as an indication of the repressed, a marker of the unconscious.

Taking all this together, the following approach of the dynamic unconscious is proposed. During an individual's particular history specific phoneme sequences or speech fragments acquire a specific affective valence which is encoded in an emotional memory system (see also Bazan et al. 2002). These affective valences can be understood as the potency for these speech fragments to induce a more or less important mobilization of the body's flight-fright-fight circuits. Highly anxiously valenced fragments more readily threaten the bodily integrity and therefore are more readily subjected to inhibition. When this inhibition then leads to the prevention of effective realization of voluntary acts, more precisely of voluntary speech acts, this results in the sustained high levels of (SMA) neuronal activation. Since this situation of high potential energy is also unstable, the high neuronal activation seeks for realization and in doing so "attracts" substitutes which are phonemically similar to the censored speech fragments though cognitively non threatening (e.g. "*effect*" instead of "*Steffie*") – i.e. what Freud calls the "substitutive word presentations associated with the repressed presentations". As a result, the speech of the subject would be particularly concerned with the verbalizations of these substitutive word presentations, which therefore might be considered to act as organizing principles. As indicated higher, these substitutive phonemic fragments could be thought of to be akin to the limb phantoms, as was e.g. observed by McGonigle et al. (2002). In other words, it is thought that recurrently active but unspoken phonemes can give rise to central representational activity, creating what we tentatively label as "phonemic phantoms in a linguistic action space". One way to conceive of the dynamic unconscious therefore would be that it appears as the instantiation of a linguistic action space which would be idiosyncratically organized by particular phonemic phantoms operating as attractors for the subject's (linguistic) actions.

Notes

1. For a reframing of this concept in terms of brain correlates, see also Bazan 2001; Bazan et al. 2002b.

2. The Ratman would have the habit to internally count the money he pays his sessions with as "Eine Rat, Zwei Raten, etc.".

3. Though the patient stays anonymous, some of the punctual data concerning the patient were changed so as to further make the clinical description unrecognizable. This was done with safeguard of the evidence character of the presented material as in respect to the case it claims to make.

4. Translated by the first author from the Dutch: "De natuur bepaalt alles. Alles is van de natuur. Alles heeft een effect. (...) Kleuren geven effect. (...) Metalen plooien niet, inox plooit. Het heeft een effect door omstandigheden. Een vent en een vrouw hebben effect op elkaar. Dit is de zin van het leven, de affectie, dit is perfect. Als het met effect is, is het heel goed gedaan. De leraar zegt, het is perfect. (...) Alles heeft een effect. Proteïnen, eiwitten, in de sport laten de spieren in massa toenemen. Fretten. Miljaarde. Fretten."

5. The theme of "eating" (popularly *fretten*) is a central theme in the family, especially between F. and his mother. Mother was fed by her father as soon as she got pregnant of F. Mother: "Father always would make double meals, because I used to systematically throw the first one up." Food is extremely (de-)regulated in the household, by a culture of pills, vitamins, healing substances and so on. Mother always judges F. upon his (gain or loss of) weight on her visits and would try to get feedback from her son upon hers.

6. In another session F. would again play with this word "*fretten*" as well as with similar sounding variations upon his own name. He then would make the jump to his fascination for terrorist organizations, with amongst others the 'ETA', which he suddenly would interpret as "Eet da!" ("Eat this!").

7. For a comprehensive comment on the linguistic dynamics in the Freudian unconscious, see also Van Bunder et al. (2002).

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Part II

Dissociation of body image and body schema and ways of embodiment

Vectorial versus configural encoding of body space

A neural basis for a distinction between body schema and body image

Jacques Paillard

1. Introduction

The way in which space relationships are represented in the brain and intervene to organize our vision of a stable world in which we move our private body space has been the topic of lasting philosophical and scientific debates. In interdisciplinary volumes like this, each of us, depending on his own background and experiences, is necessarily coming with his biased point of view. Let me first briefly outline how my own itinerary, as an early trained neurobiologist (having to teach psychobiology in the faculty of sciences) has led me, as early as 1972, to confidently consider a functional segregation between body schema and body image as biologically and evolutionary founded.

One of the most impressive features of our brain is its ability to process a continuous flow of multimodal information from internal and external sources thus producing an integrated and coherent central representation of our perceptible outside world and of both our perceived and unconsciously registered own body space.

Motor action is assumed to play a crucial role in accounting for the astonishing capacity of the nervous system to extract regularity and covariant features from changing surroundings and body state, storing them in some central representation of both a predictable outside world and the private domestic body space we inhabit.

Additionally, inherited sensori-motor mechanisms intervene both for regulating the large spectrum of autonomic functions underlying body metabolic functions and for automatically framing the basic postural mechanisms underlying the body's orientation in the field of gravity, and those anchoring oriented sense organs to targets located in a coherent, stable, and unified perceived world (Paillard 1999b).

We initially proposed (Paillard 1971) to attribute a distinctive role to two types of motor activities: (1) those involved in *transporting* body segments or the body as a whole from one place to the other, toward definite targets in their action space and (2) those *exploring* unvisited local spaces, for instance, in tactually or visually palpating objects for their identification. *Transport* toward stable targets (regardless sensory modality) is critically important in mapping an '*espace des lieux*', i.e. an action space where targets are vectorially located in a *body-centric space coordinate system*. Contrastingly, *exploration* contributes to uncover an '*espace des formes*' where local spaces are shaped by the outlines of their boundaries and internally characterized by the stable configuration of their component parts whose relative positions are referred in *world- or object-centric space coordinate systems*.

Self-generated transports have been shown to play a prominent (although not exclusive) role in the inter-calibration of the various sensorimotor action fields (Paillard 1971, 1991a), thus grounding the building up of a general amodal action space. In contrast, exploratory investigations operate within a circumscribed local space for identifying its shape characteristics and internal features, thus contributing toward the central registering of configural invariants that would allow its categorisation and later recognition.

Our basic assumption is that a sensorimotor body schema and a configurally coded body image derive from such a dual processing mode of spatial relationships. The neurological relevance and functional consequences of such a distinction will now be examined under the following headings. (a) *Sensorimotor* versus *representational* levels of neural processing. (b) The *what* and *where* dichotomy. (c) The neural basis of *vectorial* or *configural* encoding of body space. (d) Evidence from deafferented patients of a *dual body mapping*. We will conclude by some comments on the biological roots of identity.

2. Sensorimotor versus representational levels of processing

Right from the beginning of my university career, around the fifties, I was facing the hopeless challenge to try to narrow down the gap between the data gathered by a still immature neurophysiology (recently endowed with the new promising technological resources from the computer revolution) and the psy-

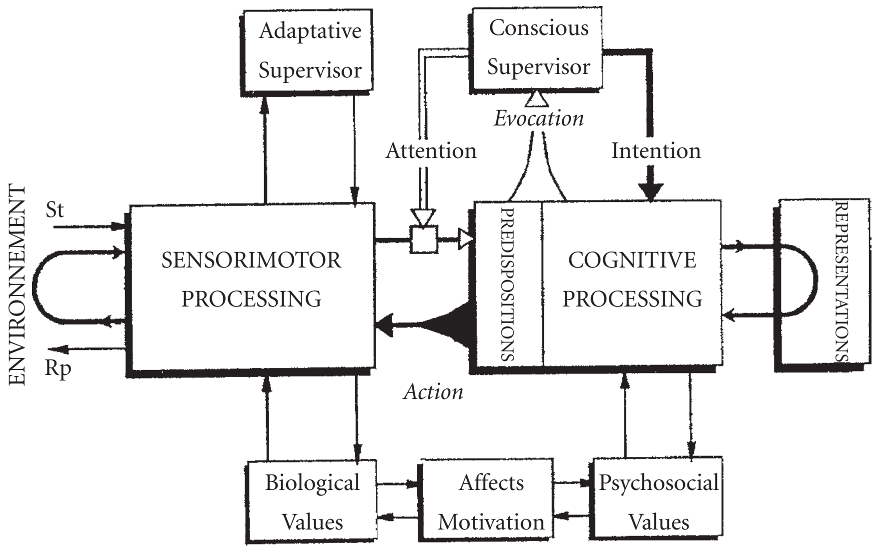

Figure 1. Two levels of information processing in the nervous system: See comments in the text (modified from Paillard 1980).

chological approaches of mental functions (yet still largely influenced by philosophical and psychoanalytical theories). To meet this ambition, and following the Piagetian assumption (Piaget 1937; 1971) that higher cognitive functions have their roots in basic sensorimotor mechanisms that primarily ensure the organism's survival, I found it useful to frame the problems by introducing the simplified model depicted in Figure 1 improved over time. This model highlights the main questions we have to cope with.

It attempted, in an oversimplified form, to schematize the two fields that characterize the neurophysiological and psychological approaches of behavioral and mental outcomes. A first compartment involves a *sensorimotor* machinery directly dialoguing with its physical environment. This happens mainly through its genetically prewired circuitry selectively tuned to supply vital functions. The second compartment concerns a *cognitive* apparatus endowed with the whole of resources of neocortical structures (with their stored abstract representations of internal or external world) able to process the variety of mental states that characterizes higher brain functions. The question arises as to whether the two processing modes operate in parallel, each using its own neural circuitry and generating its own mapping of space in two fundamentally different ways. Thus the central problem of the interaction between both levels stands in front of us. The sensorimotor level clearly stands as an interface between a cognitive brain and its outside word. It imposes its own constraints on the collecting of information gathered by sense organs and on their distribution for further processing to higher structures through the control of attention processes and conscious awareness. In the same way, descending commands for self-generated action cannot ignore the requirement of the sensorimotor interface. They have to anticipate the inverse dynamic of the sensorimotor machinery to meet their desired target in the physical space. Thus both levels are functionally tightly coupled. Since we have to envisage how far the sensorimotor schemas of Piaget's model (1937), providing the various 'savoirs faire' of the basic biological machinery, may contribute to mediate the neural implementation of the diverse 'savoirs' categories in the cognitive brain. To use the more commonly quoted distinction later introduced by Ryle (1949) we may conclude that a '*knowing what*' cannot be build without the assistance of a '*knowing how*' (which, in a sense, is no more than a reformulation of motor theories of mind). Though are we legitimated in considering that, in the body space, a "body image" (a *what* problem) could not be shaped without the presence of a "body schema" (a *how* problem)? Let us now come back to the historical background of this *what and where* dichotomy.

3. The what and where dichotomy

The early distinction we introduced (Paillard 1971) between an 'espace des lieux' (target space) and an 'espace des formes' (shape space) was consonant with the then emerging segregation in neuro-behavioral studies between two visual systems respectively processing 'identification' and 'location' cues (Ingle 1973; Schneider 1969; Trevarthen 1970; Held, 1970). The model derived from a seminal study by Ingle (1967) on the frog's visuomotor behaviour, and was extended to the hamster by Schneider (1969). Both suggested a dissociation between the role of cortical visual areas in the perceptual *discrimination and recognition* of visual forms and that of collicular structures in *body orientation and target localization* in action space In Figure 2, two visual systems are represented. One conveys visual information through the geniculate body to the visual cortex (with a dominance of central vision) allowing the perception of form; the other afferented collicular structures of the optic tectum ensuring orientation and localisation in the visual space.

Having been committed at that time as discussant in a symposium on 'Psychologie de la conscience de soi' (1972), I was confronted to a violent attack

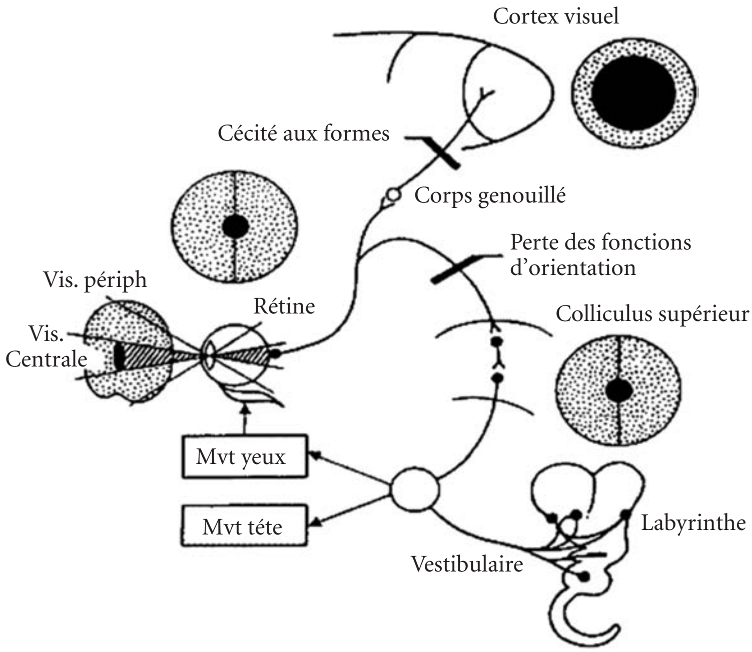

Figure 2. Two visual systems: See comments in the text (modified from Schneider 1969; in Paillard 1980).

on the Schilder book (about the body schema) by René Angelergues (a French neurologist from the Héacan's group) emphasizing "l'assumption triomphante de l'image" (the triumphing assumption of the image) in the human brain and concluding sharply : "*The Body Schema is to be considered as a useless concept, unnecessary, even deleterious and becoming an obstacle to biological and psychological thinking…*" (our translation).

In my vigorous plea to preserve this concept as one of the rare bridges we still had between neurophysiologically graspable data and psychological theories, I explicitly questioned the enduring conceptual confusion entertained by neurological and neuropsychiatrical studies between body schema and body image as the main obstacle to overcome, if we really aim at promoting a productive dialogue between biological and psychological thinking (Paillard 1973, see Footnote 1 for original French formulation).

Afterwards, I took the opportunity for further enlarging the distinction between a body localized in an '*espace des lieux*' and a body shape identifiable in an '*espace des formes*'. In the same vein, I similarly emphasized the necessary distinctive status of the body as the egocentric origin of a space coordinate system and a body referred to an object by its relative position with respect to other objects or other landmarks in a configural world-centric frame of reference (Paillard 1980, 1982, 1991a, 1991b). Additionally, I was also especially interested in the specific properties of self-induced movements when compared to passive body displacements (Paillard & Brouchon 1968) and eager to look at the inherent properties of the self-acting body. A problem topical again to day, with the new approaches of the sense of ownership as dissociable from that of agency (Gallagher 1986; Richemond 2004)

Coming back to our historical survey, I would like to mention that the Trevarthen proposal in its first monkey study (1970) to distinguish a '*focal vision*', entailing foveal retina for identification, and an '*ambient vision*', involving the peripheral retina for localisation, obviously prefigured the now influential *what* and *where* dichotomy. The latter, proposed 10 years later by Ungerleiter and Mishkin (1982), was also derived from monkey studies and established that visual information, conveyed to primary cortical visual areas through geniculo-striate pathways, was distributed to the associative cortex along two main streams. The first travels through the posterior parietal association cortex and subserves the knowing *where.* The second mainly projects into the temporal association areas (where object features are analysed) and constitutes the neural substrate of the knowing *what*. The dominant contribution of peripheral and central vision in each of these processes has recently been confirmed by Morel and Bullier (1990). Such a functional segregation between parietal and temporal associative cortex is now largely recognised and supported by neuroanatomical, neurophysiological and neuropsychological studies (Jeannerod & Rossetti 1993) (see Figure 3).

Moreover, different mechanisms for processing spatial information have been assumed to be represented in the human inferior and superior parietal lobule. Perenin (1997) argued that the superior part of the parietal cortex, the lesion of which leads to disturbances of visuomotor control such as optic ataxia, is mainly involved in "direct coding of space for action by means of several effector-specific representations", while the inferior part is responsible for "more enduring and conscious representations underlying spatial cognition and awareness" (Perenin 1997: 304). Milner and Goodale (1995) suggested that the superior parietal lobe as part of the dorsal stream of visual processing mediates "the control of goal-directed actions in an ego-centric reference system" (Milner & Goodale 1995: 41) whereas the inferior part of the parietal lobe with the parietotemporal region deal with "abstract spatial processing based on input from the ventral stream and thus associated with the formation of perceptual and cognitive representations which embody the enduring charac-

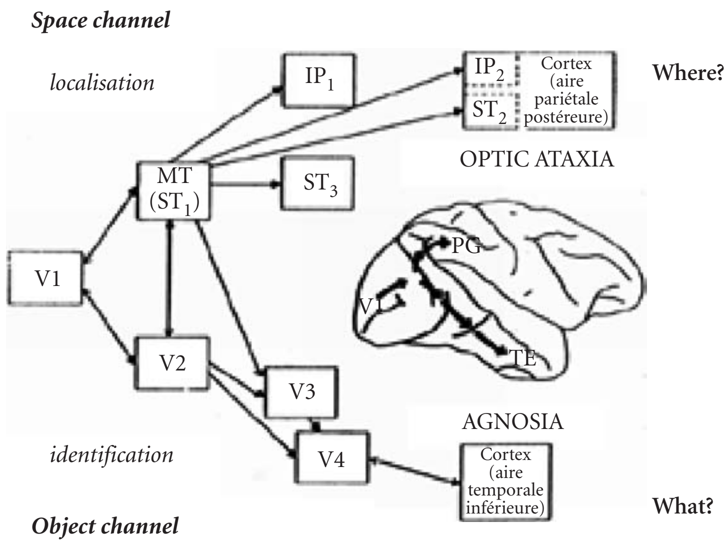

Figure 3. Double distribution of visual information to the parietal and temporal cortex. See comments in the text (modified from Ungerleiter & Mishkin 1982).

teristics of objects and their significance" (Milner & Goodale 1995: 66). Figure 4 shows that the *dorsal stream* jointly participates in the posterior parietal areas with information from collicular origin (superior colliculus *SC*; thalamic pulvinar nuclei *Pulv;* lateral geniculate nuclei *LMGd*). The *ventral stream* contributes, in the infero-temporal cortex, to object identification according to shape and internal features.

Obviously these observations fit remarkably well with the hypothesis of a dual mapping of a body schema and a body image, pointing moreover to a presumptive regionalization of two separate underlying cortical networks. In fact, it gives evidence for a corticalization of the tectum optic primitive motor functions, which may have contributed to bestow the parietal cortex with the leading role it has taken in the organisation of spatial function in primates and man.

Surprisingly, however, we have to wait for one more decade before the contribution of collicular efferent projection to these cortical areas (through the pulvinar thalamic nuclei) is taken into due consideration. The interesting observations by Goodale (1991) of their implication in the automatic monitoring of spatially oriented action at a subconscious level clearly disclose their relationship with collicular primitive functions. Subsequently it offers a convincing neural explanation for the perplexing phenomena of *blind sight* (Weiskranz

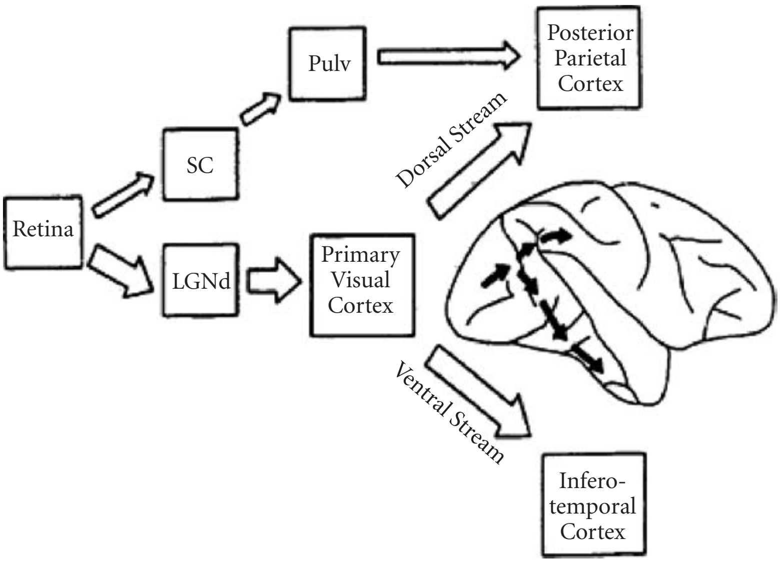

Figure 4. Double distribution of the visual streams in primates through temporal and parietal cortex: See comments in the text (adapted from Goodale & Milner 1992).

1989) and *blind touch* (Paillard et al. 1983b). Since the emphasis is put on the motor oriented role of these regions (Goodale & Milner 1992), the proposal by Jeannerod and Rossetti (1993) to distinguish a *semantic* from a *pragmatic* processing mode in the brain is especially welcome, a distinction which, in a sense, is consonant with the Piagetian one between 'savoirs' and 'savoirs faire'.

This development greatly contributes to a further splitting of the original 'what' and 'where' dichotomy into various subclasses, distinguishing for instance the *where* from the *how to get there* and the *what* from the *how to use it* (see Paillard 1991b). It has also stimulated behavioural neurosciences to bring up to date again the rather neglected topics of old neurology, such as for instance the automatic versus voluntary control of movement. Hence new models have been proposed to identify separate neural nets for the predictive or reactive driving of action (Goldberg 1985a, 1085b). More generally the emphasis put on the complementary role of implicit and explicit brain process (i.e. consciously or subconsciously controlled) opened promising new lines of research (Shachter, et al. 1988; Pisella & Rossetti 2000). This new trend joins the contemporary growing interest of neurosciences, endowed with the new technologies of neuro-imagery (opening the non–invasive exploration of the waking brain in man), to invest the long prohibited territory of consciousness, still almost exclusively reserved, until recently, to phenomenological and philosophical survey (Paillard 1999c). The topic of this interdisciplinary volume asserts precisely the reality and promises of such converging endeavours but it obliges us to evaluate how far our own contribution is providing compelling evidence for the reality of known neural mechanisms able to fully establish the Schema-Image distinction as physiologically justifiable. To that aim we have to turn to the encoding problem.

4. The vectorial versus configural encoding of body space

Looking at the identification of the neural mechanisms underlying the encoding modes presumably involved in a dual mapping of body space, we may summarize the main arguments as follows.

Two main codes, a temporal and a structural one, are recognized to be used in the processing of neural information (see Paillard 1983a). In *temporal* coding, the frequency of the propagated train of repetitive impulses (for coding intensity for instance) or the configuration of a sequence of pulses train are most commonly used. The *structural* code, still designated as the 'labeled line' code, concerns the signification acquired by a neural message depending on the target zone of its destination (for instance, an optic fibre which would be grafted so as to direct its message to an auditory area zone should raise a sound sensation).

Moreover, considering the multimodal neurons of the cortical associative areas which receive a great amount of converging sensory fibres of various origins on their membranes, each singular neuron is presumed to get around ten thousand synaptic contacts distributed on its membranes. One simple law attributed to Hebb tells that synapses repetitively co-activated (within a critical time delay) have their transmission power reinforced whereas it diminishes in the others. Consequently, if a given configuration of afferent information is invariantly present in impinging messages, the neuron behaves progressively like a filter, recognising specifically the selected configuration. In other words, it becomes the neural representation of some invariant feature of the incoming information. Figure 5 is a schematic illustration of how a configuration of multimodal information converging to membrane of a single neuron arouses a configuration of co-activated synapses (from Paillard 1999b, adapted from Mark 1974). Synapses repetitively and synchronously activated see their transmission power reinforced whereas it decreases in others. Figure 5 shows the convergence of 4 fibres carrying multimodal afferent information (visual V;

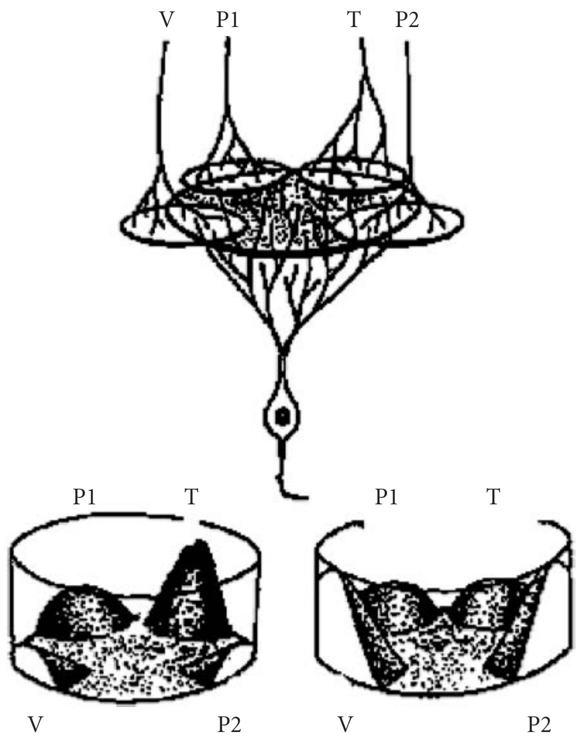

Figure 5. Schematic illustration of how a configuration of multimodal information converging to membrane of a single neuron arouses a configuration of co-activated synapses. See comments in the text (from Paillard 1999b, adapted from Mark 1974).

tactile T; proprioceptive P1 and P2). To the left: initial state of the configuration of synaptic activation at different sites. To the right: state of the configuration after repetitive co-activation of visual V and proprioceptive P2 afferent with the corresponding reinforcement of the synapses involved, whereas other connections not synchronously solicited (P1, T) are weakened.

We talk about configural encoding here. It is most pervasively used in the structuration of neural network activities. It may account for the astonishing capacity of biological systems endowed with neural networks to extract covariant signals from the flow of multimodal sensory inputs that impinges on their sense organs, and to stabilize in the neural circuitry selective configurations of synapses that are co-variantly activated (Phillips et al. 1984). In this way, a kind of internal representation of the invariant feature of the collected information is imprinted in the hard core of the neural system.

In analogy with the distinctive '*labeled line*' and '*configural code*' identified in the neural network (the first being defined through the destination locus of the fibers, and the second by a configuration of co-activated synapses) and considering now the neural encoding of the body space, we are also clearly facing two modes. The first one, considering a *target space* (our 'espace des lieux') where the target goal for a directed movement has to be *vectorialy* defined by its location (direction and distance) in a stable reference system. Second, a *shape space* (our 'espace des formes') in which a spatial *configuration* has to be registered as an invariant feature.

We have described elsewhere (Paillard 1991a) how certain metric rules (corresponding to the 'geometry of space' described by mathematicians as 'path structures') encode, in direction and distance, the trajectory to follow in order to move from one point to another. A 'path structure', superimposed on a collection of separate points, defines the *locality* of each of these points in a *vectorial map.* This kind of geometry is particularly suitable for a description of a sensorimotor space. Motor commands that displace a given sensory receptive surface from one point to another in physical space are generally prescribed in terms of direction and distance. They therefore fit the requirements for the definition of a vectorially coded path structure (Paillard 1991a). It has been shown that the plurality of sensorimotor action spaces depending on the acting body segments and the involved sensory modality have to be coordinated in a unified amodal dynamic structure of space, anchored in a geotropically oriented postural frame, which constitutes the *body schema.*

On the other hand there are many co-variant changes in the retinal image of the outside world when the body moves, and these signals might well serve to generate an internal *configural representation* of a stable visual environmental frame (Gibson 1950; Paillard 1991a). Within this frame, local bounded spaces are identified as singular objects categorisable in terms of their specific features (including their shape). Similarly, reafferent visual and somesthetic proprioceptive information (Lee 1974) issued from our moving body may tune the layered net of configurated neural filters, leading to composite and dynamic configural maps of the body's state that are consciously experienced as our *body image* (see heading 5 below).

It is, however, a matter of debate whether our transport's movements are always directed in space in terms of a *vectorial coding* of the required displacement (direction and distance) or alternatively in terms of a *place calibration* within a configural space map. These two modes, however, are not mutually exclusive and may depend on the requirement of the motor task and on the action system involved. There is a substantial body of experimental data from ethological and psychological research which suggests that spatial orientation in animals and man relies heavily on their internal mapping of the environment. Most investigators of the locomotor space of rodents, for instance, accept Tolman's notion of *cognitive spatial maps* and now offer convincing evidence of its neural counterpart. However, in this field, both the distinction between 'maps' and 'taxon' systems introduced by O'Keefe and Nadel (1978) (see Footnote 2), and that between 'bearing maps' and 'sketch maps' proposed by Jacobs and Schenk (2003)[1] support our own distinction between a dual encoding mode (vectorial and configural) of space relationships.

Our last remarks points to the advantage of looking at some patients suffering partial or acute loss of proprioception and touch, as observed in the sensory neuropathy syndrome. They offer unique opportunities to evaluate the role of somesthetic reafferent information in the structuration of their space maps (Gallagher & Cole 1995). One of them (patient GL suffering a neuropathy and described below) is presumably deprived of her body schema, and whereas unable, in blindfolding condition, to correctly reach a point located in her body-centric target space, she exhibits nonetheless, with vision, a correct pointing to that place in her configural visual space.

5. Evidence for a dual mapping in deafferented patients

Herewith we wish to present two clinical observations that seem relevant to us in corroborating the existence of such a dual mapping of the body space in localizing stimulation on the skin of the body (for a detailed presentation of these cases, see Paillard 1999a). The first concerns a patient suffering from an extensive peripheral neuropathy and who shows a capacity to detect and verbalise the perceived location of a stimulus delivered on her body but fails to reach the stimulated site when vision is prevented (Paillard 1997). The second, a centrally deafferented stroke patient shows the converse dissociation, i.e. offering the first clinical observation of an equivalent of 'blind sight' in the tactile modality, i.e. a location without perception (Paillard et al. 1983).

5.1 Perception without location

The peripherally deafferented patient GL, chronically suffered from a selective loss of large myelinated sensory fibres extended to the whole body below the nose, as a consequence of a polyneuropathy. As seen on Figure 6 on the right side, GL presents clinically a total loss of touch, vibration, pressure and

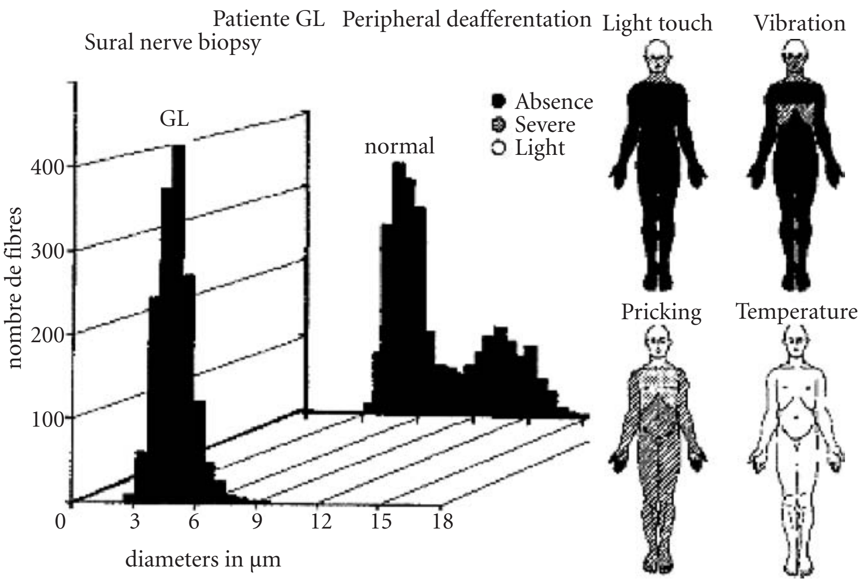

Figure 6. Patient GL: See comments in the text (Cooke et al. 1985).

kinesthetic senses below the nose. Pain and temperature sensations are present suggesting a selective impairment of the large diameter peripheral sensory myelinated fibres with an intact motor system. Histograms on the left compare the distribution of the diameters of sensory myelinated fibers observed in GL with that normally present. A sural nerve biopsy revealed that nervous fibres larger than 6.5 microns (subserving kinesthesia and somesthesia) represented in GL only 1.6% of the total number of myelinated fibres (N = 1,600).

The whole contingent of motor fibres was integrally preserved and a residual thermal and algic sensation was still present. When vision was prevented, although unable to point with her right finger to location of a thermal or pricking stimulation delivered on her passively displaced left arm, she proved very accurate in localising the stimulated site, either verbally or on a body picture. Hence, she seemed able to localise the stimulus in her *configural visual body image* while unable, in blind folding condition, to move her finger toward the stimulated area within a *vectorial proprioceptive sensori-motor body space.*

5.2 Location without perception

We already had the opportunity to study another patient (RS) showing a partial deafferentation of her right arm (below the elbow) with complete preservation of her motor control as a consequence of an occlusion of the left posterior cerebral artery. Figure 7 shows on the left a reconstruction of the parietal lesion observed in RS according to five *computed tomographic scan* slices at bottom. On the right, a distribution of the sensory deficits. RS, among other neurological syndromes (described in Paillard et al. 1983), suffers from a clinically right side hemianaesthesia, persistent after several years, with a complete anaesthesia of the distal part of left arm and left foot.

In contrast to the preceding case, deafferentation was purely cortical in this case, thus impairing awareness of the stimulation but preserving the potential implication of somesthetic information at lower processing stages. Unable to detect and to perceive any tactile stimulation delivered at various sites on her right hand when vision was prevented, this patient showed, to her own surprise, a spontaneous ability to point her left finger toward stimulated places on her deafferented right hand. Following the early description of this phenomenon as a tactile equivalent of *blind sight* by Paillard et al. (1983), three similar observations have since been reported (Brochier et al. 1994; Rossetti et al. 1995; Halligan et al. 1995). They all mirrored remarkably the above described behaviour of our peripherally deafferented patient. Conversely, the

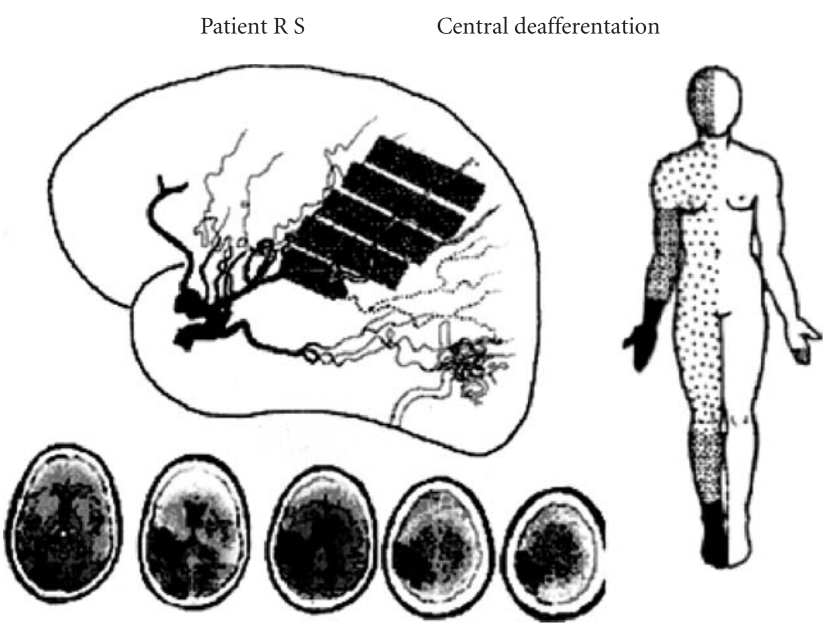

Figure 7. Patient RS: See comments in the text.

centrally deafferented patient is obviously unable to perceive the stimulus delivered on her insentient hand and hence to localise it in her *visually configurated body image*, although proving able to drive automatically her left hand toward the right stimulated place in her *proprioceptively framed body schema.*

This double dissociation obviously requests, as already emphasized in my 1973 paper (see above and also Paillard 1999), a reappraisal of the clear distinction first proposed by Head and Holmes (1912). Indeed, these authors suggested the distinction between a *postural schema* considered as "*a combined standard against which all subsequent changes of posture are measured ... before the change of posture enter consciousness...*" and a *body image* as an "*internal representation in the conscious experience of visual, tactile and motor information of corporal origin*" (Head & Holmes 1912: 212). Interestingly, Head and Holmes added the somatotopic mapping of tactile information as a *superficial schema*, endowed with an independent status and as the borderline interfacing internal and extra-corporal body space. How far this somatotopic map could be independently framed either in the postural body schema (for targeting body-centred action) or within the body image (for localizing position within its configural representation) remains an open question. It could provide a productive issue to reappraise clinical data and to identify neural structures potentially involved in body space information processing (Paillard 2003).

Additionally we have to mention two of our recent publications made in collaboration with the Jeannerod group in Lyon (Fourneret et al. 2002; Farrer et al. 2003) and dealing with the role of proprioception in action recognition in two deafferented patients including GL. Those publications touch the still debated problem of self consciousness, which will be the matter of our last comment.

6. In conclusion: The biological roots of identity

One major trend in contemporary phenomenological approaches concerns the making up to date again (probably stimulated by recent progress in neurosciences) of old philosophical questions related to self–awareness (an extensive bibliography can be found in Legrand 2004).

When questioning the biologist on how we recognize our body as our own, it seems to me that he would be first inclined to try to understand where this particular human ability is evolutionary coming from. When asking what characterizes the organisational singularity of biological machines, we are readily faced with the rather conceptual haze in which biology has left the term *organ-*

isation, though recognizing its central role in the transformation of a natural history descriptive of the morphology of living beings into a biology that explains their functional mechanisms. As pointed out by François Jacob in his *Logique du vivant* (1970): "Today, it's no longer possible to dissociate the structure from its functional significance, not only within the organism but in the succession of events which steer the organism to become what it is now. Every living system results from a given equilibrium between elements of an organisation" (our translation). Indeed, an organism may be defined as "a living entity with interrelated parts, dependant on each other and which work together to preserve and maintain their coexistence". The key problem therefore bears on the identification of the determinants of this purposive internal cohesion which bind them. In fact, the biologist has long eluded this *why-question,* which has been considered in his community for a long time as out of reach of clean scientific investigations, and was let for the sagacity of the philosopher. Yet, he may well accept that a living cell or even a football team exhibits similar systemic properties linking collective efforts of component parts toward the realization of collective goals as an active unitary whole. The biologist, however, certainly does not worry about speaking of the 'irritability' of a cell preserving the integrity of its (or even *her*?) frontiers. He also has no problem to accept the idea of a 'team spirit' conditioning the purposive cohesion of a social group. Ethology is replete with examples of the instinctual sense of ownership in territory marking and defence or in maternal instinct in the whole animal kingdom. The *emergence* of self-consciousness in the human organism seems obviously derived from related processes. Whether cellular, organic or social, every autonomic organisational unit is bestowed with emergent integrative properties grounded in identifiable internal conjunctive solidarities (see Paillard 1986). At the *structural level,* mechanical solidarities derive from the rigidity of the skeletal frame and from the ubiquitous binding role of the, fittingly-named, *conjunctive* tissue, as the agent individuating a body space with its genetically framed internal organic substructures. At the *operational level,* distributive and connective substructures allow each member of the cellular community to receive food to satisfy its energetic needs through a stabilized internal medium with its expanding net of lymphatic and blood channels of distribution (equally used for remote hormonal command signals). But it is the increasing development of an elaborate neural system of long-distance, high speed and private system intercommunication, which will provide living organisms with an exceptional tool of functional integration. At this *functional level,* however, we meet right away *teleonomic* questions and the stipulation of identifying the unifying common incentive which orients the coordination of the many specialized operations at work within the organic community. "*Simply survival*" would be the obvious answer of the biologist. To survive means first to preserve the body structure permanently compromised in its flesh by the thermodynamic eroding forces; it means also to defend the integrity of the borderline of its private territory by identifying and driving back the foreigners and by neutralising pathological intruders. The *immune system* clearly meets this criterion with its astonishing ability to discriminate the organic *self* from the *non-self*. As already stressed by many authors, and most compellingly by Varela (1979; Varela et al. 1993) it occurs that the nervous system, as the chief manager of the relation of the body space with its environment, and as the supervisor of its metabolic functions, tends to cerebralize functions isomorphic to that of the immunologic system in its ability to recognize the organic self from the non-self.

As we have seen, the neural representation of a configural space structure results from the genuine ability of central neural networks to spontaneously extract invariant features from the flow of its incoming information. Once experienced at the perceptual level, these neural representations allow the recognition of such local spaces as an external object *located* in a stable outside world and *identifiable* as a singular thing and categorisable according to a biological or social system value derived from species characteristics, or from cultural imprints and individual history. Therefore, our body space may be recognised both as an object located in the outside world and as an experienced internal image. Subsequently, like every perceptual experience, this image is amendable to illusion, distortion, completion, and affective investment (Paillard 1980).

Hence all ingredients seem to be tided for grounding a mental self with his private experienced motivations and emotions. And if we accept to consider the body image as knowledge derived from the '*savoirs faire*' of a body schema interfacing the cognitive brain and the external world, similarly, we may consider the basic organic self, which *knows how* to perpetuate the continuity of his private body life, as founding a *mental self* intimately aware of being the self-owner of his body space and accountable of his own purposive action in the world.

Notes

1. Paillard (1973: 245–246): "Schilder, en effet, entretient fâcheusement une ambiguïté sur la nature du schéma corporel. Celui-ci se confond d'une part avec l'image que nous formons dans notre esprit de notre propre corps et d'autre part avec le modèle postural qui en constituerait le substrat. Tout en se référant principalement à Head pour cette dernière notion, c'est en fait les vues de Pick que Schilder adopte en valorisant le rôle de l'image visuelle des diverses parties du corps pour l'édification du schéma corporel. Or, il me semble que les vues de Head et Holmes (1911–1912) apportaient une distinction essentielle, totalement éclipsée par ses successeurs, entre la notion de schéma et celle d'image. Ayant distingué un schéma postural comme "a combined standard against which all subsequent changes of posture are measured..." et un schéma superficiel qui permet au sujet de localiser correctement les points stimulés sur la surface de son corps, ces auteurs étaient conduits à considérer le schéma du corps comme responsable d'opérations de référence "before the changes of posture enter consciousness" et l'image, qu'elle soit visuelle, tactile ou motrice, comme reflétant le contenu de ces informations relatives au corps dans l'expérience consciente. Cette subtile différence entre schéma et image semble avoir été complètement négligée par la suite dans la littérature neurologique; ce qui n'a pas contribué à clarifier les débats. Or, il se trouve que les données neurobiologiques récentes amènent à distinguer nettement deux modes de distribution et de traitement des informations sensorielles dans le système nerveux: le premier concerne l'identification de la forme et des propriétés des objets et met en jeu les structures d'analyse sensorielle corticale, le second aboutit à l'indexation spatiale des sources d'informations visuelles, sonores ou tactiles en les référant aux schémas posturaux. Ces problèmes ont été discutés en détail lors de notre précédent symposium de l'Association à Bruxelles, l'an passé (APSFL: De l'espace corporel à l'espace écologique, Bruxelles 1972; Paris, P. U. F. 1974)."

2. The *taxon sytems* of O'Keefe and Nadel concern the processes by which mobile organisms are automatically oriented and directed toward attractive sources of information without resorting to elaborated *cognitive maps*. For Jacob and Schenk, *bearing maps* derive from movement cues and directional information obtained from distant landmarks, whereas *sketch maps* concern bounded subspaces encoded in terms of local landmarks.

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Implicit body representations in action

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1. Introduction

There is convincing neuropsychological evidence for the dissociation of conscious and non-conscious body representations. Implicit body representations are used thoroughly by our motor system. On the one side, it is often assumed that these implicit representations are dissociated from the conscious experience. For example, numbsense, a somatosensory equivalent of blindsight, demonstrates that it is possible to isolate unconscious body representations that are highly specific to action. In this case a strong top-down influence of body image on body schema can be found. Unilateral neglect is another condition where conscious and unconscious body representations can be dissociated. It is classical that anosognosic patients exhibit some form of unconscious knowledge about their bodily deficit. In this case the hierarchical relationship between body image and body schema is more difficult to identify. Beyond these dissociations, several types of interaction can be observed between body image and body schema. Several techniques used to alleviate unilateral neglect produce a direct effect on body schema but nevertheless positively affect body image as well. In addition, the link demonstrated between the improvement of anosognosia and hemiplegia suggests that body schema and body image are tightly linked. It is concluded that dynamical and two-way dynamical interactions rather than simple static hierarchical links govern the relationships between body schema and body image.

2. Body schemas and body images

One's own body can be represented in many ways and at several levels. One of the most widely diffused references to representation of the body is the notion of homunculus that describes the topography and the organisation of the body surface in the primary somatosensory cortex. Interestingly, this notion of homunculus also applies to the primary motor cortex and the sensori-motor interactions obviously contribute to body experiences. This somatotopic organisation can be depicted by 2D or 3D representations of a putative body of which each individual part is sized to the cortical surface receiving input from the corresponding body skin. One crucial aspect, though insufficiently underlined, about the somatosensory homunculus is that its representation found in physiology books is far from fitting to any kind of subjective representation of one's individual body. This remark allows emphasising the gap between the scientific knowledge acquired by neuroscience about sensory processing and the subjective experience of the corresponding sensations. As argued by several authors (e.g., Head & Holmes 1911; Gallagher 1986; Paillard 1999; this volume), several aspects of body representation, beyond the primary somatosensory level, can be distinguished. Obviously one is able to make use of the skin information fed to the primary cortex to construct a "superficial schema". Then a "postural schema" is used to register all changes of posture. It is now more often referred to as "body schema" (Schindler 1935). This level is considered to correspond to a low-level sensori-motor processing of body information prior to its conscious processing. The proper body image ("l'image du corps"; Lhermitte 1942) refers to the actual conscious representation of information related to the body, not only of somatosensory but also of visual and motor origin. Beyond the physiological, further experiences of the body can be described. As proposed by F. Dolto for example, there are unconscious levels of body image ("l'image inconsciente du corps"). These images refer to symbolic representations of one's own body that are not directly linked to the low-level sensory inputs. As argued by Dolto, this unconscious body image is purely unconscious whereas the body schema is partly unconscious but also preconscious. She also delineates a "conscious body schema" which can be taken as an equivalent of the (conscious) body image defined by Lhermitte. Although they have not been systematically investigated by neuropsychological approaches, these unconscious representations inevitably play an important role in the organisation of the patient's reactions to a deficit.

In the following chapter, we will restrict our scope to the neuropsychological analysis of the relationship between the body schema and the body image.

"Body schema" will be used here following the usage of Paillard (1999, this volume) in order to refer to the implicit processing of somatosensory information that can be used for sensory-motor interactions. "Body image" will be used to depict the conscious representation of one's own body. Body image will therefore be assimilated to a kind of perceptual awareness rather than to any more abstract representation of the body.

3. Dissociations between body schema and body image

3.1 Numbsense

Dissociations between implicit and explicit perceptions have been described abundantly over the last 20 years (reviews in: Bridgeman 1991; Kihlstrom et al. 1987; Jeannerod & Rossetti 1993; Milner & Goodale 1995; Milner 1998a; Rossetti 1998; Bridgeman 2000; Pisella & Rossetti 2000; Rossetti, Pisella & Pélisson 2000). Blindsight remains the most famous example of such a dissociation, and a number of case descriptions can be found in the literature since the initial work of Pöppel et al. (1973) and Weiskrantz et al. (1974). The word "blindsight' itself illustrates the paradoxical nature of this fascinating phenomenon described in cortical blindness. By definition, patients with a lesion of the primary visual system do not perceive visual stimuli presented within the area of the visual field affected by the lesion. Strikingly however, they remain able to move their eye or hand toward a stimulus when instructed properly (Weiskrantz 1986, 1989; Matthews & Kennard 1993). The initial pathophysiological interpretation of blindsight was based on the sub-cortical vs. cortical visual systems ("what" vs. "where" distinction) but the theoretical contribution made within the visual system of a distinction between the dorsal and the ventral streams have more recently led to the idea that the cortical visual pathways contribute to blindsight ("what" vs. "how" distinction) (for a review, cf. Rossetti & Pisella 2002).

Numbsense, the tactile and somatosensory equivalent to blindsight, has followed a similar line of thought. Paillard et al. (1983) first described a patient with a focal parietal lesion who was left with the total absence of any somatosensory sensations from the forearm. However she remained able to point at the locus of tactile stimulations applied to her unfelt forearm. This dissociation between the ability to point where the stimulus was applied and the lack of conscious perception was interpreted as a dissociation between where and what and depicted as blindtouch (see Paillard 1999; Paillard, this volume).

We had the opportunity to study a patient with a left parietal thalamo-subcortical lesion who was unaware of any kind of somatosensory stimuli applied to his arm and leg, and failed to demonstrate any significant performance in a verbal forced-choice paradigm. When he was tested in search for residual processing of somesthetic modalities, he demonstrated a significant performance when pointing at the tactile stimulus location on the numb arm (Rossetti et al. 1995). Then we investigated whether the residual ability of the patient was linked to the mode of response (motor vs. verbal) or to the representation subservient to these responses (motor vs. symbolic). Interestingly, when he had to point to stimulus location on an arm picture, no significant performance was observed (Rossetti et al. 2001). This dissociation indicates that only a representation of the stimulus linked to the body schema was preserved, whereas more abstract representations of the stimulus were fully lacking (Rossetti et al. 2003).

An interesting issue in both blindsight and numbsense is whether the presence of residual sensori-motor abilities could be used as the basis for reverberating sensory information to the perceptual systems. This issue was investigated in both neurological conditions by attempting to co-activate the motor and the perceptual systems simultaneously in response to a stimulus delivered in the affected sensory modality. However such co-activation did not provide any beneficial result. When they performed a simultaneous motor and perceptual response, patients with blindsight or numbsense lost their residual motor abilities and did not improve their perceptual guesses (Rossetti 1998). This result suggested that the cognitive representation of the stimulus, once activated (and inevitably empty) was systematically taking over the residual sensori-motor representation of the same stimulus. It was therefore argued that in both cases the cognitive representation were hierarchically higher than the sensori-motor one and in control of it (Rossetti 1998; Rossetti et al. 2000; Rossetti & Pisella 2002). It is obvious that in the case of numbsense these cognitive and sensori-motor levels of stimulus processing can be connected to the notions of body schema and body image and confirms Paillard's view that body image and body schema can be dissociated (Paillard 1999). If one accepts this idea, then one may be tempted to set body image in a position higher than body schema within the hierarchy of body representations, as depicted in Figure 1.

In many fields of cognitive neuroscience it is assumed that higher-level functions control over lower-level ones (see Rossetti 1998). It is true that, at least under short time scales, top-down control may take over bottom-up influences (Pisella & Rossetti 2000). However when longer time scales are considered, such that plasticity can take place, bottom-up influences arising from

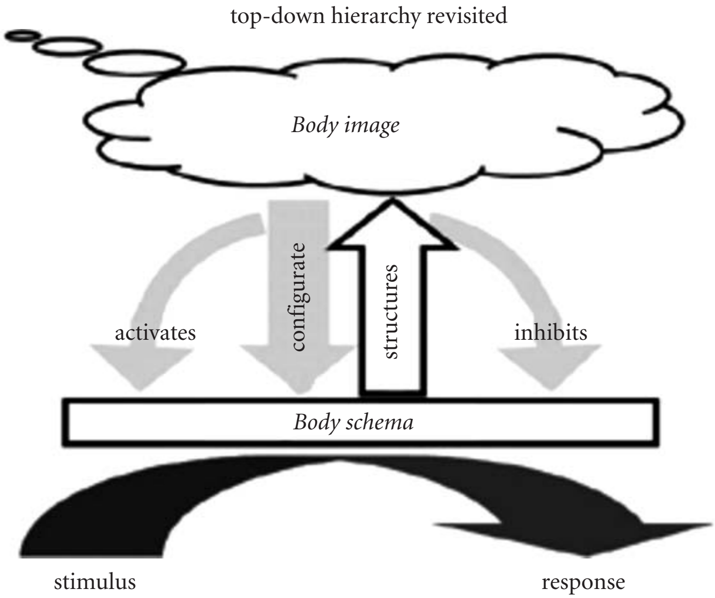

Figure 1. Top-down vs. bottom-up interferences between body schema and body image (derived from Rossetti 1998).

the basic sensori-motor interactions may structure higher levels. This general feature appears to also apply to the relationship between body schema and body image.

3.2 Unilateral neglect

After having been interpreted as a sensory deficit, unilateral neglect is now considered as a deficit of conscious access to information coming from the contra-lesional side of space (e.g. Driver & Mattingley 2001; Vallar et al. 2003). Neglect is mostly found following a lesion of the right hemisphere which is responsible for a deficit for the left side. The deficit observed in unilateral neglect applies both to body space and extra-personal space. Neglect patients typically exhibit inattention to sensory stimuli, and several aspects of their body schema appear to be impaired as well. External neglect is manifested for stimuli delivered in any sensory modality, although it has been mainly studied in the visual domain. Patients just appear to be omitting the items that are presented to their left. They may present with sustained eye and head deviations to the right or estimate the straight-ahead direction to be shifted to the right. They may produce slower movements to the left and even progressively omit to move the left hand during bimanual tapping. In addition, their body image can be affected as well. They may show anosognosia, i.e., the lack of awareness for a left-sided deficit such as hemiplegia, or even somatoparaphrenia, i.e., delusion about their own body, especially about their neglected side. There is no available direct evidence for dissociation between body schema and body image in unilateral neglect. However several studies have shown that these patients are more impaired for perceptual tasks than for visuo-motor tasks. For example, they may be strongly biased when requested to indicate the middle of a stick with their finger, but they are relatively less impaired when the task is simply to grasp the object (e.g. Robertson et al. 1995). In this latter case, they show a better ability to implicitly locate the centre of the stick for the purpose of grasping. This, among other arguments, suggests that the lower-level visuo-motor functions may be relatively spared in unilateral neglect. Interestingly unilateral neglect patients may exhibit a deficit of both egocentric reference frames used for action and of self body perception. It is classical that patients with severe neglect have difficulties to represent their own body, as their left half is typically strongly neglected. As detailed in the next section of this chapter, personal neglect may include from an impoverishment of the representation of one side of the body to a distortion of the representation of the whole body. These higher-order deficits contrast with the preserved visuo-motor abilities and are compatible with the view that neglect is primarily a deficit of conscious access and use of information. One of the classical, though still being debated, symptoms of unilateral neglect is a rightward shift of the manual demonstration of the subjective straight-ahead. This apparently basic bias is in fact usually interpreted as a misrepresentation of the egocentric reference and again can be contrasted with the good visuo-motor performances of neglect patients. This argument is of prime importance. It has been argued that the egocentric reference assessed by manual pointing 'straight-ahead' is the basis for the organisation of interactions with the external world (for a review, cf. Jeannerod & Rossetti 1993), and could therefore reflect some aspect of the body schema. A rightward shift of the "egocentric reference" is usually found for group average but it is far from being found in all patients (e.g. Farnè et al. 1999) and can be dissociated from other neglect symptoms (e.g., Pisella et al. 2002). In particular, patients with straight-ahead shift can point accurately at visual targets. Despite its apparent simplicity, the manual demonstration of the subjective straight-ahead should not be regarded as a cue to body-schema but rather to body image. Higher-order alterations of body-image are exhibited by some neglect patients. Anosognosia and somatoparaphrenia are usually associated with severe neglect. The important point here is that these body-image deficits may not be systematically accompanied by an alteration of the body schema. Therefore the classical conception of a hierarchical domination of cognitive processes upon visuo-motor interactions (e.g. Rossetti 1998; Pisella & Rossetti 2000) is not supported by the case of neglect.

4. Bottom – up interaction between body schema and body image

4.1 Body representation and vestibular stimulation

Cappa et al. (1987) reported for the first time an improvement of anosognosia through vestibular stimulation in two on four right brain-damaged patients who also showed an extrapersonal and personal neglect. One patient (case 3) during the immediate and delayed post-stimulation assessments admitted that his left hand was weaker than the right only after specific inquiry although he persisted in denying any deficit in the lower limb. On the other hand, the second patient acknowledged the motor deficits (upper and lower limbs) immediately after stimulation only when questioned specifically, and spontaneously after 15 minutes said: "*I don't know why, I have always been able to move them, but now they are blocked: it is as if my brain is no longer able to command them.*" This behavioral change was still present in the following days. In two patients, improvement of anosognosia was associated with transitory improvement of extrapersonal and personal neglect.

Bisiach et al. (1991) reported the effects of vestibular stimulation on somatoparaphrenic delusion showed by a patient suffering from a fronto-temporo-parietal infarction located in the right hemisphere. Before stimulation, when the examiner pointed to the patient's left arm and asked whose arm is this, she answered: "*It's not mine. It's my mother's. I found it in my bed; since the first day. Feel, it's warmer than mine.*" Under caloric vestibular stimulation, the patient recognized that same arm as her own, but two hours later, the patient had completely relapsed in her full-blown delusion. The same stimulation was repeated twice and the results of vestibular activation were identical to those obtained in the first tests, confirming the possibility of an experimental manipulation of a body image deficit by a peripheral stimulation.

Rode et al. (1992) reported a similar partial remission of anosognosia and somatoparaphrenic delusion in a rare case of long lasting anosognosia consecutive to a large cortico-subcortical stroke of the right cerebral hemisphere including the parieto-temporo-occipital carrefour. Neurological examination performed 6 months post-onset disclosed a complete left hemiplegia, a left hemianesthesia and a left apparent total hemianopia on confrontation. Head and gaze were permanently deviated to the right and the patient showed a severe extrapersonal and personal neglect. Anosognosia for hemiplegia and hemianopia was complete. The patient claimed that she was able to walk without any problem and did not understand why she was in hospital. She even accused her husband for having brought her there and asked over and over to go home. When an examiner brought the patient's left arm in her good visual field and asked whose it was, she answered: *"It isn't mine. I found it in the bathroom, when I fell. It's not mine because it is too heavy. It must be yours."* When asked where her own arm was, she answered: *'Behind the door'*. Following a left cold ear irrigation, a temporary and complete remission of anosognosia and somatoparaphrenia were observed. The patient was totally aware of her hemiplegia. When asked if she could move her arm, she answered:*'No'* and asked why, she said: *"Because I have suffered from a hemiplegia. I was in my bathroom and I fell. I called my niece and I was taken to the hospital".* When the examiner brought her left arm in her good field, she recognized it as hers and no longer claimed it was the examiner's. Surprisingly a temporary remission of the left motor deficit was also observed after vestibular stimulation.

Rode et al. (1998) assessed in the same patients the effects of vestibular stimulation on both anosognosia for hemiplegia and hemiplegia itself. Caloric vestibular stimulation (i.e. the irrigation of the left external ear canal with cold water) temporarily improved left-sided motor deficits in seven out of nine right brain-damaged patients. Neglect for the left side of the body (personal neglect) fully recovered in eight patients, and improved in one patient. All patients had exhibited anosognosia in the acute post-stroke stage, but the deficit was still present at the time of the vestibular stimulation study in six out of nine patients. Anosognosia completely recovered in five out of these six patients. Same results were replicated by Vallar et al. (2003) in four right-brain damage patients examined within 24 h after stroke onset. All patients had a left homonymous hemianopia and hemianaesthesia, and exhibited a severe visuospatial neglect, as assessed by bisection and cancellation tasks. All four patients had a severe motor deficit in the upper limb, which was temporarily improved by vestibular stimulation. In all four patients temporary recovery of the muscle strength deficit paralleled recovery from anaosognosia. Personal neglect appears to be unrelated to anosognosia for the left-sided motor deficit, being present in only two out of four patients.

These previous data showed that a vestibular stimulation may temporarily improve both anosognosia for motor deficits and the motor deficits themselves, suggesting that when a deficit become less severe, due to the positive effects of the stimulation, patients become aware of the motor deficit. Recovery from anosognosia for hemiplegia after vestibular stimulation may result from the regression of a motor planning deficit, which itself contributes to the clinical manifestations of hemiparesis or hemiplegia (Vallar et al. 1993). An alternative view may be to consider that vestibular stimulation could act on the body schema representation, especially on the left part of body space representation. This influence relies on experimental data showing a specific increasing of activity in cortical areas involved in the building of egocentric space representation (Bottini et al. 2001; Dieterich et al. 2003) and clinical data disclosing a reversibility of others visuospatial deficits through vestibular stimulation (see review in Rossetti & Rode 2002). The positive effects of vestibular stimulation could not be explained by a non specific mechanism relying on reduction of hypo-arousal secondary to the right hemisphere lesion. This is rather a specific mechanism as also proved the reversibility of sensory or motor deficits in right brain-damaged patients compared to left after vestibular stimulation (Vallar et al. 1993; Rode et al. 1998) and the lack of effect following a bilateral stimulation (Rode et al. 2002).

Among the previous cases several exhibited a restoration of body schema representation through vestibular stimulation that was only transient. Nevertheless, this was sufficient to permit higher effects on body image consciousness. In the case reported by Bisiach et al. (1991), these effects have even been repeated after successive left cold ear irrigation. The restoration of body schema representation involved, at each time, a better evocation of explicit knowledge of left hemibody and deficits located to it. In the case reported by Rode et al. (1992), this better evocation also concerned the episodic long-term memory, as suggested the comments of the patient about the circumstances of her stroke. A peripheral stimulation may thus favour "bottom-up" interactions between body schema and body image representations, between an implicit sensorimotor level and higher explicit level of body space representation, between primary perception and a modular thought-process.

4.2 Body representation and prism adaptation

As the body schema provides the basis for sensori-motor coordination, one may speculate that other means to alter this coordination may affect body schema as well. One interesting aspect of sensorimotor relationships is that they are highly susceptible to adaptive processes. Simple reaching behaviour can be adapted to dramatic changes of the relationship between the body and its environment. For example people can adapt to left-right or up-down reversal of the visual field within a few days (e.g. Sekiyama et al. 2000). A simpler technique, used extensively for about a century to investigate the plasticity of sensorimotor correspondences, consists of simply shifting the visual field to one side of space with prisms (for a review, cf. Redding & Wallace 1997; Redding et al. 2004). This visual shift produces dramatic consequences on the reaching behaviour of the subject exposed to the goggles, but the adaptation to this condition can be obtained much faster than for the more complex visual manipulations mentioned above. Prism adaptation is a simple procedure but its effects are more complex than it seems and the actual development of adaptation is conditioned by a few parameters (Redding et al. 2004). For example, pointing to visual targets without sight of the arm must be controlled following the exposure to the prisms. This parameter is modified in predictable ways depending on the direction of the visual shift and can witness resulting modifications of the body schema. One very interesting connection between prism adaptation and spatial neglect is that prism adaptation can also produce a shift in manual straight-ahead demonstrations in a direction opposite to the visual shift, just like has been described in some patients with spatial neglect (Jeannerod & Rossetti 1993). If a normal individual is exposed to right deviating prisms, he will exhibit a leftward deviation of his straight-ahead demonstration, and the opposite is true for left-deviating prisms. One may therefore wonder whether the egocentric reference of patients with spatial neglect could be altered by prism adaptation, and whether a hypothetical shift can be accompanied by an improvement of other neglect symptoms. Initially based on the theory stating that neglect was attributed to a shift of the egocentric reference frame that is demonstrable by manual straight-ahead demonstrations, we have investigated the effect of prism adaptation in neglect patients. We have initially demonstrated that the egocentric reference of the neglect patients, when tested through straight-ahead pointing, could be improved following adaptation (Rossetti et al. 1998). Then it was shown that visuo-manual (Rossetti et al. 1998; Pisella et al. 2002; Farnè et al. 2002; McIntosh et al. 2002; Frassinetti et al. 2002), visuo-ocular (Dijkerman et al. 2003), non-visual (Rode et al. 1999, 2001; Maravita et al. 2003), non-manual (Tilikete et al. 2001; Jacquin-Courtois 2004) and even a non explicitly spatial task such as number bisection (Rossetti et al. 2004) could be improved following adaptation to the visuo-manual conflict induced by wedge prisms (reviews: Rossetti & Rode 2002; Rode et al. 2003). It should be emphasised here that awareness of the visual shift is not a necessary ingredient for prism adaptation (e.g. Jakobson & Goodale 1989). On the contrary, conditions preventing the subjects from being aware of the visual shift have been shown to produce stronger adaptation (Michel 2003). In our experience, neglect patients never exhibited signs of awareness of the visual manipulation, even when specifically asked – whereas healthy controls show an immediate strong reaction. In addition, they show no vegetative reactions (as assessed by skin conductance) to the introduction of prisms during a simple pointing task (Calabria et al. 2004b). These arguments converge towards the idea that prism adaptation is acting at the physiological rather than the cognitive level, i.e. directly at the level of sensori-motor coordination that is pertaining to the body schema. This also shows that higher-level cognition is embodied to such extent that the apparently irrelevant plasticity of visuo-manual coordination is capable of altering at least several aspects of it. The logical consequence of this is that some of the sensori-motor effects of prism adaptation (e.g., postural balance: Tilikete et al. 2001; wheel-chair driving: Jacquin et al. 2004) are interpreted as indirect effects resulting from the top-down control of the corresponding function resulting from the bottom-up influence of visuo-manual adaptation on central representations (Rossetti et al. 1999; Rossetti & Rode 2002; Rode et al. 2003).

It is also interesting to mention here that the effects of visuo-manual adaptation to optical shifts have not been observed only in brain-damaged patients. Several parameters have been shown to be altered following adaptation to leftward shifting prisms in healthy subjects: line bisection (Colent et al. 2000; Michel et al. 2003a; Berberovic & Mattingley 2003), postural balance (Michel et al. 2003b), centring of a haptically explored circle (Girardi et al. 2004), number bisection (Calabria et al. 2004a). The results obtained in patients and normals demonstrate that there exists powerful means to act on higher-level spatial functions by only interfering with low-level sensori-motor interactions.

5. Dynamic relationships between body schema and body image

In the field of cognition, the higher levels of organisation are usually considered to regulate the processes of the lower levels. This is particularly true in the motor domain, where a clear hierarchy can be depicted from the spinal cord level of response (reflexes) to the prefrontal cortex which has been assumed to play the role of a supervisor. It may trigger, inhibit, or configure the subordinate levels. Therefore the hierarchy between sensori-motor levels and cognitive levels has been often described as unidirectional (see Rossetti 1998, 2001; Pisella & Rossetti 2000). The results presented in this chapter clearly show that this idea should not be taken as a rule. As a matter of facts, the powerful effects of low-level, physiological stimulations of sensory (vestibular) or sensori-motor (prism adaptation) levels on spatial cognition rather reflects a bottom-up influence onto the cognitive representations. As was argued extensively by Piaget, mental functions of the children are highly dependent on sensory-motor interactions. The interactions envisaged in the present chapter, focused on the body image and the body schema, may be regarded as a more general feature of body representations. As already suggested in our introductory remarks about the definitions of several types of body representations, there must be a great deal of permeability between them.

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Body self and its narrative representation in schizophrenia

Does the body schema concept help establish a core deficit?

Aaron L. Mishara

1. Introduction

This paper is divided into two parts. A first section depicts the roots of the problem of researching bodily experience in schizophrenia by appealing to philosophy. In the second section, I propose a model of the impairment of bodily self in schizophrenia in terms of results from cognitive neuroscience. The dualism between these approaches may reflect what C. P. Snow (1959) and others have called the "two cultures." The seemingly irresolvable duality of human experience of body described in the current analysis may in part be responsible for this perpetual divide.

2. The incomplete body in schizophrenia narratives: An attempt to recover wholeness

There is a long tradition of claims that patients with schizophrenia suffer from abnormalities of bodily experience. In a longitudinal study, Huber (1999) reports that 40% of patients with schizophrenia suffer from experiences of "bodily influence": "The patients feel themselves to be influenced or changed in their bodies by means of electric, magnetic, radiation, or other physical processes. These are transmitted by some kind of device, or by hypnosis. . . . However, there are even more patients with schizophrenia (73%) who experience qualitatively abnormal disturbances of sensations arising from the body (i.e., coenaesthesias) (*Gemeingefuehl, Leibgefuehl*)." (Huber 1999: 280, my translation). These may be constantly changing and extremely difficult for the patient to put in words. They may include: "experiences of body deterioration, depersonalization, body boundary disintegration, transmuted feelings of masculinity and femininity... missing or misshapen body parts, perceptions of the body as unusually weak or strong, changes in body size or consistency (e.g., turning the body into stone)... failure to recognize oneself in mirror, modifications of internal organs. Autoscopic symptoms... in which patients believe they see a replica of their body projected in front of them..." (Pruzinsky 2002: 322–323). There may also be more fixed delusions of dysmorphia, infestation or emitting strange odors. Despite the wealth of reported abnormal bodily experiences in schizophrenia, there have been sparse efforts to study this claim empirically (e.g., Priebe & Röhricht 2001). There is also little understanding of the brain areas or systems that may underlie these abnormalities of body experience, and how such abnormalities may be related to symptoms and the neurocognitive deficits of schizophrenia.

Even the recent studies, however, have not explicitly considered the conceptual distinction between body image and body schema (proposed by Head & Holmes 1911). Some authors (Gallagher & Cole 1995; Pailliard 1999) have vigorously maintained that this conceptual distinction is crucial to understanding human bodily experience including neurological and psychiatric disorders. In what follows, I will examine whether there is sufficient evidence for this distinction and, if indeed a requirement, how such a distinction of constructs may be modified for the research of schizophrenia.

Despite considerable between-subject variability, the results are extremely consistent within-subject: neurocognitive dysfunction and global intellectual decline especially in first years of illness are among the most reliable findings in schizophrenia research literature. Cognitive dysfunction appears to be a trait indicator of illness and a better predictor of the course of illness than the more overt positive symptoms, such as delusions and hallucinations. Although patients with schizophrenia rarely show gross neurological disturbance beyond soft-signs and neurocognitive deficits, schizophrenia is often compared to more clear-cut neurological disorders with well-defined lesions. Numerous efforts have attempted to decipher the mystery of schizophrenia based on an analogy with models constructed from neurology: alien hand sign (Frith), concrete thinking (Goldstein), visual apperceptive agnosia (Doniger et al. 2001), person misidentification syndromes (Coltheart and Davies, Young and Ellis), anasognoia (denial of illness) (Keefe), "subtle right-sided neglect" (Maruff and Currie), right hemisphere pathology (Cutting 1999), and the cognitive-affective "dysmetria" of cerebellar syndromes (Andreasen, Schmahmann). Neurological disorders are often linked with circumscribed brain pathology and therefore are considered to provide leads to explain the much more diffuse disorder of schizophrenia in which numerous areas of the brain have been implicated.

In addition to finding similarities with neurological disorders, some authors employ philosophical concepts to bolster their neuropsychological models. Cutting (1999), for example, employs Sartre's well-known, dichotomous description of the human experience of body. One can experience one's own body as primarily an object or thing, as it is available to others' experience (the *en-soi*); or one can experience it as subject and thus, no-thing or nothingness, as it is available exclusively to the subject's experience (the *pour-soi*) It is, in principle, open to indefinitely many possibilities, uttimately leading to "nausea" or nihilism. For Cutting, this Sartrean opposition maps well onto the subjective experiences of bodily self of schizophrenic and depressive psychotic patients respectively. He places the experiences of body of schizophrenic patients largely in the mode of the *en-soi*, as thinglike, a tendency which he, following Minkowski and Sass, calls "morbid objectification" (i.e., a hyper-reflexivity or hyper-concentration which "objectifies" experience including one's own body). By becoming object under the duress of hyper-reflexivity, the body loses a sense of its own agency, what is otherwise given to it in the *pour-soi* mode. Conversely, the patient with psychotic depression experiences bodily self almost exclusively in terms of the mode of the *pour-soi*. This is a tendency that Cutting calls "morbid de-objectification." Here the body becomes lost to the immanence or subjectivity of the patient's own consciousness without any external, thing-like aspect which anchors the subject in the world. The body loses objective character and the patient sinks into nihilistic delusions. Cutting then applies these observations to his neuropsychological hypothesis that: "... right hemisphere damage resembles schizophrenia in its tendency to over-objectify the body and attenuate the myness quality, whereas left-hemisphere damage tends to produce a de-objectification or nihilistic quality to the body." (Cutting 1999:33).

There is a hazard in applying philosophic theories to psychiatric disorders because there is no experimental evidence to constrain the investigator from making completely antithetical conclusions from the same clinical data. Patients with psychotic depression may experience their bodies as so leaden and immobile that they may feel as though they have no control or will over their own bodies which may seem more like things. Thus, contrary to Cutting's interpretation, they would experience body as *en-soi* without access to the *pour-soi*. In fact, patients with psychotic depression are nearly exclusively preoccupied with negative ruminations about the self, blaming themselves for themes revolving around loss, death and failure, in what has sometimes been called an exacerbated "self-focus." If anything, the bodily self *as* object or body image is *too activated*, too much in the forefront in major depression (perhaps corresponding to the well-documented overactivations in right prefrontal areas in depressed patients). Conversely, patients with schizophrenia often complain about losing a sense of their bodies as material object, including the ability to attribute a sense of ownership to their thoughts and bodies. This may involve the inability to associate body as object or thing – an external side linked causally to the world – with their subjective experiences. The inner detachment of self from the experience of body as accompanied by the loss of feeling the body to be substantial or objective is also reported in anomalous conscious states and dissociative experiences of the trauma related disorders and may be mediated by dysfunction of the parietal lobes (see below).[1]

Clearly each of these alternatives, Cuttings's (1999) use of the Sartrean opposition or the hypothetical counterargument I propose here, is an oversimplification of the disruption of bodily experience in psychiatric disorders. They point to the danger of trying to fit the complexity of clinical and experimental data to the procrustean bed of the neatly ordered conceptual oppositions of philosophy. Nevertheless, when used cautiously and with a sense of the complexity, philosophical approaches may be useful not only in clarifying the underlying assumptions of neuropsychological models. They may actually contribute to developing novel approaches to schizophrenia which can then can be experimentally tested or refined with further research.

By depicting ourselves to others (the ability to represent oneself from outside as one object among others and by extension to ourselves), we, by necessity, assume an external attitude to the bodily self: our self-image becomes realized (albeit in part) as the construal of how others might experience us. Although the perceptual experiences (in the various sense modalities of vision, touch, etc.) of our own body are always partial (i.e., always incomplete or fragmentary, never exhibiting the entire body as object), the body image is assembled from these partial representations as how we might appear were we to perceive ourselves from other(s') perspectives. *The body is construed as object, a body for others, devoid of our privileged inner access to it*. We hover between two perspectives: our own and an imaginary one which 'receives' (perceives) the self from outside, or how we imagine it might be received. By narrating our inner experiences, we achieve another perspective on ourselves in which we transcend our current bearings in this simulated exchange with others' perspectives. This provides a beneficial or healing process to an inner sense of isolation, a process which is somehow disrupted in schizophrenia (Mishara 1995). In fact, "existentialist" authors such as Kafka depict *their own* narratives as incomplete, as unable to surmount an unbridgeable rift between their inner experience of body and how others might receive the external bodily self as object (as in "The Imperial Message," "The Hunger Artist," and the infinite, unending journey of "Hunter Graccus"). This awareness of rift between narrator and audience, between self as subject and as object, may also be present in patients with schizophrenia, who may experience their efforts to narrate inner experience as not effectively reaching others, as condemned to incompleteness.

At the same time that we experience our effects on others through the materiality of gestures, words – the substantiality of having a body – we affirm the inner or private connection that we have to our own bodies in this outward depiction. We realize that this cannot be experienced by anyone else. *There is something inexorably mine in my bodily experience*. Although this is fundamental to my experience of self, I have considerable difficulty expressing this inner connectedness in words. It is both immediate and conceptually vague. Nevertheless in an obligatory or automatic manner (in analogy to how I experience this exclusive intimacy to my own body) I assume that others have a similar inner connectedness with their bodies by means of which I share a common world with them.

Just as otherness mediates my experience of bodily self, so selfness mediates my experience of others. In my inner connectedness to my body as mine, I not only assume but actually perceive others to experience a similar inner connectedness to their bodies. Like me, they do not merely *have* bodies but also *are* their bodies in some way that remains concealed from me. We are embedded in a kind of mutual reciprocal structure of self and other(s) which nevertheless remains implicit and dynamic within the subject.

Such a reciprocal self/other reversal could very well involve an ongoing exchange of body for others and body for self. Each side unwittingly participates in the reciprocal structure by mirroring the other. The interplay between body image and body schema (which I approximately identify with the Sartrean categories for reasons given below) not only mediates my experience of self but also enables expressive communication with others in various sensory modalities. The directionality of exchanges with other(s) shift like a revolving door (von Weizsaecker 1969) in which joint attention – or the mutual directionality of focus – is signaled by the embodied responses of the participants as if in a tightly choreographical dance. Most cognitive approaches focus on one side of the coupling of this dance, an abstract and isolated Cartesian subject (resembling the unitary body image detached from its dynamic interplay with body schema, see below). Therefore, the difficulty that patients with schizophrenia have with this ‘dance’ has been statically mislabeled as “social cognitive deficits”, rather than examining, for example, how the interplay of eye-movements between the patient and others simultaneously imparts information about the patient’s inner experience and how others may experience the patient.

Patients with schizophrenia may have difficulty with both types of body experience. (1) They may feel that their bodies lack outward substance or objective reality and therefore have considerable difficulty in envisioning how others may experience them from an external perspective. (2) They may feel that their bodies are no longer their own or they no longer exist through their bodies as if they have lost all inner connectedness to their bodies; they may also be unable to ascribe – as some neurological patients with person misidentification syndromes – such inner connection of self to others’ bodies. Patients with schizophrenia often depict themselves in their narratives in an incomplete or fragmentary way. As existentialist authors such as Kafka, they may feel that their efforts at communication must always remain incomplete and never reach others. Figure 1 presents the self-depiction of a 29 year old male patient with schizophrenia as incomplete. Only the upper part of the body is depicted with an immaturely portrayed face and long, dangling arms (without hands). The facial expression suggests that the figure is oblivious to its lack of connection with the ground, i.e., a surface that, in principle, could be shared with other

Figure 1. Self-depiction of 29 y.o. male patient with schizophrenia as incomplete.

figures. It would be rash, however, to infer from such anecdotal evidence that patients with schizophrenia suffer from a disturbance of bodily self or, in the terms of the current volume, of body schema and/or body image. It is equally plausible that the patient lost interest in the task and simply neglected to draw the rest of the figure.

In this context, the French psychoanalyst Lacan had observed that we never *see* our own body in its totality: I envy the other's privileged gaze as he envies mine. We try to co-opt or incorporate the other's perspective by identifying with the quasi-totality or unity of our bodies as given in the mirror image,[2] i.e., how we imagine others to see us, as an object with external surface in space. When I start to observe my own movements in the mirror, however, I shift the directionality of focus from "me" as object, to "I" as subject, initiating the movement.

Remarkably some of these views anticipate the quandaries of contemporary neuroscience concerning the self, which I will contend, must take into account the "incomplete" on-line character of the body schema as fundamental to the subjective experience of self.

3. The Provisional unity of body-image/body-schema: Self as hidden mediator of frames of reference

In their lucid 1995 article, Gallagher and Cole define *body schema* as "a system of preconscious subpersonal, anonymous processes that play a dynamic role in governing posture." (Gallagher & Cole 1995: 369). Below the level of self-referential intentionality, it, at the same time, supports intentionality. Despite not requiring consciousness, it is tacitly keyed into the environment. In contrast, *body image* "consists of a complex set of intentional states – perceptions, mental representations, beliefs, and attitudes – in which the intentional object of such states is one's own body." (Gallagher & Cole 1995: 369). Body image involves a "reflective intentionality" expressed in three modalities: the subject's *perceptual* experience, conceptual understanding and emotional attitude towards his/her own body.

Interestingly, Gallagher (1985) defines the relation body schema/ environment dialectically: "... the body schema is not something entirely in-itself; through its posturing the body defines the environment just to the extent that the environment defines the body postural attitudes. The body in its body schema most genuinely lives as a body-environment." (Gallagher 1985: 552) Conversely, body image does not require current interaction with the environment but is conceived as *complete* or *independent* from the environment: "... in the body image, the body is seen as something distinct from the environment. It is understood as something in-itself, an object with its own abstract identity; a thing that is ... experienced in an isolated fashion" (Gallagher 1985: 551). These observations are fundamental to the current argument.

As evidence for the body-schema/ body-image distinction, Paillard (1983, 1999) presents a double dissociation in the performance of two neurological patients. One of the patients is centrally (involving left parietal areas (Brodman Areas 1, 2, 3, 5, 40 and 43)), and the other peripherally deafferented (polyneuropathy of the large myelinated sensory fibers) but with intact motor function. The former is deprived of body image and a world-centered frame of reference. She is unable to consciously detect where on her affected side she is touched but she is able to point to this same point without any conscious awareness of how she does so (i.e., "blind touch"). She knows "how to get there," i.e., the pragmatics of knowing where to point (i.e., a kind of intuitive guessing like blind sight). However, she is unable to build a conscious representation "where" on her tactile body map or body image. The patient compensates by employing her body schema which non-consciously indicates the tactile stimulus by the on line body-centered frame of reference used for guiding action and thus, her pointing.

Due to a reduction of proprioceptive information organized in terms of the non-conscious body schema, the *peripherally* deafferented patient employs her body image to compensate for the loss in a converse "strategy". By means of the allocentric frame of reference of body image, she is able to locate on a picture of her body the site of being touched. However, she is unable to point to this site on her body in the blindfolded condition. She has retained the explicit "where" relative to her body image, indicated by vision, but not the pragmatic "how to get there" guided by the implicit body schema. Thus, Paillard writes: "a distinction between body image and body schema is to distinguish between a conscious awareness of one's own body and a nonconscious performance of the body." (Paillard 1999: 197). Hence "proprioceptive information is obviously necessary for updating the postural body frame (or schema), whereas exteroceptive multimodal information, mainly visual, underpins the central representation and percept of the body image..." (Paillard 1999: 198). Paillard (1991b) contends that the non-conscious sensori-motor mode of processing of body schema is more primitive in the evolution of the human brain than the more conscious "representational mode" of processing of body image. The later evolved representational and linguistic skills "... could take precedence over basic sensori-motor capacities and thereby mask the action-oriented evolutionary roots of the way spatial information is processed" (Paillard 1991b: 476). Rosetti and colleagues (1995) propose that an evolutionarily later "semantic" system is able to override the earlier non-conscious "pragmatic" system.

With regard to the application of body image/ body schema distinction to schizophrenia, the following points are of interest:

1. The overlap of the body image/ body schema model with Goodale and Milner's distinction of separate processing streams: vision-for-perception and vision-for-action.
2. The role of the parietal cortex and its functional subdivisions as mediating frames of reference in sensori-motor transformations.
3. The parietal cortex mediates voluntary and involuntary systems for reorienting awareness from its current focus to a peripheral stimulus.
4. The problem of the operationalization of self in functional neuroimaging studies; i.e., the resting awake state as baseline for focal cognitive tasks is associated with a more primitive involuntary system for reorienting awareness.
5. The reorienting of awareness to a hitherto implicit site in peripheral vision underlies the body image/schema relationship.
6. Gallagher (1995) states that Husserl had not investigated the pre-noetic body schema. However, Husserl's description of the kinesthetic system underlying noetic (i.e., cognitive) awareness is precisely such a phenomenological description of body schema. It provides a model of embodied neurocognition to integrate findings regarding the body schema/ body image distinction and schizophrenia. In the Husserlian model, embodied consciousness is defined as vulnerability to the not-yet known.
7. In early schizophrenia, patients complain of an egocentricity of perspective which is also suggested by their delusions of reference (Conrad 1957), passivity symptoms and neurocognitive deficits. They may suffer from an inability to avail themselves of the sensori-motor transformations of shifting frames of reference (mediated by intact frontoparietal connectivity). They are therefore unable to maintain provisional unity between an explicit, enduring ventral stream body image with an allocentric frame of reference and the implicit moment to moment, on-line body schema mediated by dorsal stream and the parietal lobes. Therefore their self-depictions may be fragmentary and unable to take into account external perspectives.

1. Paillard (1999; this volume) acknowledges the overlap of his model with Goodale and Milner's (1995) reformulation of the classic distinction (Mishkin

& Ungerleider 1982) between ventral "what" and dorsal "where" visual processing pathways. Goodale and Milner propose a "vision-for-perception" ventral system which is more recently evolved than the more ancient "vision-for-action" dorsal system. For Milner and Goodale, the dorsal stream projecting from primary visual cortex to the superior parietal lobes is a key component in an action pathway of visual processing. A reason for this view is that patients with unilateral or bilateral lesions in dorsal stream areas, especially in the superior posterior parietal cortex, often exhibit optic ataxia, i.e., a defective reaching for objects.

The perceptual pathway of visual ventral stream processing projects from primary visual cortex to inferotemporal cortex. When this stream is impaired, patients develop visual form agnosia, an inability to identify visual objects on the basis of their form or shape. Despite the inability to consciously recognize objects, one visual agnosia patient, D.F. (reported by Goodale) is nevertheless able to pick up objects and accurately place them through a slot. Although she did not know "what" she maneuvered, she knew "how" to do so by employing the spared dorsal stream processing. The viewer-centered, egocentric codes that are employed by this faster on-line dorsal stream processing are computed in terms of the absolute metrics of the target, i.e., are more closely scaled to true object properties. However, dorsal stream performance is particularly sensitive to delay. If there is a delay of 2 or more seconds between viewing the object and having to grasp it, D.F. loses the ability to accurately scale her grip to the object's dimensions. The dorsal stream operates in terms of moment to moment computations which play a specialized role in the on-line automatic transformation of visual information into action as in grasping, reaching, etc. However, the motor programs begin to change or decay if not immediately used.

On the other hand, ventral stream processing computes the size and position of objects in current perceptual experience relative to one another (i.e., in scene-based relational cues). Therefore, it renders the subject much more susceptible to the experience of optical illusions than its dorsal counterpart. Milner et al. (2001) studied a patient with the converse condition to D.F. The patient, I.G., had optic (visuomotor) ataxia due to extensive bilateral damage to the posterior parietal lobes. Although able to identify objects in her visual field, she was unable to reach out and form the correct finger grip aperture in anticipation of objects of different widths presented to her visually. After training, I.G. was able to "pantomime" the correct grip aperture by employing her visual memory 5 seconds *after* the presented object had been removed. Although she had no access to the on-line immediate body centered computations of anticipatory grip aperture provided by the putative implicit body schema of dorsal stream processing, I.G. showed improved performance, conversely to D.F., in the delayed pantomime condition. Being less subject to immediate decay, the conscious perceptual system was available to I.G.'s employment of pantomimed action (i.e., action directed toward *remembered* targets) to retrospectively produce in working memory an approximate grip aperture which had otherwise not been available to her.

Visually guided actions, mediated by dorsal stream are largely refractory to perceptual illusions (e.g., the Ebbinghaus–Titchener size-contrast or the Mueller-Lyer visual illusions). Interestingly, patients with schizophrenia are less susceptible than normal controls to some visual illusions including the Mueller-Lyer figure (Parnas 1999), and the inverted hollow mask (Schneider et al. 2002), than normal controls or patients with other psychiatric disorders. Their relative immunity to visual illusions suggests that their ventral stream processing may be impaired. For example, they exhibit abnormalities in perceptual grouping, visual contour integration, or the ability to pantomime simple actions such as lighting a match (Martin et al. 1994) thought to be controlled by ventral stream processing (Westwood et al. 1999). They also demonstrate deficits in perceptual closure tasks, "in which the brain attempts to 'fill in' the missing pieces of an object until recognition is achieved" (Doniger et al. 2001),[3] the deciphering of meaning of visual scenes and the ability to make judgments about the relative relationships between visual objects. As D.F., patients with schizophrenia may be relying on a more intact dorsal stream to strategically compensate for deficits in visual ventral stream processing.

In accord with the findings of abnormalities in ventral stream function, there is good reason to believe that the experience of body image as common social referent is also disrupted in schizophrenia. The body image as (intentional) object is experienced in terms of an allocentric frame of reference and thus dependent on ventral stream. Patients with schizophrenia demonstrate some of their largest deficits in declarative episodic memory. This is thought to be encoded in terms of a scene-based allocentric frame of reference which, in all likelihood, includes reference to body image. In beginning schizophrenia or acute psychosis, the experience of body becomes alien, fragmentary, and transient. The patient's world becomes "egocentric" in the sense that delusions of reference and the passivity symptoms (see below) are directed towards an isolated self. Conrad (1957) observes a mental vertigo in many patients during beginning schizophrenia. One patient's statement summarizes this experience: "*I have the feeling as if everything revolves about me.*" This is qualitatively different than the excessive self-focus and negative self-ruminations of the patient with major depression. It is also not the entitlement, grandiosity and self-involvement of the Cluster B personality disorders (i.e., antisocial, histrionic, narcissistic). The egocentric frame of reference that patients experience in early psychosis is rather the converse, i.e., a loss of self, without any footing in a shared, social world. German phenomenological psychopathologists (e.g., Pauleikopf) describe a loss of standing in the world (*Standverlust*) in beginning schizophrenia, which invokes an image of loss of foundation from below (as depicted literally in Figure 1). The self becomes the *middle-point* in the delusional systems of early psychosis, as in delusions of reference (*Beziehungswahn*), not because of an exacerbated self-focus on body as object but precisely because of a loss of subjective orientation altogether.

These symptoms are concordant with the idea that patients with schizophrenia lose the ability to associate the experience of self with the social construction of a unitary and independent self provided by the slower processing of the ventral stream. This unitary self of body image becomes retrospectively linked with one's actions as their cause to produce an emergent, albeit inaccurate sense of agency (as is suggested by Libet's (1983) frequently cited experiments in which the conscious experience of willing a movement is preceded by its *Bereitschaftspotential*). Unable to plan or think prospectively or rely on the familiar continuity of the narrative memory of an autobiographical past (which is presumably encoded in allocentric coordinates), patients with acute psychosis become trapped in the present moment (Binswanger 1957; Mishara 1995; Mishara 1997). There is a disruption of the continuous experience of *having* a self (Hemsley 1992; Binswanger 1957). Continuity of self and its anchoring in world is based on the common sense assumption that *experience will continue in more or less the same manner as before*. Common sense provides a protective function to consciousness by presenting a familiar world or background shared with others in which redundancies are minimized and distracting contradictions are overlooked (Mishara 2001). Common sense requires the collusion of top down processing to fill the gaps, rifts of meaning or natural scotoma in experience that would otherwise be distracting if not unsettling. Patients with schizophrenia appear to be deficient in these helpful *illusory* processes that allow for this *retrospective* patching up and restoring the sense of continuity of experience. The latter gives the self the impression (in all probability inaccurately) that it is in control or has ownership of an experience that, in fact, had only become possible on the basis of much more rapid, non-conscious brain processes. This is the attribution of self as agent via the "*completed*" or unitary body image, i.e., to have a body, to have a self which more recently has been called the "user's illusion." Despite being an illusion, the awareness of agency as cause of one's acts has important evolutionary and social consequences in that the self acquires the feeling of responsibility for its actions, i.e., of being their cause (as suggested by Libet et al.'s (1983) experimental findings).

It is possible that patients with schizophrenia are deprived of this (*retrospective*) body image which, if available, would have been interpreted as cause of their actions. In its stead, they employ the on-line *prospective* body schema as proxy self in what may be called (following John & Hemsley 1992) compensatory bottom up processing. This strategy temporarily maintains the sense that *one is alive or exists* (see below), but just as rapidly decays – without continuity, *without a ground to stand on* – as Sartre's punctuate, prospective for-itself.[4] The for-itself can only sustain itself by paradoxically yielding to the next ongoing upsurge of consciousness, an iterative for-itself, and by relinquishing any images of self as object (in-itself) which it is condemned to surpass as already past.

The hypothesis of exclusive ventral stream dysfunction in schizophrenia becomes questionable, however, when we consider that patients with schizophrenia also exhibit deficits that appear to be mediated by body schema and dorsal stream function. Doniger et al. (2002) propose that deficits in perceptual closure and object recognition in patients with schizophrenia may actually be secondary to dysfunctional upstream cross-over input from parietal areas of the visual dorsal pathway. These areas "spotlight" the relevant information before being transferred to the ventral stream and are therefore responsible for the exhibited deficit. Abnormalities of dorsal stream processing in schizophrenia are further supported by the incremental evidence that *the parietal lobes may be implicated in schizophrenia* (Danckert et al., in press; Paulus et al. 2002). That is, the dorsal stream, mediated by superior posterior parietal lobe functioning, with a crucial role in the constitution of body schema, may not be completely intact in schizophrenia. How then can we integrate these findings of suggested dysfunction of dorsal and ventral visual processing streams to determine whether the body image/body schema construct may have usefulness in providing a model of neurocognitive dysfunction in schizophrenia?

2. The parietal cortex is structurally heterogeneous and plays a crucial role in mediating frames of reference in the sensori-motor transformations necessary for the non-conscious visual guidance of action and, as we have seen, the online moment to moment functioning of body schema. It does so in terms of functionally segregated sub-regions in which populations of cells code various egocentric coordinates of body schema (e.g., eye-centered, head-centered,

limb-centered, body-centered). It enables the transformation between these and the incoming retinocentric information from striate occipital cortical areas. These sensori-motor transformations are available to the body schema on an on-line basis for the visual guidance of motor control as well as the polymodal integration of information from other senses.

Parietal lobe damage leads to a host of heterogeneous neurological disorders many of which may be linked to body-experience: object- or body-centered neglect of the contralateral hemispace; asomatognosia (an inability to name body-parts, or point to them when named); denial of hemiparesis or ownership of the left half of the body, Gerstman's angular gyrus syndrome (with its symptom complex of finger agnosia, acalculia and right-left disturbances), and Balint-Holmes syndrome, "psychic paralysis of gaze," a peculiar set of disturbances linked to an inability to re-orient to or localize stimuli relative to a visual background (examined further below).

Bizarre beliefs result from damage to the parietal lobe(s), especially the right, such as the conviction that one's arm rendered immobile in hemiparesis belongs to one's dead husband (Feinberg 2001). These may resemble the more fixed body-related delusions reported by patients with schizophrenia. Additionally, the paroxysmal, protean coenesthesias in schizophrenia (cited above) may also be seen in some neurological patients with damage to the parietal lobes. Experiences of shrinking or enlargement of the head and body are found in "Alice in Wonderland syndrome." This syndrome includes feelings of depersonalization, derealization, visual illusions and disorders of time perception (symptoms often also reported in schizophrenia). It has a diverse etiology often involving parietal lobe dysfunction.

In autoscopic symptoms, patients believe they see a replica of their body or a significant part of their body projected in front of them. Such symptoms, although rare, may be found in abnormal states of consciousness, including schizophrenia during active psychosis, epileptic aura states, hypnagogic imagery, delirium, dissociative states and near-death experiences (Conrad 1953; Denning & Berrios 1994). These often involve damage to occipital-parietal areas. Conrad (1953) reports a blind patient who persistently "sees" his own face in front of him for over 7 years. The unexplained face mimics his facial expressions as if he were looking in the mirror. However, Conrad doubts that the mirror-face was the product of optical hallucinations or a denial of the blindness (Anton's syndrome). Comparing it to the phantom limb, he states that it reflects an effort to *retain the integrity of the body after loss*, in this case, after the loss of vision. The threatened integrity directly involves *the conviction that one exists*. This conviction draws from the "sum" of internal sensations and impressions which arise from the body. Although impersonally arising, it is also at the root of the most personal sense of self: the internal perception of our own bodies as existing, or what is sometimes called "coenesthesia, (*Gemeingefuehl*)."[5] The sense of bodily existence, i.e., that one's body exists, may lie at the core of the human experience of self. However, it is a sense of self which persists ambivalently in relation to the inevitable dualism of body image/body schema – a dualism, which, when parietal function is intact, usually remains relatively seamless. How might this sense of self resting on the seamless unity of variants of bodily experience, be disrupted in the abnormalities of self-experience in schizophrenia?

3. We may conclude from the previous section that there is a heterogeneity of symptoms and disorders involving body-experience, which implicates the parietal lobes. This diversity may, in part, be due to the structural and functional heterogeneity of the parietal lobes themselves, their various subregions, and their connectivity to other regions of the brain. In a recent review, Corbetta and Shulman (2002) propose two separate but interacting visual attention networks mediated by different subregions of the parietal lobe in humans: one that anticipates a shift of attention to an already known or cued target, and the other, which alerts attention to a previously unknown, undetected target. In each case, attention is shifted from its current focus to a location in the peripheral visual field. In terms of the current argument, the latter system is a little more puzzling because the subject re-orients to a novel *target without prior knowledge of its location in the peripheral visual field*. It is puzzling how computations in egocentric coordinates with regard to possible movements to not as yet known targets could be performed rapidly enough to reflexively orient awareness prior to any conscious knowledge of where to look. This is once again a form of know-how without explicitly knowing-that. In Paillard's terms, the Corbetta and Shulman's first visual attention system emphasizes conscious knowledge of "where" the target is, the latter tests the more implicit, pragmatic knowledge of "how to get there," i.e., to a previously unknown location. Paillard (1991a) states the body schema provides a "path structure", superimposed on a collection of separate points, in a vectorial map which defines in egocentric terms how awareness is able to shift from a current "here" to an anticipated but still not consciously known "there." The model of conscious awareness provided by Husserl (1966; described below) gives a plausible account of how – in the second case – *this paradox of "knowing how to get there" but of not knowing at first "where"* is possible.

To summarize: Corbetta and Shulman propose that there is a duality of attention systems mediated by specialized function in parietal areas: a top down network which anticipates the stimulus in the periphery and a bottom up network – capable of interrupting the top down network – by drawing attention to a peripheral area. The latter system alerts the subject to information potentially relevant to the organism's survival or interests not currently in focal awareness. The authors conclude that these networks represent voluntary and involuntary systems for orienting visual attention. Activation of the voluntary system of visual attention also occurs when the eye-movements are not performed but the subject merely thinks of where to orient them, i.e., covert shifts of attention that anticipate the movement. Such anticipations of movement, in this case saccades, may never reach conscious awareness but nevertheless inform the shifting on-line coordinates of body schema as potential movements (see Husserl's model below).

4. In studies of human cognition, the embodied self is hard to operationalize. Therefore, the neural substrates of the self remain elusive in neuroimaging studies which employ cognitive paradigms. Because a self-reference effect has been demonstrated to facilitate memory and other cognitive operations, many functional neuroimaging studies operationalize the self in terms of self-reference or self-representation. It has become fashionable to have the subject perform self-reference tasks in various cognitive domains including language, episodic memory with self-referential components and mirror recognition tasks. Experimental studies of patients with schizophrenia suggest that they do not benefit from self-reference bias either in linguistic (as in the studies by Fossati), or mirror-recognition tasks (Tilo Kircher, personal communication). This would suggest a disruption of the ability to coordinate self-representation with current awareness. However, this is still only half of the story. The self is not merely the sum of its representations.

The problem of *having* a self (as in "having" a body image) may be addressed in these studies, but the problem of *being* a self, a body-subject – what patients with schizophrenia struggle so hard to maintain – is not even grazed by such tasks. Efforts to describe or study schizophrenia as a deficit in the self-monitoring of agency (Frith, Blakemore) or in terms of pre-reflective or hyper-reflective self-awareness (Zahavi, Sass) seem to address a more subjective side of self. However, none of these approaches conceptualize self as ambivalent body subject, vulnerable to possibility (i.e., what is not yet), in terms of the body schema, and therefore are unable to access the problem of relation of self to body in schizophrenia. I will return to this point in my conclusions.

Ironically, the embodied self as subject has emerged unpredictably in the problem of ascertaining a baseline or resting state during functional neuroimaging experiments. In a review, Gusnard and Raichle (2001) observed a peculiar similarity between functional neuroimaging studies which take the awake resting state of experimental subjects with eyes closed or passively viewing a fixation cross as the control state. These baseline states are used as a comparison with increases of activations during goal directed, focal cognitive tasks (i.e., increases of blood flow in regional brain activity as indicated by local changes in the blood oxygen level-dependent (BOLD) signal). However, there were not merely the expected increases in activation in the brain areas required to perform the specific cognitive task. There were also, quite independently of the particular task performed, repeatedly and consistently, unexpected decreases of activation in a consistent group of brain areas.

The authors interpret this stable and uniform pattern of activations in the awake but resting state to be a default tonic activity supporting a self-network. It becomes suspended during goal directed behaviors and higher-order, cognitive processing. It is only present when we are in a non-focused restful waking state: "Its functions are spontaneous and virtually continuous, being attenuated only when we engage in goal-directed actions. This is consistent with the continuity of a stable, unified perspective of the organism relative to its environment (a 'self'). This unified perspective is generally under appreciated, because it operates largely in the background..." (Gusnard & Raichle 2001:692–3).

Gusnard and Raichle (2001) speculate on the evolutionary significance of the resting awake state: It is the ability to be affected by a *hitherto undetected salient stimulus which could have emotional significance* for the survival of the organism. The rapid, passive and involuntary detection of any sudden threats or other stimuli pertinent to survival should not require the intentional allocation of attentional resources. It should rather trigger focal attention which then subsequently disengages the broader but now no longer effective mode of restful awakeness. Thus it would appear that the ability to have background consciousness with its vague unity and the ability to rapidly focus to impinging stimuli (potentially relevant for survival) involves a network of frontal parietal connectivity which is suspended during sleep and anomalous conscious states on the one hand, and engaged focal goal directed behavior on the other.

5. Information from the peripheral visual field has faster access to the implicit body-centered computations of dorsal processing streams than the slower ventral pathways subserving conscious focal awareness. This has been substan-

tiated by neuroanatomical studies of the macaque brain. Nowak and Brulier (1997) proposed the term "fast brain" for the fronto-parietal connectivity of the dorsal pathways which, according to the Goodale Milner model, mediate implicit visuomotor control (as well as sensori-motor transformations from other sensory modalities necessary for this control). Paillard (1991a, 1999, this volume) observes that Mishkin and Ungerleider's (1982) classic what/ where dichotomy of visual processing was prefigured by Trevarthen's (1970) distinction of a "focal vision" for the "whatness" of an object from an "ambient vision", which locates "where" a relevant stimulus might be in the periphery relative to current focal vision. Information may be relayed to the dorsal or ventral pathways based on its peripheral or central location in the visual field. That is, information coming from the peripheral visual field "has access to fast, direct pathways that allow for faster onset times in dorsal stream areas." Moreover, we may conclude that the function of frontodorsal connectivity is the "monitoring of peripheral stimuli in general." (Stephan et al. 2002: 3072).[6]

6. Remarkably such a system of self as the ability to be *affected* by its experiential field prior to focal awareness was described by the philosopher Husserl (Husserl 1968; Mishara 1989). Without recourse to scientific experiment, Husserl employs a disciplined method for philosophically reflecting on the foundations of consciousness. He describes how the ego (focal awareness) is first passively and involuntarily "awoken" to reorient to affectively salient contrasts in the periphery. In this pre-attentive field, the greatest contrasts compete for attention prior to the orienting of awareness. Their location in the visual field is *prospectively* structured by the possible kinestheses of ocular-motor response. The field of experience is not structured by the focal "what" which I grasp as actual in current awareness, but rather, by a potential field that is structured in terms of the possible movements required to reorient optimally to possible objects of future focal awareness. When viewed in these terms, schizophrenia involves *the inability to shift awareness from its current focus to potentially relevant information in the background*. That is, the very ability to have an affective background to awareness, a vague marginal unity which supports consciousness may be compromised. The ability to alert awareness to suddenly emergent or intrusive contrasts which may convey important information relevant to emotional needs of the organism appears to involve a specialized network. By becoming over-focused on certain aspects of their environment or experiential field that do not seem to have social relevance or emotional significance for conspecifics, patients with schizophrenia may have a disorder of processing the background of experience or the ability of the self

to be affected by its field. This would involve the self-network described by Gusnard and Raichle in the terms of cognitive neuroscience, and by Husserl who philosophically defines the self as fundamentally vulnerable to what has not yet occurred. This inability to be affected by what may be relevant should not be confused with a dysfunction of attentional systems in schiziophrenia which some have proposed to be not selective or vigilant enough (Braff) while others (Sass, Cutting) have argued to be too hyper-focused or hyper-reflexive. The disorder is rather *pre-attentional* (Mishara 1997) in how what is experienced as possible spreads as "affection" prior to eliciting awareness (what Husserl called the pre-attentive spreading of affect (of "where" it emerges in the field of peripheral awareness) (*Fortpflanzung)* prior to kinesthetically orienting to it and identifying "what" it is (Mishara 1989).

The human self *is* not its representations, but a process. In existentialist terms (e.g., Sartre, Binswanger, von Weizsaecker), the human self is a dialectical process condemned to self-transcendence, i.e., condemned to prospectively transcend each of its current representations of itself as possessing a body image. Being (rather than having) a self is the ongoing vulnerability of being oriented towards what is not yet. In Husserl's terms, the self is affectively tied to its own field of experience as a field of possibilities.

Gallagher (1995) states that the body schema, unlike the body image, cannot become the content of an intentional act (i.e., an object of awareness) but rather makes such intentional awareness possible. Husserl identifies the noetic or mind (*nous* in Greek) with intentional activity or cognition and therefore overlooks the body schema which is, for Gallagher, "pre-noetic." Gallagher (1995) writes that Husserl ignores the prenoetic basis of intentionality: "The focus on body-image, to the exclusion of body schema, is due to the limitations of Husserl's model... Intentionality appears ex nihilo a pure spontaneity that begins at the noetic act of consciousness and moves in the direction of the noema [i.e., the content of the act, AM] ... Husserl ignores the 'from whence' of the act." (Gallagher 1995: 232).

It may be a minor point historically but of great consequence to the current argument: Husserl *did* examine what is here called "body-schema." After years of careful examination of unconscious layers of the (noematic) content on the object's side of the intentional act, he turned to exploring the nonconscious processing on the subject's side, the kinesthetic orienting of awareness to the experiential field motivated by affective strengths of competing contrast saliencies (*Abgehobenheiten* or *Gestalten*) (Mishara 1989). Awareness is this openness to what is not yet, i.e., an affective relation to potential movements in its field. After years of thought-experiments (what he called abstractive reductions, like pealing so many layers of an onion to prior conditions or basic rules of the formation of conscious meaning), Husserl concludes: all mind (*noesis*) is fundamentally kinesthesis.

Husserl's kinesthesis is equivalent to Paillard's implicit "knowing how to get there" rather than an explicit knowing that. In Husserl's description, kinestheses have an egocentric frame of reference and are covaried with aspects of the object given in an external horizon (what today could be called allocentric or environment centered frames of reference). For Husserl, the object obtains an "inner" horizon (as a complete or nameable object in which the various profile aspects (*Abschattungen*) or views of the object combine) only when the preattentional kinesthetic system achieves closure. In this way, the two covariates (the kinesthetic orienting and the revealed aspect of the object) become independent for subsequent memory systems, what today are called procedural and declarative/semantic systems, respectively).

Experimental studies of change blindness indicate that we tend to overestimate our representation of objects in the background. No matter how splotchy or under-represented the background is in current awareness, it nevertheless can be disrupted in certain neuropsychiatric disorders. The relatively rare Balint-Holmes syndrome (with simultanagnosia as one of its symptoms) results from bilateral posterior parietal disease. Patients complain of a searchlight or tunnel vision in which they are unable to detect more than one object or aspect of a scene at a time. They are unable to perceive the visual field as a whole, or grasp the composite nature of a scene by adding up the various components perceived sequentially. Such disorders may be characterized as the inability to be affected by a background or have a background at all. The very ability to have an affective background to current awareness, a vague marginal or fringe consciousness, appears to involve the specialized network proposed by Gusnard and Raichle. This requires the intact frontoparietal connectivity underlying the fast brain of reorienting to peripheral stimuli in terms of the egocentric computations of the body schema, i.e., what, for Husserl, is most vulnerable to sudden contrasts imbued with emotional value for the organism. It would seem that patients with schizophrenia may have a disruption of a similar network which mediates background with regard to current awareness and the ability to seamlessly shift in back and forth transitions from body image and body schema.

4. Conclusion

Like Paillard's deafferented neurological patients, patients with schizophrenia suffer from an inability to avail themselves of the sensori-motor transformations of shifting frames of reference. They employ a compensatory strategy of substituting an effortful bottom up strategy to compensate for loss of the unity and shared social reference of a body image: they employ an incomplete and transient proxy body schema (which becomes a vortex point of "self-centrality" (Maggini & Raballo 2002) in passivity symptoms, delusions of reference, and may underlie some neurocognitive deficits). This provides a brief and momentary sense of being alive in the sense of *coenesthesis* or *Gemeingefuehl* (described by Conrad 1953). However, the body schema is itself disrupted in schizophrenia as evidenced by deficits in ocular-motor and other realms of motor control. There is a deficit in being affected by the experiential field, in voluntarily reorienting from current focus to saliencies that are relevant to current goals or involuntarily to hitherto unknown saliencies that may have emotional significance for the subject's survival. Arbitrary or non-relevant stimuli in the background may take on abnormal salience (mediated by abnormal mesolimbic dopamine as proposed by J. Gray and more recently by A. A. Grace and S. Kapur) and capture attention. These may distract and preoccupy the patient in delusional interpretations of his experience. The resulting delusions are used to patch up a deteriorating world of common sense which when intact is supported by top down biasing and communally shared illusions.

Current approaches in philosophy, cognitive science and neuroscience tend to identify self with self-representation, self-referentiality, hyper-reflexivity or pre-reflexive self-awareness. However, narrative, linguistic or even visuospatial reference to self, or even the attribution of agency to the self as responsible for his actions, is only retrospective (as in Libet et al.'s (1983) findings), substituting an illusory unity for the ongoing, prospective, incomplete and affectively vulnerable relation of awareness to its field – whether in goal directed tasks, or in the default awake resting state. This ongoing shifting between prospective and retrospective is what has been called variously a "Gestalt-circle" ("*Gestaltkreis*") (von Weizsaecker 1948), an ongoing task of self-transcendence (Sartre 1966) and what Binswanger (1957) found to be at the heart of the disrupted "being-in-the world" of patients with schizophrenia.

From the standpoint of common sense, determining which aspects of interactive experience with the world is active movement and which passive feeling does not matter: the computations of sensorimotor transformations of frames of reference as mediated by subregions of the parietal lobes are non-conscious and thus, to a large extent effortless. Schizophrenia has been defined as illness involving the loss of common sense (Blankenburg 2001; Mishara 2001). The otherwise seamless common sense transitions between touch and being touched, inner and outer, agency vs. passivity, movement vs. being affected, body for self and body for others become problematic in schizophrenia. In conclusion, it is hoped that more attention will be paid to the necessity of distinguishing modes of self in the burgeoning recognition that the conceptual distinction between body schema/ body image is critical to the research of bodily experience in human neuropsychiatric disorders.

Notes

1. Blanke et al. (2002) describe an epilepsy patient undergoing evaluation who reported spontaneous out-of-body sensations following focal electrical stimulation to Brodman's Area 39, the angular gyrus of the right inferior parietal lobe. " 'Out-of-body' experiences are curious, usually brief sensations in which a person's consciousness seems to become detached from the body and take up a remote viewing position." (Blanke et al. 2002: 269). They involve the loss of a subjective or inner connection, a feeling own-ness to one's body. This area may be implicated in feelings of depersonalization and the passivity symptoms of schizophrenia (as well as analogous feelings of detachment or dissociation from one's own body in some trauma related disorders).

2. Influenced by prior philosophic views of human nature as incomplete resulting from a pre-mature birth, a poverty of instinct and a fundamental "openness to world," *Weltoffenheit* (Heidegger, Scheler), the French psychoanalyst Lacan described a fundamental lack or disconnection between self as I and self as me which is the heart of human desire: the unity of the self can only be mediated by the Other's desire.

3. Doniger et al. (2001) write: "Impaired object recognition in patients with schizophrenia, as reflected in this study, would thus be consistent with dysfunction within ventral visual-stream sensory regions and especially in the lateral occipital complex." (Doniger et al. 2001: 1822)

4. This again counters the proposal that there is in schizophrenia an overemphasis of body as object (Cutting 1999 and others, including Parnas and Sass) due to a "hyper-reflexivity" which detaches and distances itself from one's own body. It also provides an alternative explanation to Frith's hypothesis that the passivity symptoms in schizophrenia (i.e., delusions of control, thought-insertion, thought broadcasting or hearing voices) may rest on the disruption of an efferent copy or internal model of self-generated motor programs, which, in turn, leads to a lack of awareness of the intended action. However, it is equally plausible that the disruption of willed action is due to the 'for-itself' being rendered absent or inaccessible. The main point is that the two modes (for itself/in itself) are dialectically, interdependently related in terms of a relationship of provisional mutual exclusivity (Binswanger, Blankenburg, von Weizsaecker). Once one mode is exaggerated above the other (resulting, for example, from neurological impairment), a disproportion results, and the dominant mode starts to behave in a compensatory manner resembling the suppressed mode. While this paper was in press, I discovered that U. Frith and F. de Vignemont (in press, *Consciousness and Cognition)* have made similar, but independent observations about Asperger syndrome: the uncoupling of egocentric and allocentric frames of reference leads to a compensatory exaggeration of both. They write: "People with Asperger syndrome are unable to connect to an egocentric or allocentric stance and can only adopt extreme forms of either." These parallel findings suggest that comparison of these disorders may help us understand their respective neurobiological abnormalities.

5. The term coenesthesia was common until the beginning of the twentieth century when it was replaced by terms such as "body schema," "body image" (e.g., Head & Holmes 1911) and "body ego." It derives from the Aristotelian doctrine that information from the external senses (vision, audition, touch, smell) only reaches internal sense by means of a common sense (*sensus communis*, *koinon aesthesis*), therefore the German, *Gemeingefuehl*.

6. As suggested by Gusnard and Raichle (2001), the fronto-parietal self-network preferentially processes bodily and emotionally salient information. This suggests an interesting association between posterior midbrain areas, emotion processing and peripheral vision: "The idea that this area participates in aspects of emotional processing is also supported by observations in the fields of psychology and communication. Images shown on larger screens elicit greater 'attention' and 'arousal', as measured by heart rate and skin conductance, than the same images shown on medium-sized or small screens. Although related functional imaging studies have not been carried out, it is anticipated that larger screens would stimulate the visual periphery and would, therefore, be associated with activity in this area." (Gusnard & Raichle 2001: 690).

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Body structure in psychotic and autistic children

François Sauvagnat

1. Introduction

Whoever is engaged in tackling the issue of the consistence of body image in psychotic and autistic children will apparently find little support in most of the recent scientific literature on such disorders, although most of the direct testimonies – especially among parents of such children – abound in material. We will try to disentangle this striking discrepancy that goes together with a recent disinterest, in the Anglo-Saxon cultural domain, for psychoanalytic theories of the Kannerian disease, for reasons that have very little to do with fundamental research. In the following lines, we will (1) show that the opposition between infantile psychosis and autism has been overestimated for ideological reasons, a stance that led to an underestimation of body-structure disorders in autistic children; (2) show that the Freudian theory of drives is in fact a theory of the body; (3) describe evidence of body-structuration perturbations in psychotic and autistic children; (4) give a description of critical phases in body-structuration; (5) discuss the current options in the treatment of psychotic and autistic children. We will conclude with a few remarks on the therapies of autism.

2. Autism and psychosis in children: The epidemiological conundrum and the Harry Potter effect

The first thing we have to do if we want to address the issue of the psychotic-autistic body is to discuss matters of diagnosis. The epidemiology of autism has recently come into a crisis, when it was discovered that there was an "epidemic" of patients presenting the "spectrum of autism" in States like California (Department of Developmental Services, California Health and Human Services Agency, 1999), with a number of reported cases increasing by 273% from 1987 to 1998. This was considered to be all the more surprising since the diagnostic criteria had been left mostly unchanged through the various versions of the DSM, from the DSM-III on. At the end of the 1970ies autism has been increasingly excluded from the group of psychotic conditions, to be considered as the "core disorder", or the "model" of a broad spectrum of "pervasive developmental disorders", a general category of childhood disorders encompassing various cognitive and instrumental disorders, excluding very strictly psychotic conditions. At the same time, the American Psychiatric Association decided that infantile psychosis included exactly the same psychopathology as schizophrenia – an opinion which was in no way shared in the rest of the world. Consequently, the American and British statistics of autism soared continuously whereas childhood psychosis tended to disappear from the Anglo-Saxon cultural domain (whereas it subsided in the French, which stuck to Kanner's original position). This taxonomic framework, officialized by the DSM-III, might very well be the "proton pseudos" explaining the current conundrum. In fact, we will see that there is very little clinical evidence to support this absolute separation between early psychoses and this pervasive "autistic spectrum".

Even if there has been a constant agreement, since Kanner's initial description of primary infantile autism (Kanner 1943), that at least two types of symptoms, "loneliness" and "sameness" should be considered as the cornerstone of the syndrome (he subsequently added to them language disorders and a special relationship to objects), Kanner himself never considered that childhood psychoses should be erased. Nor did he consider that intermediate cases (showing both autistic and psychotic traits) did not exist. In fact what clinical evidence showed – and still shows! – is that most autistic patients present with symptoms that are strongly evocative of other disorders, most of which are frequently found in psychotic children (as diagnosed following the classical standards). According to Tsai:

> about 60% [of autistic children] have poor attention and concentration; 40% are hyperactive; 43% to 88% exhibit morbid or unusual preoccupation; 37% have obsessive phenomena; 16% to 86% show compulsions or rituals; 50% to 89% demonstrate stereotyped utterance; 70% exhibit stereotyped mannerism; 17% to 74% have anxiety or fears; 9% to 44% show depressive mood, irritability, agitation, and inappropriate affect; 11% have sleep problems; 24% to 43% have a history of self-injury; and 8% have tics. (Tsai 1999: 655)

Recent research (Cooper 2004) has shown that the DSM has very little clinical consistency, and that social, economical (insurance benefits) and cultural pressures have been extremely influential throughout its successive versions. The arbitrary separation between autism and psychosis was originally promoted by Rimland (1964). By that time, the North-American category of "childhood schizophrenia" was not only considered as exhibiting a later onset than autism, but most of all – at least in the American doctrines – as psychogenic, related to parental disorders... and linked to the infamous accusation of "blaming the parents". By contrast, without obvious proof, autism was proclaimed to be "neurological" and "genetic" – the transmission of hypothetic "bad genes" could be understood as a form of predestination, a factor that was culturally more acceptable than unsuccessful interpersonal interactions.

In fact, when Kanner defined "primary infantile autism", he considered that, apart from the age of onset, it did not exhibit major differences from infantile schizophrenia (or child psychosis), the latter being implicitly defined according to the classical recommendations of the most precise specialist of the 30ies, the Swiss psychiatrist Lutz (1937), who, like all his contemporaries, considered autism as a central trait in childhood psychosis. In fact, Kanner knew that he was only radicalizing a significant aspect of the contemporary views, and never seems to have thought to be working on anything else than a specific form of childhood psychosis – a blooming theme of research by then (Cantor 1988) – alongside with people like Mahler (1949), Bender (1956) or Despert (1968). He carefully refrained from differentiating too strictly the two conditions. It was not before Kanner's death that autism was officially proclaimed by Rutter (Rutter et al. 1967; Rutter et al. 1971) and Kolvin (1971) to be an entity entirely separated from schizophrenia, although no clear evidence of this was ever produced; as a consequence, childhood psychosis practically disappeared from the Anglo-Saxon manuals.

What certainly facilitated the evaporation of childhood psychoses in the Anglo-Saxon cultural domain is that psychosis, in children, often goes undercover. This is what we could call the Harry Potter effect. I have shown (Sauvagnat 2002b) that in numerous cases, psychotic children tend to keep their delusional or hallucinatory experiences secret and camouflage them as character traits or behavior disorders, as they experience that nobody wants to hear about them. There has been a long debate about whether children could have hallucinations; in spite of the clinical evidence exhibited by pioneers like Despert (1968), the weight of prejudices has prevailed and most clinicians and researchers still tend to respond by the negative.

Volkmar and Cohen, among the American authors who tried to find a reasonable solution to the threatening pervasiveness of autism, gave a good summary of the situation when they wrote:

> There have been some reports of individuals suffering from autism having schizophrenia, but most studies looking at co-occurrence have shown that numbers are low. One review of 163 individuals with autism found a single individual with schizophrenia, resulting in a rate of 0.6%, which is comparable to the rate for the general population. The DSM-IV suggests that schizophrenia can be diagnosed in an individual with autism when hallucination or delusions have been present for at least 1 month. However, the 2 disorders may be difficult to differentiate when a patient has odd obsessions. These can look like delusional thought disorder, except that, usually, ideas of reference or other distortions of thinking are absent. (Volkmar & Cohen 1991: 1705)

In fact, one can wonder whether expecting to find exactly the same type of disorders in psychotic adults and children is a wise heuristic strategy. Bleuler (1911) carefully distinguished two aspects of schizophrenia, the primary symptoms and the secondary ones, which were said to be mainly shaped by personal reactions to the malady – classically, psychotic children were described as exhibiting different reactions to their disorders than adults. In the recent Anglo-Saxon research on childhood psychoses, this aspect tends to be totally ignored and psychotic children are supposed to exhibit exactly the same picture as adults. Nevertheless, some authors seem to be doubtful about this issue. In a recent presentation on schizophrenia, the NIMH (2001) stated: "Misdiagnosis of schizophrenia in children is all too common", but unfortunately failed to expand on the subject. Discussing the same issue, an instructor from the University of California, Jimerson (2003), prudently wrote:

> This extremely low prevalence rate (.14/ 1000) [of childhood psychosis] may reflect, in part, difficulty in defining the phenomenology of childhood-onset schizophrenia due to young children's limitations in describing their symptoms as well as researchers' difficulty in distinguishing those symptoms from normal childhood experiences. (Russell 1994: 631)

The same author added that the specificities of the DSM tended to foster an "underestimation of schizophrenia" in children. There is little doubt that such "unidentified" disorders can to some extent be camouflaged by the children once they have experienced that adults have simply decided that they do not exist. A closely related issue has been raised by French clinicians since the 1950ies: according to them, psychotic symptoms in children tend to be transformed into developmental disorders, character traits, psychomotor idiosyncrasies etc., in clinical pictures called “parapsychoses” (Lang 1978) or “dysharmonies d’évolution” (Misès 1994).

Whoever is prone to have limited confidence in DSM diagnosis will also doubt that the discontinuity between autism and schizophrenia is as strict as it has been said to be since the 1970ies. In fact, for the advocates of the continuity hypothesis (as contrasted to the predominant hypothesis of a total discontinuity between psychosis and autism) (Aussilloux 1994), most psychotic children exhibit some autistic traits, so that cases can be distributed between two extremes: on one side, the predominently autistic child with a “crust” (Tustin 1972), strictly stereotyped activities, and very little disorganization, and on the other extreme, children exhibiting mainly schizophrenia-like disorders. A certain number of cases can find some way of stabilizing or camouflaging their disorders into character-traits, intellectual limitations, and psychomotor disorders. In the last decade, the Yale School of Medicine (Volkmar 1996) has tried to promote a “new” clinical category, exhibiting “developmental disorders”, “multiplex (complex) developmental disorder”, the description of which is very close to that of the French “parapsychoses” and “dysharmonies d’évolution”, i.e., psychosis camouflaged under the guise of various instrumental, behavioral and intellectual disorders.

We can thus propose, instead of the “autistic spectrum”, a continuist model of autistic/psychotic disorders in children, according to which the psychopathology can vary from a very disorganized schizophrenia-like picture (Sauvagnat 2000a) to autistic aloneness (refusal of contact) and sameness (stereotypies), whereas to a considerable extent both the autistic “crust” and the schizophrenic disorganization can either be camouflaged as milder syndromes (Asperger’s syndrome and “parapsychoses” or “multiplex developmental disorders”) or evolve into clinical pictures of intellectual limitations – or find favourable developments through various modes of stabilization (Grandin 1996b; Williams 1995).

If autistic disorders and psychoses should be seen as a continuum, an important consequence should be drawn: such children are liable to experience important disorders in their body image structure. In the following lines, we will explore the question why this issue has been so heavily underestimated in mainstream literature, and what evidence is at hand of such bodily disorders.

3. The body problem in psychotic and autistic children: Classical Freudian views

This is intimately connected with the way Kanner understood the term "autism". It had been in use for three decades to qualify either psychotic phenomena related to pathological introversion or more normal day-dream like states – and even in some instances abstract language – when Kanner decided to christen a specific syndrome with it. Originally, Bleuler (1911) had employed the term to describe a detachment from reality that could be observed in schizophrenic patients. The term was derived from "autoerotism", in an attempt to describe a mental attitude whose mechanism seemed to be dictated by an affective trend ("complexes") dominated by self-containment. Bleuler's theory of schizophrenia (Bleuler 1911) was partly dependent on the Freudian theory, according to which mental mechanisms were ultimately determined by drives and object-relationships. In fact, before 1940, most of the research on childhood psychoses insisted on this instinctual aspect – we must here insist that in the Freudian tradition, drives are what structures the body, the basic model being the paediatric observations of thumb-sucking in infants and children, a crucial activity that has to be situated in the process that goes from the infant waking up, being breast-fed, then concentrating on thumb-sucking in order to be "pacified" and fall asleep (Sauvagnat1999b; Sauvagnat & Sauvagnat 2001). We will give here a short description of this line of research.

In 1879, Lindner, a paediatrician in Budapest, describes the characteristics of 69 children sucking their fingers or other objects. He shows that it is a specific behaviour distinct from feeding activities, which separates the child from his environment, and can work as a pacifier. He shows that it is not a pathological conduct, and that very sick children do not have this sort of behaviour. Although this certainly did not contribute to Lindner's social recognition, Freud explicitly quoted Lindner when he first described sexual drives as a specific mode of body-investment, even considering that the description of the oral drive could be generalized to all other sexual drives. Although Freud and his colleagues (e.g. Schilder) always insisted that body image should be seen as the result of a dialectic between sexual drives and the unconscious as a "system" (Sauvagnat 1999b; Sauvagnat 2002b), they also claimed that bodily experiences are strongly related to interpersonal relationships. Freud himself proposed four distinct hypotheses to describe the relationship between sexual drives and interpersonal relations. Most popular among these were the idea that thumb-sucking and its equivalents could be a consolation in abandoned children, or a compensation for an unsatisfactory relationship with the mother, and the idea that there could be several kinds of "introversion" (i.e., rejection of interpersonal relationships, the most severe cases being psychotic). Most of the psychoanalytic literature on childhood psychoses and autism does indeed focus on the vicissitudes of this particular object, the most characteristic conceptualization being probably Tustin's "autistic object", implying both a failure in body structuration and in interpersonal relations as opposed to Winnicott's "transitional object", which implies a successful articulation of both aspects. Between 1905 and 1930, thumb-sucking observations were quite popular among psychoanalysts interested in young children, and concurring theories were proposed of the dialectic between drives and interpersonal relationships. Typically, American analysts supported theories hypothesizing the most radical contradiction between drives and interpersonal relationships, a specificity that should certainly be compared with the intensity of puritan views in American ideology (Rado 1995; Sauvagnat 2003b). In contrast, the Lacanian school has upheld the view that drive object was structurally distinct but structurally articulated to both the imaginary globality of the body and the interpersonal other as described by XXth century phenomenological research (Sauvagnat 1999b; 2003b).

When Kanner developed his theory of autism, he mainly focused on two cardinal aspects, aloneness and sameness. In doing so, he paid tribute to Meyer's views on psychopathology, which mainly emphasized the relationship to the environment and the effect of biological dispositions ("ergasias"). He seemed to consider as rather secondary the specific sort of object-relations and language difficulties exhibited by these patients. As a result, we have two separate research-lines concerning autism: the kannerian tradition mainly insisted on the perturbations in the relationship with the environment and paid little interest to the inner life or bodily experiences, whereas the psychoanalytic tradition (e.g. Mahler 1949; Tustin 1972; Lefort 1980) has kept insisting on the sort of object-relationships and body image distortions exhibited by these children. In a previous publication (Sauvagnat 2000b), we have shown that the "theory of mind", a late and limited application of intersubjective philosophy to autism, focussed on the contact with the environment and skipped the issue of the autistic body. The same can be said about the "theory of control" and the theory of imitation, which exhibit the same kannerian assumptions and also avoid discussing the body issue.

In the following lines, we will (1) describe the typical difficulties experienced by autistic-psychotic children concerning their body image; (2) propose a view of the evolution of their body image, as compared with the evolution of the body image in normal/neurotic children, from birth to age 3; (3) propose some hypotheses concerning theses differences and some therapeutic strategies.

4. Evidence of body image perturbations in autistic-psychotic children

In this paragraph, we will draw both on our clinical experience and on available literature, in order to show that most of the autistic-psychotic symptomatology is intensely related with the body issue.

The first sort of body image difficulty evidenced in childhood psychosis-autism is sleep disorder. Parents often complain that these infants, toddlers or children cannot fall asleep, or wake up a few instants after slumber. Some keep lying with their eyes open. Some keep awake all night. Alternatively, some children adopt acrobatic bodily postures in order to fall asleep (for instance, twisting their legs behind their head). Others have difficulties in keeping awake, losing bodily tonicity and sliding into slumber during day-time. This should be understood as related to the difficulty in monitoring the limits of the body, which are in infants regularly related to the capacity to "close oneself up" when falling asleep.

The second type of body image disorder is related to feeding problems: severe early anorexia frequently occurs in children who will later develop autistic-psychotic disorders. In less severe cases, children engulf food or drink without limitation, and there does not seem to be any relationship between actual hunger and the process of taking food. In extreme cases, some children are liable to absorb all sorts of substances, even including bodily secretions.

Although encopresia and enuresia in autistic-psychotic children have been overwhelmingly considered to be the consequence of allergy and other biological problems in the recent literature, we have found that in many cases these disorders are strongly related with body image disorders and anxiety, especially a poor appraisal of the limits of the body and the very possibility to control its orifices, with cases evidencing a quasi-agnosia.

The absence of "transitional objects" has also been evidenced in autistic-psychotic children (Winnicott 1953; Tustin 1972). A specific development of the classical "drive-object" theory, the "transitional object" was presented by Winnicott (1953) both as marking a "transitional zone" in which the infant develops a sense of independence within the territory controlled by his parents, and as a means to close a crucial body-orifice in order to be "pacified" and partially isolated from the outside world for some time. Instead of this, "autistic objects" animated by rhythmic movements have been described as mechanical, potentializing excitation, and insuring a very poor bodily containment.

Although most of the recent "cognitive" research on autism has focused on "deficits in the theory of mind" suggesting that the autistic child ignores others, quite the contrary is very often observed: many autistic-psychotic children tend to focus suddenly on someone else, look the other in the eyes, squinting, as if they attempted to intrude into the other's body, in a wild form of intersubjectivity. This has been called the "Cyclope's phenomenon" by Haag (1984), and has been constantly evidenced by such authors as Lefort & Lefort (1980), and many others. Imitation disorders can also be understood as a result of this phenomenon. The same thing can be said about the difficulty often observed of psychotic/autistic children to reach certain objects, implying that the structuration of space has not been settled, as a consequence of their incapacity to experience their body as a closed, controllable totality.

The relationship between language and body image disorders has long been underestimated. We have shown that most of the recent research has focussed on pragmatic disorders or failures to address the interlocutor (Sauvagnat 2000b). What is here avoided is the more direct relationship of psychotic language disorders with body image. This can be considered in four main directions:

1. The refusal to be directly addressed or called upon (or alternatively, designated, touched, watched) by other persons (Kanner's "aloneness"), the incapacity to use correctly personal pronouns, and the "objectification" of other persons' limbs as instruments (Sauvagnat 2000c).
2. The absence of a "symbolic frame of reference" of the patient's body, in such situations as having to cross an open space or being confronted to an unstructured crowd. Some autistic children, when they have to cross an open space, just speed from one room-door to another. In other cases some patients resort to stereotypic "sameness" in an effort to maintain some stability in their body-structure. For many of these children, the very possibility to be idle or relaxed is excluded; they repetitively ask for directions or guidelines from adults, in order to feel contained.
3. Hallucinations as defined by the French psychiatric tradition, i.e., as a pathology of inner speech ("Séglas phenomenon", cfr. Sauvagnat 1997). This definition, which has been supported by overwhelming empirical evidence, is of course very different from the XIXth century concept of hallucinations as "false perceptions", which has proven unspecific of psychotic conditions – although it is still admitted by the current version of the DSM.

The patient may experience that language is out of control (e.g., functions automatically and cannot be monitored), that the words or sounds emitted by the subject reverberate into an uncontrollable echo, that this echo (or words coming from other people) controls the verbal activity of the patient or alternatively that the patient's verbal activity automatically influences others' verbal activities. Even mute autistic children can often be found muttering to themselves. All of which is necessarily related to the experience of an absence of limits between the inside of the body and the outside world.

4. Stereotypies and echolalia can be considered as an equivalent of delusional hallucinatory disorders, in which a signifier is endlessly repeated, especially in a puzzling situation, in an attempt to re-create a controllable closure of the body. This is particularity evidenced in cases where stereotypes find no answer and result in automutilation.

In all these cases, the limits of the body and the capacity to control them are obviously challenged. In a recent research with 7 autistic and psychotic children, we have found that those of them who were the most silent seemed to "talk to themselves" and have some sort of inner speech, which often accompanied their use of autistic objects.

Anxiety states regularly determining automutilation should also be seen as a result of poor body image structuration. In a recent research, one of our students (Legrand 2002) has shown that automutilation could occur in various contexts, all of which are obviously related with a lack of structuration of body image – and each of whom suggests a specific pacifying strategy:

a. In some cases an aggressive reaction is determined by the lack of control in bodily activity like taking food; e.g. a patient queries ceaselessly for food, and auto-aggression will occur unless an unequivocal monitoring is ensured by a counsellor.
b. In other cases, the daily-life rituals are deranged, determining auto-aggressive behaviour.
c. An unexpected exterior intervention surprising the patient can cause auto-aggressive behaviour any time.
d. An unauthorized action (e.g. hitting someone else) repressed by a counsellor can determine auto-aggressive behaviour that can be understood as self-punitive.
e. The perception of certain sounds, or of hallucinations, can determine auto-aggressive behaviour.

f. The experience of threat, e. g. during an interaction with someone else can cause the feeling of being absorbed of engulfed into the other, and subsequently auto-aggressive behaviour.
g. The impossibility to fall asleep can determine auto-aggressive behaviour.
h. Some autistic rituals, i.e., swinging, patting one's mouth, etc. can drift into movements entailing a self-aggressive value.

The last aspect we will discuss is the direct verbal expression of autistic-psychotic children about their own body – in the case of verbal children. It is not uncommon to hear such children explain that they have a "monster in their belly", or complain about the shape of one of their limbs, or explain that they are immortal, or have died several times already (such experiences are recounted at full length by autistic writers like Williams (1994). In highly-functioning autists, this issue will be mentioned more discreetly, e.g., a young Asperger painter explained on a French TV show that he was in fact reconstructing the entire reality through his (mainly architectural) art, and that he could not think of what would happen if he stopped doing so.

How can these phenomena be singled out? In the following lines, we will attempt to propose an outline of a chronological presentation of them.

5. Critical phases in body-structuration

Autism, in the current view of the DSM, is presented as a Pervasive developmental disorder (PDD). In fact, the classical issue of development, such as it has been characterized by developmental psychology is not to be taken too strictly here, since to the best of our contemporary knowledge, there is no such thing as a "primary autistic phase", and it is well-known that late-onset autism does exist. In fact, in spite of the current fascination for "development disorders" it has proven fruitless to try to correlate too strictly psychopathological disorders with psycho-neurological development. Instead, the attention of clinicians has been attracted on what we could call "critical phases", in which the infant, toddler or child has to resolve typical difficulties, resulting in obvious psychopathology. In the following lines, we will attempt to describe such critical phases in the continuing structuration of the child's body. We will confront two characteristic cases, on one side, the normal/neurotic child's development, and on the other side, the psychotic/autistic child's experiences.

The first issue that has been raised is that of the body-structuration of the neonate. Classically, one describes the series of inborn reflexes, like sucking, swallowing, etc., but we would like to insist on two crucial issues. The first issue has been underscored by the recent research on the early capacities of interaction and expressivity in normal infants, i.e. the fact that they normally react directly to the voice, the sight, the odour, the proximity of the parent's body, that they are able to imitate facial expressions within the first days after birth and soon engage into elementary role-switching games suggesting a preliminary form of intersubjectivity (Trevarthen 1990). Typical bodily tonic response is regularly evidenced in infants when taken in their mother's arms, a response which is absent in psychotic-autistic children.

The second issue is the strikingly early stage at which language competence has been demonstrated to be present. Chomsky's (1975) hypothesis of inborn Language Acquisition Devices that should pre-equip the newborn in order for him to learn human language has clearly been confirmed, at least in the domain of phonological discrimination. Empirical research has shown that a 4-days-old infant is able to discriminate a foreign language from his mother's tongue (Mehler & Dupoux 1990). It is not known whether this is characteristic of all infants. In any case, this strongly supports the view that language is, from the beginning, a massive ingredient in the perception of the outside – and possibly also of the inside – world.

If we now examine what are the known peculiarities of autistic/psychotic infants, we come across several significant facts. Firstly, the tonic response in bodily interaction is lacking, i.e., the infant either does not react with its motricity to parental manipulations (what the Viennese analyst Bick called the "sack of potatoes" reaction (Harris 1998)), or expresses an anxiety that nothing can seem to pacify. Anorexia is not rare in these infants, as well as sleep disorders. Another phenomenon worth considering is the presence of rhythmical movements which sometimes result in self-mutilation (for instance: rhythmically banging one's head against the bed side). Since no neurological derangement has been unequivocally evidenced so far in autistic children, we suggest that this might be the way autistic children react to their linguistic pre-equipment, which we can hypothesize to be felt by them as parasitic, as an intruding mecanicity.

We can consequently consider that whereas the normal/neurotic child has some sort of "practical foreboding" of the limits of his body which conditions his earliest relationship with the Other, and allows him to enjoy communication, as Trevarthen (1990) has brilliantly shown ("protoconversation", with an early capacity for role-switching), but probably on a direct protolinguistic level (a formulation which Trevarthen certainly would not share), both faculties are not integrated by autistic/psychotic babies. We must here propose a hypothesis concerning the earliest type of integration of the body: it must imply a capacity to close itself, differentiate itself through a closure, the very thing that sexual drives as defined by Freud can ensure, an anticipation of the mastery of orifices. This is intimately mixed with the interventions of the mother through feeding and cleaning. At this stage, this capacity of closure cannot be differentiated from the intervention of the Other, and this certainly gives all its value to what Daniel Stern (1985) calls "attunement". In doing this, the mother guarantees that this capacity of voluntary closure is at the disposal of the child. I propose to call this originary function "primary bodily nomination". In a famous paper, "La troisième", Lacan (1975) characterizes the primary definition of the body as a separation between the imaginary and the phallic *jouissance* (i.e., mastery of the sphincters), the latter being concentrated on bodily orifices. Lacking this possibility of a primary closure, both the "protoconversation" with the parent and the relationship to the primary forms of language appears to be deeply perturbated, with repetitive banging and stereotypes becoming the first experiences of outside language instead of an immediate interest in the other's proferations.

A second critical phase is the mirror stage, which Lacan, drawing on Henri Wallon, describes as the infant's capacity to enjoy his body as a globality, when he is invited to do so by a parent who is carrying him before the mirror. We must here recall that Lacan's mirror stage (Lacan [1949] 1966) does not correspond to the experimental conditions described by his critics like Zazzo (1977), who only envisaged a procedure in which children of various ages were presented a mirror and the observer had to recognize whether the child was becoming aware that he had a dot of paint on his face – a protocol in which of course the mirror recognition could only happen much later. What the Lacanian protocol is meant to show is that when actively designated by his parent, the 6-months infant is capable to "jubilate" before the mirror, turn from the virtual image to the parent, and move his limbs to compare these movements with the virtual image in the mirror (Le Gaufey, this volume; Knockaert & Steenhoudt, this volume; Van Bunder & Van de Vijver, this volume). What we would like to suggest is that this phase is simply the continuation of the previous one, i.e., it can only be fulfilled if a primary bodily nomination has taken place. This phase, in the case of the normal/neurotic child, still implies a high degree of transitivism and imbalance between his own body and the virtual body of the little other perceived in the mirror. In the case of psychotic/autistic children, this is simply intolerable. In fact, the mirror stage associates two ingredients which both prove unbearable to the psychotic/autistic infant: firstly, their designation by someone else, which they feel to be over intrusive, and secondly a direct relationship to another, both as object and as an equivalent of the self. The perplexity before the virtual image finds its natural continuation in the "Cyclope phenomenon", which autistic children frequently exhibit when confronted to close contact with someone else.

The third phase is the moment when children pass from the mere babbling of sounds more or less structured by their linguistic environment (in a conversational exchange with parents or caregivers or as a private activity) to the actual proferation of words accompanied by active pointing towards objects. Whereas it seems certain that psychotic/autistic children experience some kind of inner speech and some of them show signs of babbling, most of the time this moment of exquisite expressivity, when children start to speak out designative words, is usually heavily delayed or even impossible. Instead, they tend to confine themselves to repetitive games implying no reciprocity, and with a high degree of stereotypy.

The fourth phase occurs when normal/neurotic children pass from babytalk to adult language, and specifically when, around age 3, they start using the pronoun of the first person instead of their first name on a regular basis. Jakobson (1971) has described this as a traumatic and depersonalizing event, as everybody can say "I" and deprive the subject from his initiative and personality as a speaker. This is certainly all the more so for psychotic/autistic children and it has been regularity observed that the incapacity to use the first person pronoun is linked to the prevalence of echolalia. Echolalia, from the point of view of bodily structuration, can be seen as a refusal to be "de-personalized" by linguistic turn-taking; it can also be seen as an attempt to control the Other. Prizant et al. (1984) have insisted on the idea that delayed echolalia (a concept coined by Kanner himself) could be seen as a surrogate of communication. What we would like to insist on here is that echolalia can also be an attempt to maintain some sort of fragile bodily continuity. Strikingly, when autistic children begin to speak after years of silence, they most of the time give orders to everybody, proclaiming the "law of the Other". Doing this can be understood as a means of controlling the locus of language which is also the place from which a body can be bestowed – and also that having a body is not such a natural event as one could believe.

6. A few consequences

This could prove to be of interest for phenomenological research: most phenomenologist theories insist on the subjective movement from the subject to the object, in order to analyze the peculiarities of perception assuming a unified and mainly "solid" subject (Sauvagnat, 2004, forthcoming). This is in particular the case in Husserl when he assumes that consciousness is an a priori condition of this, prohibiting de facto to envisage the questions raised by autistic bodily experiences. However, several of Husserl's followers have seen things somewhat differently. Merleau-Ponty (1969) repetitively pointed to the basic conditions which are implied in what he calls *la chair*, especially that the subject must assume that something, in the landscape, behind the door, is expecting and accepting this intentional movement; he also discussed the problems of space organization in psychotic patients in his *Phenomenology of perception* (1945). Binswanger has tried to describe *mißglücktes Dasein* of psychiatric patients, in which the projection of the subject fails, reverberating into intimate psychopathology. Ingarden has criticized what he saw as Husserl's proneness to psychologism, and has insisted that the Ego could not be a privileged agency – that its forms of being could be as frail as objects themselves (Sauvagnat 2004; forthcoming). However, very little has been said concerning the specific conditions which could provoke a feeling of body fragility or even the experience that the limits of the body are uncontrollable. There is ample evidence that the study of autistic and psychotic children could teach us a lot about that.

We must also regret that much of the recent medical and psychological research has unfortunately turned its back to this sort of knowledge, resulting in little therapeutic progress, in spite of what is frequently claimed.

There are currently three main types of therapeutic techniques in use for the treatment of psychotic/autistic children: behavioral interventions (starting with Lovaas' ABA method), educational methods, and applied psychoanalysis. Applications of psychoanalysis tend to be eliminated in countries under overwhelming Anglo-Saxon influence, especially under the constraints of so-called "evidence-based medicine", and this goes together with the elimination of the clinical interest for body image disturbances in children exhibiting the "autistic spectrum" and a laboriously repetitive literature on the deficits of the "theory of mind" purportedly exhibited by these individuals – in fact, as we have shown when discussing the "Cyclope phenomenon", the question is much more that of insuring a preliminary bodily containment than of re-establishing or creating such a forced intersubjectivity. In terms of therapy, most of the recent debates in this growing cultural area have focused on the more or less strict directivity of behavioristic or re-educational methods. Interestingly, the very authoritarian and rigid ABA method has met some criticism in practitioners (Koegel & Koegel 1999; Stahmer 1999) who objected to its linear procedures and to the lack of "generalizability" of the skills taught in spite of the highly enthusiastic presentation made of them to the public. Another positive point is that recent research seems to have admitted that stereotypies could cover some sort of subjective choice, a point on which we have insisted in previous publications (Sauvagnat 1999a; Sauvagnat 1999c) and there are currently more discussions on how to use some aspects of stereotypies rather than on the best way of erasing them. Nevertheless, the idea that the core derangements of autism could be related to body image disorders is generally alien to most of current researchers, and very few people seem disturbed by the fact that most of the literature on self-harm focuses on some ethically questionable "aversive techniques". Little attention has been paid to proposals made by high-functioning autists, like Grandin and Williams, who, among various and abundant recommendations in all domains pertaining to the treatment of autism have insisted on the significance of bodily disorders in this condition. Grandin (1996b; 1996c) has proposed a curious method of bodily compression to control overwhelming anxieties; Williams (2003a; 2003b) has proposed to use rhythms in order to enrich stereotypes as a preliminary for all treatment of severe autism. In spite of the differences between these methods and what we actually propose to children suffering these disorders, it is interesting to note that for these two highly-functioning autist individuals with a vast experience of practical treatments, the body issue is an extremely significant ingredient in the struggle for increasing the chances of stabilization and of a richer interpersonal life. Although the main currents of psychoanalysis in the Anglo-Saxon cultural domain have given up the treatment of psychotics in the last decades to concentrate on "border-line cases" (Sauvagnat 2003a), this is not the case with Lacanian psychoanalysis, which still considers that the unconscious is what finally structures the body image, and that adaptations of the classical analytic play-therapy can still be an apt response to the questions psychotic and autistic children are confronted with.

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Radical embodiment*

Experimenting risks

Natalie Depraz

> The need to replace the risk of the relation with the security of the possession. (Giannaras 1992: 26, author's translation)

1. Introduction

Experimenting life is experimenting risks. There is a growing tendency today to "overprotect" living beings against any possible danger, thus wishing to leave no more space for uncertainty. Yet, you will never be able to eliminate all danger, so that you will in fact create more danger by wanting to protect the living being from all danger than you would if you did not protect it at all. Indeed, an overprotected person is over-dependent on the protecting other and he or she ends up in danger in every situation where he or she will have to make decisions on his or her own. On the basis of such a Nietzsche-inspired understanding of life, I would like to suggest the hypothesis of a strong identity between risk and embodiment. Being embodied is being able to take risks, that is, being open and exposed to the unknown.

Now, when we speak and think of embodiment we usually have in mind human and/or animal living beings, because we are used to defining embodied living beings as *moving* beings. Indeed, movement has recently become in the phenomenological tradition (even though it can also be traced back to Aristotle) the main feature characterizing living beings (cf. today Sheets-Johnstone 1991; Barbaras 1999; Sheets-Johnstone, this volume). In contrast with Husserl who always – as early as in 1901 – stressed perception as being our basic activity as subjects, although *kinesthesis* was also very early – in 1907 – put to the fore as the primordial experience of embodied subjects, that is, as *Leiber*, Merleau-

Ponty was the first among phenomenologists to radicalize Husserl's view, so as to identify living beings with their ability to move, that is, to *be* movement. In that respect, he considers motor activity as having a primacy over perception. As a consequence, if a living being is a moving being, it means that the best way to protect it is not to prevent him or her from moving but, on the contrary, to help him or her moving at best, along its own drive-thrusts.

Within such a framework we would like to distinguish between two ways or modes of being embodied. On the one side, the risky way of being, on the other side, the secure way of being. Let us say first and foremost that with these modes we do not have to do with substantial realities, that is, with modes of nature, but with existential/personal actions/tendencies, which means that they are not once for all the givens of an individual but can each time be transformed and improved. In other words, each of us is inhabited by several potentialities, with a primacy given to the one or to the other, and our embodiment therefore is an interesting mixture of security/programmation and risk/surprise. The question then is: how are these two modalities of our embodiment articulated in every singular living being?

Let us try to provide descriptive phenomenological and cognitive pragmatic translations for such a modal polarity of embodiment. (1) *On the phenomenological level*, *Leib* represents the mode of the risk, while *Körper* corresponds to the secure modality of embodiment. *Leib* indeed contains in itself the irreducible opening of life (*Leben*) as an indeterminate flowing, whereas *Körper* is the object-closed side of the body as a determined reality. An opened body involves some degree of uncertainty and hesitation, that is, of freedom; a closed physical surface somehow provides comfort and easiness but also means objectification, namely potential alienation (cf. Depraz 1997). (2) *On the pragmatic level*, body schema as well as body image respectively correspond to familiarity and habituality on the one side, and to the opened directedness of intentionality on the other side (cf. Gallagher 1986). Even though they are both inhabited by a certain interplay of inner plasticity, both pragmatic bodies remain registered under the label of security. Indeed, they show dimensions of bodily experience which are structured by the horizon of the near world and by the presence of close others. In that respect, such world- and otherness-structures contribute to reassure each time the own stability of my bodily existence. On the contrary, a risky pragmatic body would be permeated at each instant by the experience of the risk of non-being, that is, by its being open every time to the imminent possibility of dying. In that respect, life is such a challenge and it becomes quite adequate to identify the phenomenal *Leib* with the very modality of the risk.

More precisely, there is some phenomenal evidence for contending that the phenomenological lived body (*Leibkörper*) has clear affinities with the body schema insofar as both integrate their own sedimented experiences and develop them as know-hows; on the contrary, the living flesh-body (*Fleischleib*) understood as a pure stream corresponds to a practical body experiencing a radical unceasing mobility.[1] Only such a radical streaming bodily mobility seems to be relevant in order to describe the experience of our body as intrinsically inhabited, permeated by risks and besides *genuinely living* through them.

We would like to use these two modes of living we have just mentioned (risk/security) as methodological tools in order to engage in a renewed description of animal embodiment in contrast with and in relation to vegetal embodiment. Contrary to the current view that tends to identifying animal embodiment with the mode of risk and vegetal embodiment with the mode of security, we would like to suggest here a more complex analysis of the general experience of embodiment.

2. Animal adventure and vegetal rest

Daily observing animals and plants provides an obvious understanding of their differentiated embodiment. The former are characterized by their motor activity whereas the latter seem to lead a static life. You put plants in your home and you do not expect them to move by themselves; you buy a dog and you know that you will have to go outside with it at least twice a day; or you walk in the countryside and you see birds and insects flying while flowers and trees are moved by the wind and hurt by rain. Basically, in order to carry on living, animals need to go and get their food, either by killing other animals, by searching for already killed animals, or by looking for plants, as it is attested by the purchasing and nomadic life of anthropoids. Instead of looking for food, plants wait for water to nourish them and draw food from the soil via their roots.

So it seems that the classical distinction between animal mobility/vegetal immobility is highly relevant and can also be translated into the difference between activity and passivity. It was for example remarkably presented by Von Uexküll as early as in the twenties in *Streifzüge durch die Umwelten von Tieren und Menschen – Bedeutungslehre* (Von Uexküll 1956).

2.1 Animality is mobility

Looking back at the etymology is a good indication of such an equivalence: "animal" comes from the Latin *anima*, which means "soul" and furthermore "breathing", that is, the innate and initial life-drive of the living being at its very birth. Breathing makes the communication between the inside and the outside possible, and opens up the possibility of sensory knowledge of oneself and of the world.[2] From the very beginning of life, animals are moving their lips in order to suck the milk of their mother; soon they are grasping everything in order to touch and taste it; a bit later they move their legs and feet, sit and crawl, before standing and walking. All these movements are, beyond the practical need for feeding oneself, also an eminent source of knowledge.

A majority of authors situated at the crossroads between biology and phenomenology advocates such a definition of living beings through their mobility. (1) Von Uexküll early stressed the mode of being of animals as eminently structured by their mobile relationship with the environment. In contrast with both introspectionism, which exclusively deals with the inner mental abilities of the lived body, and behaviorism, which is only interested in the external behavior of the animal in its world and considers their mental states as an inaccessible "black box", von Uexküll chooses the medium descriptive way of the animal way of being. The image of the "intentional arc" thus suggests an understanding of sensory motor activity as a phenomenal recurrent circularity between the body and its surrounding world. Unlike atomism, which sees sensations as local impressions affecting the body from outside and punctually printing themselves on it, von Uexküll's view is highly holistic, integrating lived body, conscious self and living world in a plastic unified bodily structuring. (2) In his turn, Merleau-Ponty, in the thirties-fifties, strongly relies on Husserl's new conception of intentionality as a dynamical linkage between consciousness and world, but he questions the Husserlian primacy of perception in order to give a more material account of our embodiment. He therefore radicalizes Husserl's analysis of kinesthetic embodiment and literally grounds perception upon movement. In his view, perception remains formal and too much cognitive-oriented, while motor activity opens up the realm of our kinesthetic sensory roots and relates ourselves far more to our most archaic embodiment. (3) In the sixties, Hans Jonas goes one step further in his book *The Phenomenon of life* by situating mobility at the very origin of life. According to him, unicellular beings are always already inhabited by a primordial thrust that provides them with the ability to self-develop. In that respect, living (moving) precedes knowing (perceiving). The whole evolutionary process is nourished by such an initial drive of living, which provides beings with the originary energy to search for new territories, to discover other beings and to welcome unforeseen events. More than instinct, which calls for a mere physical and mechanistic understanding of such a driving thrust of life, we would like to name this process "desire"[3] or, to use a Greek word, "*eros*". (4) In a sense, Francisco Varela's whole path of thinking offers us a remarkable synthesis of these three major phenomenological steps towards the understanding of the "radical embodiment" of a living being. (a) From von Uexküll, he draws interesting views in order to conceptualize with Maturana his auto-poiesis-model, more precisely the notion of structural coupling (*estructural acoplamiento*) (cf. Maturana & Varela 1973/1980; cf. also Varela, Maturana & Uribe 1974); still he always questions von Uexküll's holistic (nicely ideal) understanding of the living to the benefit of the precarious existence of the latter. Thus Varela considers reductionism and holism as two complementary (but also one-sided) views on the living system (cf. Varela & Goguen 1977). (b) From Merleau-Ponty, he draws a first adequate phenomenology of the lived body. He develops, thanks to the Buddhist meditation practice, the dimension of training inherent in our being embodied, what he calls "enaction", as opposed to any representational conception (cf. Varela, Thompson & Rosch 1989). (c) Inspired by Jonas, he enriches and radicalizes his understanding and experience of embodiment, thanks to the idea of the precariousness and preciousness of life and the potential imminence of dying (cf. Jonas 1966, first essay: "Life, Death and the Body in the Theory of Being").

If he had had the opportunity to write further, he probably would have articulated more precisely the desiring erotic dimension as an intrinsic part of his definition of a living being. Still, one question remains open in Varela's thrust, and it has to do with the radical alterity of the other. It seems that his understanding of the coupling of self and other tends to dialectalize the relationship with the other so as to give primacy to the circularity of self and other over the singularity of the other itself. Besides, his stress on the autonomous identity of the self-organizing living being leaves too little room for the alterity of the contingency of non-being. Varela's optimism is little thwarted by his interest for natural drive and his consequent criticism of performant adaptation. In that respect, radical embodiment would claim more room for the indeterminacies of world-events and for the passivity of the welcoming of the other.

The whole growth of the animal (both individual-ontogenetic and phylogenetic-evolutionary) leads it to walk and to move towards others. It thus seems to us that the definition of living beings as moving beings needs to be more precisely articulated by adding to it its originary *relational* component. Giannaras, a contemporary Greek philosopher, uses a superb word for describing such a desire-founded quest for our relationship to otherness: in his book *Variations sur le cantique des cantiques* he speaks of "eros".

> It is no doubt in eros that the natural and the relational effect converge and accomplish themselves. That is the reason why eros also confirms alterity, and reveals the subject. It is the supreme tension of existence, the thread that permits to leave the enigma of mortality. If my inner conscious self, or our soul, emerges and affirms itself in eros, then it only exists as relation. When shall the last resistance against the plenitude of the relation, [to wit the] corporeal and psychic resistance of individual autonomy disappear [...]?
>
> (Giannaras 1992: 21, author's translation)

Erotic desire therefore seems to be the genuine experience of living beings. Being embodied is being related.

In that respect, the sexual intercourse is an eminent place where the relationship with the other is continually intensified, re-asserted but also questioned and therefore renewed: you meet the other each time with the possible risk of losing him or her. Instead of taking the relationship for granted, you will each time compel the other to be there in a renewed way. Each new encounter is the recreation of a whole new experience.

2.2 Vegetality is security

On the contrary, the life of plants is *in principle* a motionless life. To begin with, and also to provide a transition with what was just argued with regard to reproduction, plants are well-known for their non-sexual reproduction, that is, for living in a parthenogenetic way. It fundamentally means that their way of living is a self-assertion of their own identity without any alter-ing. Reproducing oneself is repeating oneself without transforming oneself thanks to and through the other. At first sight, such a solipsistic functioning seems to be the most secure way of living. The absence of confrontation with the other, even of sheer relationship is the best way (so it seems) not to be in danger of losing one's own identity, that is, to get altered and hence lost.

Plants therefore lead such a secure life. According to von Uexküll, the development of plants is gradual and linked to a specific place. The author takes the example of the acorn of the oak: "from this germ various cells shall come out, some of which form the underground roots, and others the branches and their roof of leaves, according to a rule of development characteristic to the oak" (Von Uexküll 1956: 115, all quotations are translated from the French by the author). So the oak uses the place where it is in order to grow without having to move itself. In *The Phenomenon of Life,* Jonas remarkably shows how plants develop such a great ability.

> The division between immediate and mediate environment-relation coincides with that between plants and animals and must thus be related to the basic difference in their modes of metabolism. By its ability to synthesize inorganic matter directly into organic compounds the plant is enabled to draw its sustenance from the ever-ready mineral supply of the soil, while the animal has to depend on the unassured presence of highly specific and nonpermanent organic bodies. Furthermore, the intake of solid food which the animal mode of nutrition requires as against the mere osmotic absorption of dissolved nutriments by plants, involves the interposition of an auxiliary, "mechanical" stage (of conveying, shredding, etc.) before the direct, chemical stage of metabolic appropriation. On these counts the plant shows a superiority rather than a deficiency in comparison with animals. But the possession of this one power of direct synthesis, and the sufficiency which it affords, are the very reason for the absence of those other features which the animals were constrained to evolve on the basis of their more precarious mode of metabolism. (Jonas 1966: 103)

Or again: "In terms of mere biological safety, the advantages of animal over plant life are highly questionable, and in any case they are bought at a high price." (Jonas 1966: 106)

So first the vegetal life is characterized by a stability linked to its assured way of getting food: directly from the inorganic soil. In short, food is always there, you do not have to worry about it. Besides, with plants the appropriation of food is always direct, while it takes some time for animals. Immediacy and ever-presence make up the security of vegetal life. In that respect, the plant is efficient while things are precarious for the animal. Security is synonymous with fullness and satisfaction, while absence, void or difference creates instability and insecurity.

3. Spontaneity of the vegetal and anxiety of the animal

Hence the tendency inherent in animals to develop more stability in their way of living. Since animals are naturally exposed to dangers, to uncertainty with regard to food, to the precariousness of survival, and are thus subjected to the anxiety of loss, absence, and desires, they end up looking for a more secure life. "Motile existence is fitful and anxious: plant life is nothing of the kind." (Jonas 1966: 106) On the contrary, insofar as plants have developed highly satisfactory and efficient automatisms, which "relieve them of the necessity of moving" (Jonas 1966: 106), they may be able to create another kind of freedom: "The ability to go out in search of food merely answers to the necessity which its mode of metabolism imposes upon the animal and from which the plant is free." (Jonas 1966: 106) Such a freedom from the necessity of nature goes hand in hand with a later feature that we will deal with, that is, spontaneity.

In short, the traditional distinction articulating being an animal with risk and being a plant with security belongs to nature. Now, such a distinction refers in fact to modes of being (of living) and not to substantial realities. That means that the difference is phenomenological or involves at least a phenomenological conversion, which leads to take into account the mobility of the plant and the stability of the animal.

3.1 The secure life of the animal

If we look closer at the continual movements of animals, what appears is their ability to synchronize themselves in order to make them serve each time a particular goal. The motor activity of the animal is therefore not an unceasingly non-oriented mobility. In its very movements the animal endeavours to master what irreducibly escapes it. In other words, if experimenting life is experimenting risks, in the end the latter are always accurately calculated. You give yourself possibilities of action, but you know how to measure to what extent you can accomplish them.

More concretely, animals live and move in a delimited environment, the proximity of which brings about know-hows and familiarity. It has interesting correspondences with the way living beings gradually settled in the long history of their becoming humans. In that sense, individual sedimentation and historical settlement amount to a similar thrive to create stability by sitting: "sedere" is the common Latin root of both resting processes ("sedimentation", "settlement", "sedentary"). In order to sit (including for a stabilized meditation) however, one needs to stand and move.

Resting by sitting is the supreme way to experience stability, which is the opposite of death insofar as it enables the living being to experiment its own limits. Respecting instituted laws may also be considered as an invitation to really work with one's own challenges. It sometimes goes hand in hand (in a very ambiguous experience) with a counter-invitation not to change. In that sense, limits may become limitations and sitting a death-bearing immobilization. Stability is therefore ambivalent, either as the experience of a resting life or as the counter-experience of a rigidified life.

Now, not inviting changes, respecting laws, establishing limits is often considered as a tendency proper to masculinity. It may become an all-or-nothing rule, according to a manicheistic distinction between what is allowed and what is not, which amounts to the difference between openness and closure or between possibility and necessity, or again, between freedom and necessity. A distinction of this kind however underlies an opposition which is itself highly rigid. In other words, it is in fact guided by one of the terms of the distinction, namely the closure-polarity, that is, prohibition, law or fixity. Being allowed is being rightly entitled to do so in quite a disembodied, formal, abstract and general way. Such a law is death-bearing: it must not be discussed, it is given as such.

3.2 Vegetal growth as spontaneous life

Where is then the vitality of the law? If the latter can be accommodated, it means that the living being is entitled to discuss, that is to question it. It involves the possibility of appropriating the law itself, bearing it in the sense of developing it with regards to a room for "auto-nomy".

3.2.1 *Spontaneity and satisfaction*

Indeed although the plant does not move, it develops a capacity to create its own autonomy. Let us read again von Uexküll.

> We know that in the acorn the organs are situated in potency that will allow the oak to support its vital struggle with the thousand different actions of the external world. We see in our mind the future oak fight against the coming rain, the tempest to come and tomorrow's sun. We see it resist the later summers and winters. (Von Uexküll 1956: 115, author's translation)

So the vegetal growth is a self-development which provides a form of spontaneity. A great deal of its actions are put to work in order to favor such an autonomy of the plant.

> In order to be able to give an answer to all the actions of the external world, the cells of the acorn will have to diverge into organs, roots, branches and foliage that catches the sun beams, and of which the leaves will follow as light pennons the wind, which will be resisted by gnarled branches. At the same time, the foliage will serve as an umbrella that directs the precious humidity from the sky to the fine underground roots. The leaves contain chlorophyll that will use the sun beams in order to change, as by magic, their energy into substance. (Von Uexküll 1956: 115, author's translation)

The plant is thus able to invent new actions in order to avoid the disturbances from the external world, which means that it possesses a great amount of resources and vital potentialities. Besides, von Uexküll stresses the autonomy of plants, which amounts to a kind of automotion: "All the future actions, which the oak will have to endure, are not in a state as to influence in a causal way its development." (Von Uexküll 1956: 115, author's translation). The plant thus creates in itself the opportunity not to be dependent on external causes, therefore building its own self-causality.

Such an understanding of the living being as a spontaneous being is noticed by some recent thinkers (cf. Sheets-Johnstone 1991; Thompson & Varela, forthcoming), but it does not seem to be considered as a major feature of plants. To my knowledge Jonas is the only one to have stressed the unique ingenuity of plants.

> In roots, plants "invented" the most efficient means of exploiting the inherent advantages of a photosynthesizing organism. [...] Through their continuous contact with the source for supply, the organism-environment relation functions automatically and no further apparatus for adaptation to short-term changes is necessary. [...] As satisfaction is contemporary with the vital activity, there is no gap across which need could become felt by itself and activity would have to perform by itself, under the spur of appetition.(Jonas 1966: 102)

The creative thrust of the plants lies in their fulfillment. It implies that they do not experience emotions as the reaction to an unfulfilled desire, as animals do.

3.2.2 *Emotionality and vegetality*

Being touched is being moved. Now, e-motion literally means "moving outside of oneself" (*ex-movere*) (cf. Depraz 1999). That seems to be characteristic of animals more than of plants, which are unable to move out of themselves.

Emotions however are also a dominant feature of plant life. Contrary to the main interpretation which links emotion with distance.

> [...] desire presents the object "not yet but to come": motility guided by perception and driven by desire turns there into here and not yet into now. Without the tension under the conditions of animal mediacy, where it emancipates itself from its immersion in blind organic function and takes over an office of its own: its functions are the emotions. Animal being is thus essentially passionate being. (Jonas 1966: 105–106)

We would like to stress the fact that

> [. . .] emotion has no external organs by which to be identified and to force its way into a physical account, and this invisibility or complete inwardness [...]

> seems to make it dispensable in a scientific description of organic behavior [...]. (Jonas 1966: 100)

Emotionality therefore radically goes hand in hand with vegetality, or again with the vegetative system, which is attested by its invisible immanence (cf. Henry 1965).

In that respect, the plant-dimension inside living beings develops as a radical dynamics of inner vitality.

> The affective force manifests as a rapid, dynamical transformation from tendency to salience, involving one's entire *Leib* (lived body) as a complex [...] the gamut of autonomic action such as respiratory, heart rate, endocrine secretion, etc. as well as the ancestral motor pattern involved in posture and movement [...] a feeling grounded in the body's responsive repertoire. (Varela & Depraz 2000)

Valence is the name we have given to such an immanent vital move, which is also called a "primordial fluctuation": the gradually emerging change is an affect-emotion in the self-movement of the flow, of the temporal stream of consciousness. (cf. Varela & Depraz 2000; cf. on that matter Rudrauf 2003: 59).

3.2.3 *Change and flexibility*

In short, the vegetal modality of life is made up of three main features: (1) spontaneity, (2) emotionality, (3) openness. The latter has to do with our relationship towards laws and our ability to adapt to them or even to trespass them. As Pascal very early asserts in his *Thoughts*, reeds always bend but never break. Vegetal life is characterized by a great propensity to adaptability, that is, by a flexibility which also results in deep female tendency.

On such a basis it is possible to understand such a transformative mind in two different ways: on the one hand, you thwart the rigidity of the law by trespassing it in all directions; "permissiveness" is the name of what is allowed, that is, everything. In a system where everything is possible, there is no law any longer, which means that you do not effectuate any differentiations anymore: anarchy, that is, a logic of confusion reigns. On the other hand, you may also take the particular case into account, that is, the person, or again, his or her singularity. Law is considered as being adaptable: it is the domain of jurisprudence, or case law, in which a precedent is set which enables laws to be transformed; "permissibility" would then be the name of what can be allowed: it is the ability to open possibilities, which gives way to the plasticity of the law, its genuine embodiment.

4. Conclusion: Embodiment is permeability

We would like now to come back to the understanding of embodiment which is underlying our thrust. In our idea, being embodied is being "permeable". A raincoat that is "waterproof" is a coat that water is unable to go through; an impervious person does not show his or her feelings, or does not accept to be questioned: he or she is insensitive. On the contrary, permeability means receptivity and openness: I allow the other to go through me and to read through me. Contrary to a rigidified relationship where each one stands in front of the other without being able to listen to him or her, permeability is a way of being which is founded on the circulation of the persons, one into the other.

To conclude, we would like to check various philosophical views of the living being with regard to such a criterion of embodiment as permeability. (1) The radical discontinuity between human, animal and mineral modes of being in Heidegger is founded on the idea of a separation between different kinds of relationships to the world. The mineral, as asserted in *Grundprobleme der Metaphysik* (1929), has no world (*weltlos*), whereas the animal has a poor world (*weltarm*) and the human builds the world (*welt bildend*). Such a contrast between different modes of being gives way to quite a narrow sense of embodiment, nearly exclusively reserved to the human being, as if animals and plants (which are not even mentioned) would possess a limited access to embodiment. Contrary to such a restricted view of embodiment, multifarious views are able to promote each time in a very specific way such a conception of embodiment as permeability. (2) The solidarity between reigns (animal and vegetal) in von Uexküll is a direct expression of a receptive sense of circularity: it gives way to a holist methodology in the vein of Goldstein's *Aufbau des Organismus* and of Von Weizsäcker's *Der Gestaltkreis*. However, the stress on the exposition to the other is a serious limitation of the relevance of holism, insofar as it opens the way for the fragility of the living being. (3) The complementarity between animals and plants in Jonas shows how both have a strength and a weakness. Whereas the plant is endowed with an efficient embodiment due to its sense of stabilized security, the animal is characterized by its passionate sense of moving; but such a passion is also the source of its constitutive instability, while the secure environment of the plant brings about a death-bearing static state. (4) Finally we have to do with Ey in his major work *La conscience* with a radical intricacy between plants, animals and humans, where a direct and immediate awareness appears to be a broad dimension of our being embodied, tracing back to the most elementary unicellular forms of life till the most sophisticated ways of living in human. What gathers all these forms of life is their unique ability to develop their "thymos" or, in other words, theirs inner and subtle emotions.

In short, being embodied is a particular mixture of exposition and stabilization, in a signature which is each time different, hence providing the living beings with their singularity.

Such an alternative approach is not meant as a frontal criticism toward the concepts of body image and body schema, which could appear as too static, without the necessary possibility of death involved, without the dimension of desire or drive. Actually, my approach is based on such a distinction, which I find quite operative, although I think it is necessary to add to it the above mentioned components in order to get a more exhaustive understanding of the living being.

Notes

* This is a wink to Francisco Varela's late work, much of which we are strongly indebted to. See E. Thompson and F. J. Varela, "Radical Embodiment", *Trends in Cognitive Science*, 5 (10), 2001, pp. 418–425.

1. With regard to such a comparison between pragmatic-cognitive bodies and phenomenological ones, see my *Lucidité du corps. De l'empirisme transcendantal en phénoménologie,* Kluwer, Dordrecht 2001.

2. About the first meaning of animality, see *Alter Revue de Phénoménologie* No. 3, "L'animal", Paris 1995.

3. About the distinction between instinct, drive and desire, see *Alter* No. 9, "La pulsion", Paris, 2001, and in particular Depraz, "Pulsion, instinct, désir. Que signifie *Trieb* chez Husserl ? – A l'épreuve des perspectives de Freud, Merleau-Ponty, Jonas et Scheler".

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Part III

Dynamic interpretations of body image and body schema

A functional neurodynamics for the constitution of the own body

Jean-Luc Petit

1. Introduction

However little philosopher may as yet be aware of this recent development, the burgeoning field of brain cartography has transformed the traditional dispute between phenomenology and positive science about the adequate treatment of the body into an obsolete quarrelling. Up to now, phenomenology used to dedicate itself to calling attention to the difference (not to say stirring up the conflict) between the fixity of anatomic *Körper* structure as an object of science, and the free fluidity of the meaning patterns of *Leib* subjective experience. From now on, one's inquiry should be whether or not such a contrast is on the verge of vanishing. In fact, neuroscience has resolutely shaken off its former belief in a rigidly somatotopic representation of the peripheral organs of the body within the frontiers of definite somatosensory mapping territories of the centro-parietal cortex and thalamus. Accordingly, a new methodological approach is forcing its way through brain science labs, putting on their common agenda the setting up of a global online recording of constantly moving functional activation patterns (a "mental cinema"). These patterns transitorily distribute themselves over varying regions of cerebral tissue at a rate determined by the demands made upon them by the performance of behavioural tasks. Such representational plasticity, far from being genetically predetermined in all its localisational specifics, proves itself to be induced, shaped and modulated to a considerable extent by the unique experience of the organism in its environment. Laying our bet on the chances of a new relationship between phenomenology and objective science, we will take advantage of the opportunities created by these developments. And we will (allowing ourselves some speculation) bring together the flow of functional activity of the brain and the flow of lived experience of the body in an attempt to bridge (or at least narrow down) the gap between activation patterns and meaning patterns, considering that they are mutually indispensable correlates underlying the *auto-affection* of the acting person.

Dominated as it is by the paradigm of a brain-machine designed to process information, neuroscience tends to reduce "the body" to one of the representations in the brain alongside representations of other things. And so it becomes the representation of that object by means of which it receives information (mainly tactile) and the muscular movements of which it controls. In one particular branch of the neuroscience, cerebral brain cartography, a branch which has made remarkable progress in the last thirty years, the talk is of "somatotopic coding", regions of "cortical representation", "cellular receptor field", etc. Apparently, this way of talking is inspired by the fairly traditional ideology of representation as an unequivocal correspondence (isomorphism) between the peripheral structure of the body and the central homunculus (or homunculi). However, belief in the rigidity of this projective relation suggested by the expression "somatotopic coding" is (at least potentially) contradicted by the discovery of the representational plasticity of the cerebral tissue, a discovery made by this same cerebral cartography. The current generalisation of this phenomenon of plasticity from association to primary areas and to all the sensory modalities, as well as to the motor function, increases the tension between the new intuitions and conceptions and the modes of expression still employed. All the same, the power of the metaphor of the brain-machine upholds the use of the vocabulary of the code and of somatotopy and delays its replacement by a conceptual framework better adapted to the functioning of the brain and to its true relation to the body. With regard to this relation one already suspects (while waiting for the paradigm change which will make it a legitimate claim) that, rather than the representation of a body preconstituted prior to this representation, it will have to take the form of a dynamic interaction between three terms: the body, the brain and also the world (absent from the traditional, representational ideology), terms which cannot be taken to exist prior to this same relation since they bring each other into existence through their mutual interaction.

2. Somatotopic cartography and functional plasticity

A few preliminary remarks are useful to fix the limits of our enquiry. First of all, research into the functional plasticity of the brain does not stop at the representations of the body in the somatosensory (SI) and motor (M1) cortices. It applies equally to the retinotopic representation of visual information in the striate cortex (V1) and to the tonotopic representation of acoustic information in the temporal area (A1). We will restrict our attention to the evidence bearing on the cartography of the body, even though the plasticity of corporeal representations is not isolated from modifications stemming from exteroceptive sensory influences. Second, one of the factors responsible for much of the progress in neuroscience consists in experiments performed on animals and the transfer of hypotheses or concepts developed in connection with mammals or primates to human beings. In particular, the rat is currently an object of intense research, due to the ease with which its sensory system can be manipulated in experiments, a system whose vibrissae are the peripheric organs and the barrel cortex the organ of internal representation. Since evidence relating to a system as specific as this cannot be directly carried over to humans, we won't go into this any more. On the other hand, restricting ourselves to the human system would put us in a position where we could no longer obtain a global view, not even a view of detail bearing on plasticity and somatotopy, since progress in non-invasive techniques of cerebral imagery have not yet made it possible to reduce the gap between knowledge bearing on the human brain and knowledge already achieved in connection with monkeys (by means of recording techniques based on chronic – i.e. permanent – cerebral electrode implantation). Finally, our interest is in plasticity induced or modulated by experience, understanding by that experience the one that an individual develops through a normal use of his or her body, a use which is evidently enriched and diversified in the course of a learning process. The plasticity that is evidenced by patients that have suffered a stroke or a surgical amputation of a limb and reacted to it by a functional reorganisation of their brain, cannot be described as induced by experience except in a highly extended sense of that word. In particular, we are not going to take into consideration "the illusion of phantom limb", with regard to which the literature tends to be as vast as it is controversial. However, even if we decided not to take the mechanisms brought into play in that case or the other into account, it would be foolish to ignore the knowledge obtained by the study of such reorganisational phenomena in the case of lesions both in humans and animals, because if the word "reorganisation" tends to be employed in this context while the word "remodelling" is more frequently used in the context of normal usage, this verbal difference does not seem to be one which testify of the existence of a distinction *in re*.

3. Penfield's homunculus and its contemporary "Verification"

Penfield himself is remarkably prudent in his statements regarding the value he accords to the "sensorial and motor homunculus" (Penfield & Boldrey 1937) or to "the sensorial homunculus and the motor homunculus" (Penfield & Rasmussen 1950) as regards the light it throws on cortical topography of the sensory and motor functional representations. Moreover, the expressions of "mapping" and "coding" have not yet been used. In the first version, "this grotesque creature" is only called in to faithfully represent two features. The first feature is *the constant order of succession* of the different parts of the body concerned by the movement provoked or the sensation evoked by an electrical stimulus applied bit by bit to the cortex, following the edges of the central sulcus in the medio-lateral direction. These parts are, specifically, the body, decapitated and inverted, then the head from the front, juxtaposed to the thumb, then the tongue out of the mouth, etc. The second feature is *the relative vertical extension* of that portion of the rolandic cortex devoted to the representation of each part of the body, which is carried over to the homunculus as the disproportionate length of the tongue, the face and hands in comparison to the rest of the body. With the result that, with the exception of these two topographical constants, all that the outline could save as representative of a man ("as though representing a man", says Penfield, cf. Penfield & Boldrey 1937: 431) with its specific surface, its size, its precise contours (not to mention hair and skin wrinkles in certain popular illustrations!) had to be treated as arbitrary and misleading. For in fact Penfield does not try to hide the considerable dispersion of the points of stimulation evoking motor or sensory responses in different individuals, and in the same individual from one to another surgical intervention. Even though he distinguishes a postcentral sensory cortex and a precentral motor cortex, he admits that he also obtained motor reactions (even though less frequently) by stimulating the postcentral cortex, and sensory reactions (more frequently) by stimulating the precentral cortex. If he proposes a delimitation of the areas responsible for different parts of the body, it is not for making of them "the borders of the territory of representation" relative to these parts, but to underline their mutual interpenetration (Penfield & Boldrey 1937: 430, fig. 25). In the end, he holds back from developing any hypothesis about the correspondence or lack of correspondence between representations, whether this be with the cytoarchitectonic regions of the cerebral tissue or with the distributive density of the sensory captors on the skin of different parts of the body. Hence the notice to the reader in the work of 1950: "It is a cartoon of representations in which scientific accuracy is impossible" (Penfield & Rasmussen 1950: 56).

The development of a technique of non-invasive cerebral imagery at the end of the 70s and the beginning of the 80s has made possible a certain "confirmation" of this classical description of the somatologic organisation of the functional representation of parts of the body in humans. Measuring the regional blood flow in the cerebral areas through tomographic recording by the emission of positrons (PET), visualisation of the structures of the brain through magnetic nuclear resonance (fMRI), exploration of regions of interest by subtraction of images,[1] the addition of images maximising activations corresponding to each condition in one subject and to one and the same condition in all subjects, without taking into account numerous operations of normalisation, correction, standardisation, redistribution, averaging and calibration, all of the above adds up to a mass of manipulations each of which rests upon a questionable presupposition of neutrality and non-interference with the facts under examination. Since the complexity of the technical apparatus brought into play and the tacit claim of transparency seem to grow at the same pace, the apparatus employed tends to disappear behind the publicly communicated "views of the brain" and their reproduction in works of synthesis. Without going too far into the much needed criticism of such methodology, let us at least ask what in fact the procedure adopted has helped to confirm. Essentially two things: (1) by means of a manual cutaneous vibrator applied successively to the lips, the fingers and the feet, the latter are stimulated in such a way as to evoke responses focused in different regions of the postrolandic cortex (SI) strung out along the central sulcus in a latero-medial order from the parietal opercula to the interhemispheric wall (Fox et al. 1987); (2) chasing a target moving randomly about a video screen, using respectively the big toe, an outstretched arm, the index finger or the tongue, activates precentral zones of the cortex (MI) which follow upon one another from the dorso-lateral edge of the interhemispheric fissure to the neighbourhood of the lateral sulcus, passing across a region of activation where the index finger is superimposed upon that of the arm (Grafton et al. 1991). One notes that only that aspect which Penfield himself considered true remains in accord with Penfield's homunculus, namely, the sequential order of the functional representations on the medio-lateral axis of the pre- and postrolandic cortices. However, the limits of this agreement tend to be concealed by the expressions employed. The talk is of "millimetric localisation", even though the average difference between the localisations taken two by two in the same subject is of the order of 3 mm (Fox et al. 1987: 39). Or one talks of "detailed examination of the somatotopic distribution" and of "localisation to predictable sites" even though the variability of the gyri and sulci from one individual to another involve displacements in the activations, both in breadth and in depth, which only allow for a range of estimation regarding their probable occurrence (Grafton et al. 1991: 737; 739, Fig. 3).

4. Reorganisations of the functional structure following a deafferentation

The existence of a permanent potential for functional reorganisation has been demonstrated at the beginning of the 80s by the research on hand representation in the monkey's somatosensory cortex (3b) undertaken by Merzenich and his lab (Merzenich et al. 1984; Wall et al. 1986). The consequences of more or less important deafferentations, such as the amputation of one or two fingers, severance of the median nerve innervating the skin of the radial half of the palm and the internal face of the first, second and third finger, localised crushing of the same nerve, etc., have been controlled by detailed cartographic readings. This has happened on the basis of intracerebral recordings practised at different stages of functional recuperation. These manipulations have proved that the central representations of the body are not subject to a rigid anatomical determinism, attributing rigidly the surface of each part of the body to a well defined cytoarchitectonic area of the brain. In contrast, the representations of the body are far more the expression of a dynamic activity enabling the organism to react in an innovative way to changes in the sensory inputs in order to maintain the integrity of the "body image" (tactile sensitivity, somesthesia, motricity) damaged by the lesion. This activity is displayed at the centre by "movements" in the cortical representations: expansion or contraction of the individual representations of the fingers, displacement of the borders between representations of different fingers, expression of normally latent representations, withdrawal from or reoccupation of deafferented regions. At the periphery, one finds correlated movements in the cutaneous receptor fields (RF[2]) of neurons belonging to the same somatosensory cortex: RF expansion or contraction, the appearance of multiple RFs for one and the same cell, the acquisition of alternative RFs. As points of reference, I will rely only on the most significant evidence.

In response to the amputation of the index and/or major finger, the cortical representations of the adjacent fingers extend into the area where the amputated fingers were represented, and in such a way as to fill the gap between the represented fingers, thus re-establishing a new borderline. To the extent that this borderline passes between the representations of fingers which are not adjacent in normal anatomy, its emergence appears as a true creation of the functional dynamism. Here and there, the same neurons which until then upheld the representation of the amputated finger are reassigned to the representation of one or the other (but not both of) remaining neighbouring fingers. Since the expansion of the cortical representations (increase in magnification[3]) is coupled with a contraction of the cutaneous receptor fields localised on the same fingers, the intervening reorganisation results in a refinement of the representation of the skin, which can be interpreted as an attempt to compensate for the sensory loss due to the amputation (Merzenich et al. 1984). In response to the severance and suture of the median nerve (an operation favouring a reinnervation of deinnervated skin) the neurons dealing with the cortical representation of the hand begin by losing their receptor fields, which are normally situated on the internal surface of the fingers 1 to 3, and acquire alternative RFs situated on the back of these same fingers. Later on, the regeneration of the median nerve does not result in a centrally diffuse and random reactivation but in a reorganisation of the functional representations, which includes persistent anomalies: discontinuities, delocalisations and superimpositions alongside topographically localised aspects (Wall et al. 1986). After a transitory transfer of the RFs of the dorsal surface of the fingers onto their ventral surface, deafferentation resulting from the localised crushing of the median nerve turns out to be compatible with the reestablishment of correct correspondences between skin and cortex in the context of a normal topographic organisation of the somatosensory cortex (Wall et al. 1983).

The cerebral cartography of the monkey has taken advantage of the accessibility of the somatosensory cortex of the hand in the species under investigation, namely the owl monkey, whose brain has no central sulcus. Consequently, a methodology has been developed making possible the drawing up of veritable maps of the functional topography of the cortical areas, assigning to these areas quite specific borders and allowing by means of objective measuring the demonstration of the occurrence of displacements of these borders. This has been made possible by the chronic implantation of a grid made of many hundreds of microelectrodes, combined with the tactile exploration of the hand by means of a tapered probe designed to make indentations of the skin at the limit of the visible. In that way, minimal RFs for the neurons under examination are defined. In the case of humans, the neurophysiological description of phenomena of functional plasticity, exception made of preoperative and direct explorations, has depended upon the development of techniques of non-invasive functional imagery like PET, fMRI, magneto-encephalography (MEG) and transcranial magnetic stimulation (TMS). Only that these methods can only offer images of more or less diffuse centres of activation, or else curves of motor potentials evoked in the muscles through TMS. Thus, even though the language of "maps" has been retained, the maps in question are very far from delineating the frontiers of the representations with a millimetric precision approximating that achieved with animal experiments. As a result, an evaluation of the amplitude of the reorganisation induced in humans by deafferentations inevitably has a qualitative character and this whether they are provoked by a local anaesthetic or are of accidental or pathological origin.[4]

5. Remodelling induced by Experience (1): The somatosensory cortex

Does this reorganisation of the functional architecture induced by deafferentation (experimental or accidental) depend upon mechanisms essentially different from those of a remodelling linked to a normal use of the perceptive or motor organs? The question remains controversial. Whatever the outcome, the study of deafferentation has brought to light a principle of plasticity pertaining to the organisational schemata of functional somatotopy. This principle integrates the neurophysiological correlates of the experience of the body with the general dynamism of the functional organisation of the central nervous system. In fact this principle of plasticity is not limited to somato-aesthesia that interests us in connection with the theme of the body image but also concerns exteroceptive sensory modalities, in particular the primary visual and auditory areas (to say nothing of the other senses). Visual and auditory experience are not rigidly predetermined by the anatomical structure of the receptive surfaces and the cortical regions. In spite of the textbooks, it is admitted that the retinotopy of V1 is not the isomorphic (nor deformed) projection of the retina, the tonotopy of A1 is not the isomorphic projection of the cochlea; rather, the projective geometry implemented here and there by the brain has to be incomparably more complex and dynamic. The way in which this happens should be such that the bodily experience draws its significance from the autonomous activity of the organism, which in its effort at a permanently renewed adaptation to the flux of ever renewed experience, finds in itself the resources needed for the emergence, the remodelling, and the persistent renewal of its organisational patterns. This dynamism might eventually prove easier to verify with reference to deafferentations, which are all the more dramatic because the survival of the individual depends upon them. But it ought also to be possible to verify the dynamism in question in the normal circumstances of everyday life. The eminently plastic usage (depending in part if not entirely on a learning process) such as the normal use of the skin as an organ of tactile and somesthetic sensitivity, of the hands as tactilo-kinesthetic organs of action, cannot but bring with it a reorganisation, or at least a modulation, of functional representations. These changes, in turn, condition the improvement (or deterioration) of the behavioural performances.

The cartography of the parietal regions bearing the representation of the hand in the normal adult monkey is highly variable as regards the detailed representation of the hands in individual cases, a fact that has convinced researchers that the maps could not be predetermined with precision by the genes for all the individuals of one and the same species, nor even onto-genetically fixed at a precocious stage of development. In contrast, they have to be formed by the particular use made of the hands by each animal in the course of its individual history. Here are some of the differences from one individual to another: the global form of the area responsible for representing the hand, the total surface of this representation, the magnification of the representation of the regions of the skin, the surface of the representations of the different fingers, the disposition of the representations of the dorsal surface of the fingers, in islets or at the lateral and medial margins, the topological boundaries between representations – continuity, discontinuity, interpolation, proximity of the boundaries (Merzenich et al. 1987). Training to detect a difference between an initial vibratory stimulus applied to a finger and a stimulus of a higher frequency in a series of stimuli of variable frequency produces a topographical complication of the representation of the hand, including an extension of the skin zone stimulated and a shattering of the representation of the stimulated phalanx. This representational change is correlated with the animal's progress in the realisation of the task, that is, in a reduction of its tactile threshold of detection of the vibratory frequencies, a reflection of the localised improvement in perceptual discrimination of the skin. All the same, and contrary to what one might have expected on the basis of the rule of inverse proportionality between the extension of cortical representations and the extension of the cutaneous receptor fields, this representational change does not correspond to a shrinking of these receptor fields. On the contrary, one notes an extension, a multiplication and a mutual overlapping of RFs of the neurons dealing with the representations of the hand subject to training, numerous RFs being displaced in order to be re-centred and superimposed upon the zone of the stimulated skin. This reorganisation does not take place on the occasion of a passive stimulation of the finger, but only when the stimulation is a part of the task, which suggests that it is under the control of attention (Recanzone et al. 1992).[5]

In humans, the representational plasticity of the somatosensory cortex induced by practise has been confirmed for the more complex tasks of professional life before being confirmed again by artificial tasks controlled in the laboratory.

Violinists and other players of string instruments continually make use of the second to fifth fingers of the left hand to press the strings onto the fingerboard while the thumb of the same hand holds the shaft of the instrument with frequent changes of position and variations in the pressure exerted. Since the aim is to ensure a very rapid identification of the right notes with the tips of the fingers along the entire length of the four strings from the fingerboard to the bridge, this movement becomes automatic with practise in all gifted musicians. On the other hand, the movement of the right hand which holds the bow between the thumb and the index (and middle) finger, by blocking (albeit with great flexibility) the individual movements of the fingers is less muscular and constantly calls for the sort of considered decisions in which the artistic personality of the musician is expressed. A practise of this kind normally initiated at an early age and continued throughout an entire life-time for several hours a week brings with it a considerable disequilibrium in the sensory input of the two hemispheres of the brain. Researchers are interested in the remodelling of the cortical maps of the hand induced by this intensive and highly differentiated use of the fingers.

A tactile stimulation from a (painless) pressure applied with a pneumatic stimulator either sometimes on the thumb and at other times on the little finger of each hand evokes cortical responses which can be recorded on MEG. The representative vectors of the equivalent current dipoles which summate the contributions of the flows of dendrite currents registered in different subjects are transferred on an fMRI image of the cortex of a control subject. It is observed that these vectors, which represent the localisation and the average intensity of the foci of cortical activity corresponding to the individual stimulation of the thumb or little finger are extended and displaced towards the median plane with musicians, and this all he more so when the practise of the instrument begins at an earlier age. The authors infer from this that the size of the cortical representations is not genetically determined but rather modified by practise, and that the expansion of the representation of the fingers of the left hand induced by learning the string instrument can afford the musician a decisive advantage in responding to the demands of this art, to the extent that this expansion reflects the enlistment of a more extensive neuronal network for the processing of a larger flux of tactile information with the musician than the non-musician (Elbert et al. 1995). The focal dystonia of musicians,[6] which can be correlated with a fusion (without topographic disorganisation) of the representations of the different fingers on the map of the affected hand, proves that this remodelling by practise can be converted into a handicap when this usage is overdone and a lesion is brought about in the central sensorimotor system by the synchronically abnormal, repetitive and prolonged movements of the hands (Elbert et al. 1998).[7]

In a recent experiment, subjects had to recognise as quickly as possible the orientation of tactile stimuli consisting of three little pins arranged in an arrow pointed at random towards the right or left, and this by pressing a button with the right hand. These stimuli were applied simultaneously on the last phalanx of the thumb and the little finger of the left hand for 50 msecs in a massive and repetitive way for 1 hour a day over 4 weeks. A high resolution electro-encephalogram shows that the passive tactile stimulation of a finger elicits on the scalp an electric field at a latency of 50 to 60 msecs and that the source of this field can be modelled with an electric dipole situated at the level of the somatosensory cortex. An electroencephalogram recorded at the beginning and at the end of the period of training makes it possible to establish, by projecting it on a MRI image of the brain of each subject, the occurrence of any displacement of the localisation of the source of the electric field induced by a new stimulation of the trained thumb and little finger. With regard to the localisation of the cortical representations of these fingers, it appears that their simultaneous stimulation in the context of the task of discrimination produces an effect contrary to their individual and passive stimulation. The representations of the thumb and the little finger of the right hemisphere (contralateral to the trained hand) move away from each other in the medio-lateral axis as a result of the training, denoting an expansion of the areas of representation and from there a disassociation of those neuronal groups activated by each representation. When, on the contrary, the stimulation is applied separately to the two fingers with a random orientation of the stimuli which the subject does not have to identify, the representations of the thumb and little finger get closer to each the other, to the point of superimposition, translating an overlapping of the areas of representation under the effect of a passive stimulation. In their interpretation, the authors do not decide between two hypotheses: (1) a unique map of the hand whose activation is differentiated as a function of the different ways in which the stimulus is processed; (2) multiple maps coexisting in the same cortical area and whose activation is a function of the context (Braun et al. 2000).

6. Remodelling induced by Experience (2): The motor cortex

What direct electrical stimulations of the precentral cortex evoke are *bodily movements*; what Penfield and the first mappers of the brain sketched out in the form of the homunculus are *parts of the body*: the fingers of the hand contralateral to the stimulated hemisphere which, in anatomical order, are represented in the latero-medial plane. But movements are rarely evoked in one part of the body without being evoked in the neighbouring parts. The mastery of the independence of the hands with conductors, that of the fingers of pianists or typists, requires a difficult learning process that most probably draws upon important cerebral resources. This inconsistency has only been noticed quite late on. A somatotopic organisation of the cortical representation of the hand suggests the existence of *a neuron (or several) for the index finger,* that is, of a neuronal group exclusively dedicated to the control of a particular finger, alongside other neuronal groups devoted to the control of each of the other fingers. However, nothing of the kind is found. The recording of neurons of the motor cortex during the carrying out of movements of flexing and extending different fingers with the monkey shows that the movement of each finger mobilises neurons distributed throughout the entire area of the hand and that the map of the cortical representations of the *movements* of the fingers is not somatotopic (Schieber 1993). In fact, just as an unequivocal correspondence between representations on a somatotopic map and the parts of the body would exclude any possibility of reorganisation, in that way the activations distributed throughout the totality of a neuronal network according to a certain given configuration would lend itself to a functional reorganisation due to the varying usages of the body.[8]

The methods of human cerebral imagery (measuring the cerebral blood flow in PET) which proceed by averaging the results obtained with several subjects and which identify regions of interest by subtraction of images are disadvantaged for the examination of phenomena of plasticity linked to a motor learning process. That is due to the fact that the procedure adopted to arrive at the mastery of a new task is not necessarily uniform from one subject to another and to the fact that the non super-imposable activation sites are automatically erased from the resulting image. To get around this difficulty a technique of individualised imagery has been developed which suggests the existence in each subject of a relation which is not that of a simple correspondence movement-cortical area, but that of a complex relation between a particular schema of adaptation to the task and a type of change in the schemas of cerebral activation distributed over varied regions. The task is to carry through blindfolded, as fast as possible and without mistakes, a complex series of movements involving an opposition between the thumb and each of the other fingers of the right hand. Progress over one hour of training differs largely according to the criterion employed: acceleration of the process or correction of the mistakes. Despite an activation of the left primary sensori-motor (and pre-motor) region in all subjects, the authors noted a considerable diversity in the areas of activation from subject to subject, and this no matter the areas in question were cortical (mesio-frontal, parietal, cingular, Broca) or subcortical. This is a discovery that raises questions pertaining to the contribution of each of these regions to the particular profile of performance of the trained subject (Schlaug et al. 1994).

A longitudinal study of a similar learning task with a training of several weeks adds complementary information resulting from an MRI examination of the regional blood flow in the motor cortex. Starting from an equivalent activation of M1, first with the sequence of learned movements and then with a sequence composed of he same elementary movements in another order, passing a paradoxical though transitory reduction of the area of motor activation corresponding to the sequence of learned movements, one finishes with a significant extension of this area in the fourth week, an extension which can be maintained for several months. According to the authors, this durable expansion of the representation of the ordered sequence of learned movements would make of the primary motor cortex a memory of the know-how in the adult (Karni et al. 1995; 1998).[9]

7. Pluralism in the models of neurobiological explanation

In spite of the fact that the interdisciplinary character of the neurosciences makes it possible to hold to the belief in the equal rights of all participating disciplines to their claim for being fundamental, the familiar practise of all these disciplines is still far from being able to risk comparison to any science which is genuinely fundamental, such as quantum mechanics. A fundamental science seeks to develop the paradoxes hidden in its concepts without being afraid of exposing itself to controversy, even on the contrary, seeking controversy. It does not attempt to clothe these concepts with the garb of consensual unanimity, or even to surround the emerging divergences which might menace its dogmas. Those dogmas, moreover, pushed to the limit, might turn out to be contradictory. A truly fundamental science which knows only too well how illusory the irrepressible human tendency toward objectivation, substantialisation and absolutisation of the theoretical models and dominant scientific paradigms of a given epoch (yesterday Lapacian mechanism, today the mechanism of Turing) can be, is not afraid of appearing to progress backwards by systematically referring back its "explanatory" and "predictive" concepts to their conventional and so largely arbitrary principles of construction, the field of its "real" objects to the geometry it makes use of, its "exact" measurements to the limited power of resolution of its instruments. Apparently this is still not the case in neuroscience, where the same dogmatic defenders of the genetic determinism of the cerebral thinking machine with its cognitive programmes also want to present themselves as heralds of epigenesis and of the history of the development of the individual. And the very persons who, in the course of 20 years, have revolutionised cerebral cartography, demonstrated the inanity of its traditional concepts "map", "somatotopy", "representation", "coding", etc., and so laid the basis for the next functional neuro-dynamics, habitually employ a language that preserves and perpetuates the prejudice of a (or even many) homunculi in the brain.

The format of scientific journals which print in small letters the technical account of the cell recordings, the image analysis or the method by which the published "maps" are constructed, leads one to separate these products from their mode of production, thereby incurring the risk of their being envisaged as maps in the brain. But that nothing like such maps is found in the brain is something that can be persuasively upheld. The following items related to maps are evidently not found in the brain: readings obtained from the grids of penetration sites of electrodes in the cytoarchitectonic cortical areas, outlines of the cutaneous neuronal receptor fields, histograms of the neuronal peristimulus action potentials, mosaics of the categories of movement evoked by IMS, electroencephalograms, scintigrams of the rate of consumption of oxygen or glucose by the regional blood flow, the distribution across the scalp of loci of stimulation evocative of motor potentials, dipoles of the sources of the induced electric or magnetic fields, etc. But when one imagines that it might be possible to "go further" (by extrapolating from the available methods of obtaining images or representations) there arises a danger of fixing, objectifying or substantialising the transitory configurations of the functional dynamism of living organisms. That includes that one misses the essential and persistent feature of the potential for reconfiguration and functional reallocation which is not limited to an early age or to the axonal regeneration and functional recuperation of a lesion.

The challenge is to understand neuro-plasticity without trying to situate our conceptual instruments in the brain, by talking of "neuronal coding" or of the "genetically programmed", and without entering into any collusion with a neuronal determinism which conceives of the functioning of the brain as the calculations of a machine that follows a programme that completely specifies in advance all its transitions from state to state.

Even if linguistic habits have not changed greatly, we cannot but concede that this challenge has been met from the time of the first work on cerebral plasticity. In an effort to grasp conceptually the data of Merzernich and his team, Edelman has advanced the idea of a functional and interactional morphogenesis by selective stabilisation of the synaptic connection patterns in conjunction with the activity of the organism (Edelman et al. 1987; Kaas et al. 1983). While avoiding any reductionist explanation, a computer simulation of a simplified model of the neuronal network has made it possible to elucidate analogically and holistically the principles of a dynamic morphogenesis of functional topologic maps, by bringing to light certain of the properties established by deafferentation or amputation of the fingers in the monkey. Without entering into details, we would like to applaud the spirit in which this model has been developed, to the extent that its dynamic approach seems to us to contradict the fixist prejudices conveyed by the language of coding inherited from a mechanistic conception of cerebral functioning.[10]

8. Autonomy and experience in the constitution of the own body

By virtue of its quasi-spontaneous or autonomous character, the correlative emergence of neuronal groups in the context of the network of neurons and of neuronal receptor fields in the matrix of the skin captors of the same network is the best analogy that one could find in contemporary naturalistic science for the transcendental constitution of the own body in genetic phenomenology. The use of my hands gives me (in a certain sense) my own body. But in what sense exactly? According to Husserl's later manuscripts, the regulated effectuation of tactile kinesthesia (objectifying) and of motor kinesthesia (de-objectifying) is the constitutive operation by means of which alone I acquire the sense of being (and from there consciousness) of my own body, both as a body object, an object among other objects of sensory perception, and as the unique organ of my voluntary movements. In the very course of its functioning, the first group of kinesthesia constitutes a continuous and closed surface which adopts for me the meaning of being "my skin"; the second fills this surface with a subjectively animated matter which adopts for me the meaning of being "my flesh". But neither my skin nor my flesh have anything a priori to do with this "mass of flesh and bone that I call my body" (Descartes). They are in essence the products of a constitution, more specifically, of an active auto-constitution on the part of the living organism, a self-organising agent, constantly adapting to its context, moulded by its own history. The organism (as certain eminent physiologists have said in astonishingly phenomenological terms) makes "an effort after meaning" (Bartlett, quoted *in* Barlow 1985: 121) and "chooses from one moment to the next the being it will become" (Merzenich & deCharmes 1995: 76). Ironically, by adopting the hands, which are both sensitive surfaces and motor organs, as the privileged models for the morphogenesis of the somatotopic maps (for simple reasons of practical convenience I assume), the neuroscientists thereby resuscitated the analyses (developed by Husserl and Merleau-Ponty) of the celebrated example of "my right hand touching my left hand, the latter, in turn, passing from being passively touched to actively touching."

This improbable encounter between a neurodynamic (still in preparation despite the promising perspectives opened up by the "mental cinema") and a genetic phenomenology (unhappily relegated to the field of historical studies) attests to the possibility of at least breaking the magic circle of representation, which still holds neuroscience imprisoned in the paradigm of the mechanical brain and the body representationally intellectualised. What does this opportunity depend on? On the fact that the emergence of the body schema, on the basis of the functioning of a dynamic system in the brain, and the constitution of our sense of the own body, on the basis of kinesthetic activities of the organism, are (for the one who places himself or herself in the context of the flux of experience and not in the position of an external observer) genuine beginnings, effects without causes, absolute origins. For in fact, for the living organism caught up in the immanence of its own experience, there is no such thing as a physical or anatomical body to be represented, a body which would precede in the order of being its representation, the latter reproducing somewhere in the mind-brain a cartographic image of this same preconstituted body. The signifying form, the sense of being a body, arises from its own operation as self-given sense. The own body is no more the representation of the physical body than the functional body is the representation of the anatomical body. The true relation runs in the reverse direction; first comes the own body, the subjective form of lived experience or the functional configuration of a living organism. As for the anatomical or physical body, it is a later product constituted by a procedure of scientific objectification, and, what is more, a constituted product in the paradigmatic context of yesterday determinist science, a science of permanent objects, the fixed substrates of properties such as physical, functional or mental properties, which can always be precisely located.

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Notes

1. The subtraction: image of a brain state of sensory stimulation (or motor activity) – image of a state of rest.

2. For any individual neuron in a brain cortical tissue area that functions as territory of somatotopic representation of hand, the surface of hand skin which tactile stimulation induces the firing of this neuron is its receptive field.

3. Relation between the extension of representative cortical area and the extension of represented cutaneous area.

4. Cf. Buchner et al. (1995) for modification in the excitation-inhibition equilibrium of the sensorial input in the case of *local anesthetic* of fingers 2, 3 and 4. It has been established that this reorganisation is subject to the modifying influence of attention (Buchner et al. 1999). For an expansion of the representation of the movement of the finger in *neuropathy,* both for active and passive movement cf. Reddy et al. 2001. For the post-operative reorganisation of the map of the hand in patients suffering from *syndactyly,* which reflects the new functional status of the hand cf. Mogilner et al. 1993. For the dynamical re-organisation of muscle representations in the case of *amputations,* cf. Cohen et al. (1991).

5. For a progress in dexterity in monkeys, Xerri et al. 1999.

6. Selective loss of finger sensation and difficulty of control of finger coordinated movement.

7. For the convergence of results confirming an expansion of the functional representation of the reading finger with blind readers in Braille, cf. Pascual-Leone et Torres (1993). This expansion can no doubt be imputed to the intensity and to the selective character of the sensorial stimulation imposed upon this finger by the rapid and repetitive movements of the tactile detection of letters in Braille. This expansion is accompanied by a disorganisation of the somatotopical topography of the representation of the fingers, which no longer follow one another in the normal latero-medial order, a disorganisation which could be related to a difficulty in identifying the finger subject to a minimal tactile stimulation arising from the determination of the threshold of the sensorial sensitivity of these fingers. This observation poses the question of the adaptive value of the functional plasticity induced by use (Sterr et al. 1998).

8. For the plasticity of the functional topography of the motor cortex linked to a motor learning process in monkeys, cf. Nudo et al. (1996).

9. Without calling in question the role of functional plasticity in the learning process, an inverse result suggests that it would be wrong to dogmatise on the basis of hypotheses drawn from empirical research. A TMS of the motor output of M1 towards the muscles of the fingers was practised between blocks of tests. The tests concerned the reaction time for the appearance on the screen of a computer of the number of the finger which had to be used to press the reply button. This experiment shows successively (1) a coupling of the progressive diminution of the reaction time with an amplification of the motor output and an expansion of the map of the excitable positions on the scalp, (2) an abrupt uncoupling of this same reaction time, which continues to diminish, and the amplitude and extension of the representations of motor outputs, which shrink and return to their previous level and topography. This change (on a smaller time scale than the previous experienced) reflects the transition from a practical and implicit mode of knowledge to one which is declarative and explicit as well as the taking over from M1 by other structures (Pascual-Leone et al. 1994, 1999).

10. If the anatomical architecture of Edelman's "neuronal network" is initially fixed, the functional properties attributed to the "synapses" are not, but change as a function of the "cutaneous" stimulation, on the one hand, and of the equilibrium established by the exciting and inhibiting influences that "the cells" exert on each other, on the other hand. The operative concept is that of the "neuronal group". Neuronal groups are not anatomical entities but rather purely functional entities, stabilised patterns of cellular activations distributed throughout the network. Their process of formation depends uniquely upon the flux of stimulation of the captors and on the local equilibrium between excitation and inhibition. By hypothesis, the network is deprived of initial organisation, the connections between cells being left to chance. In accordance with the theory of "selection of neuronal groups", three principles of synaptic functioning make possible the "spontaneous" emergence of these neuronal groups. (1) The mutual overlapping of the divergent "thalamo-cortical connections". (2) "Selection": the neuronal groups whose activation is more powerful stabilise their internal connections and refine their receptor fields while the weaker ones tend to dissolve. (3) On the borders between groups in the course of differentiation, intervening cells are disputed by groups which compete with each other, as a result of which a more precise determination of their mutual frontiers becomes possible. The organisation of a network of neurons on the unique and exclusive basis of these three principles results in neuronal groups whose behaviour simulates some observed functional plasticity phenomena of the somatotopic maps of the hand: their expansion under the impact of an abnormal stimulation of a finger, retraction and substitution of the RFs of the palm by RFs on the back of the hand in response to a deafferentation of the median nerve.

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What are we naming?*

Maxine Sheets-Johnstone

Introduction

As my title indicates, I would like to pose a question concerning body image and body schema. The question revolves about the terms 'body image' and 'body schema', and the concepts 'body image' and 'body schema'. The challenge of *languaging experience* broadly identifies the terminological issue; the challenge of *being true to the truths of experience* broadly identifies the conceptual issue. I approach the interrelated challenges by way of a basic claim that grounds the inquiry. Spelling out this claim and its empirical foundations will set the stage for addressing the title question directly, and in turn allow me to specify inherent weaknesses in the terms 'body image' and 'body schema' and to recommend their replacement by terms that do empirical and conceptual justice to the phenomena in question.

A prefatory remark is apposite. I would like to single out and acknowledge the clarifying and ever-broadening researches and writings of Shaun Gallagher on body image and body schema (e.g., Gallagher 1986, 1995, 2000; Gallagher & Cole 1995). In a sense, my title might be taken as unnecessarily repeating the fine work already done by Professor Gallagher. My concern, however, is neither to recount his analyses nor to refine and extend them along further lines. It is rather to step back and ask quite pointedly: Just what are people, specifically people in present-day research, trying to understand and to explain by using the terms? What are they trying to capture by invoking a body image and body schema?

The basic claim that subtends my response to the question begins quite simply. In the most fundamental sense, when people use the terms body image and body schema, they are trying to answer the question, How do we do what we do? That is, in the most fundamental sense, they are trying to understand or to explain how it is we come to move knowledgeably, effectively, and efficiently in the world, or alternatively, to understand or to explain how it is we do *not* move knowledgeably, effectively, and efficiently in the world, questions that, I might point out, need answering not only with respect to deficiencies, i.e., pathologies, but with respect to proficiencies, i.e., masteries and learnings that originate in our common infancy and ontogenetic history, and progress to diverse individual achievements arrived at through processes of self-cultivation. In broader terms, their efforts might be said to aim at understanding and explaining how it is that not only human animals, but animals in general, come to move knowledgeably, effectively, and efficiently in the world. It should be added immediately that this animate capacity does not exist in a one-individual vacuum. It necessarily involves others; it is an intercorporeal as well as corporeal capacity. The basic claim thus has substantive intersubjective meanings and implications. It affirms that to understand or to explain how we do what we do, we must necessarily turn our attention both to the ways in which movement grounds our practical ways of being in the world, and to the ways in which movement grounds our ways of being with others. Because of space limitations, these latter ways will be touched on only marginally and in passing.

I begin by substantiating aspects of the claim from several perspectives, laying out empirical grounds for its validation in the process.

I

Infants and young children live in a world of movement. Well-known researchers in infant/child development regularly highlight the centrality of movement. Psychologist Colwyn Trevarthen, for example, writes that in two months old infants, "movements of the whole body ... accompany vocalizations and movements of the lips and tongue," and that "[v]igorous calls or shouts are generally combined with longer movements including waving of the hand ..." (Trevarthen 1977: 251–252; see also Trevarthen 1979); psychiatrist Daniel Stern points out that the intensity, timing, and shape "of a person's behavior ... form the basis of attunement" (Stern 1985: 146), i.e., the intersubjective "sharing of affective states" (ibid.: 138), intensity, timing, and shape being instantiated in and through movement in each exemplification; psychologist Jerome Bruner states that the principal linguistic interest of young children "centers on *human action and its outcomes*, particularly, *human interaction*" (Bruner 1990: 78); psychologist Philippe Rochat affirms that among the experiences that an infant has of itself in the course of moving its limbs, touching itself, or hearing its own voice, "Proprioception is indeed the sensory modality of the self 'par excellence"' (Rochat 2002: 91). In short, empirical findings underscore the fact that infants are kinesthetically alive and kinetically attuned. Clearly, they are doing something and/or learning something in and through movement.

But what exactly are they doing or learning? Certainly we can answer – and with strong empirical backing – that they are learning their bodies and learning to move themselves (Sheets-Johnstone 1999a). To flesh out this learning, however, requires what physiological psychologist Hans Teuber (Teuber 1966: 441) described as a "different way of looking." Indeed, when we ask what they are doing or learning with the combined acuity and puzzlement of the autistic child who remarked, "People talk to each other with their eyes. What is it that they are saying" (Frith 1993: 113), we step back from a ready-made wisdom and have the possibility not only of uncovering much of what we take for granted about movement, but of uncovering assumptions underlying our natural attitude toward movement, assumptions that quite precisely lie in the way of understanding or explaining "how we do what we do". For example, we might readily find the common assumption that movement is a change of position; or the common assumption that our awareness of our own movement consists of sensations of movement; or the common assumption that movement is nothing more or other than behavior, and that behavior more aptly and properly describes kinetic phenomena, as the terms eating, standing up, grasping, and chasing clearly indicate. With such assumptions intact, an appreciation of movement, particularly an appreciation of the fact that any movement creates its own qualitative dynamics (Sheets-Johnstone 1966/1980, 1999a, 1999b), is straightaway diminished if not obliterated. The assumptions blind us in each instance and are obstacles to an accurate, veridical account of "how we do what we do".

In the context of discussing volitional movement, for instance, people often give the example of raising one's arm overhead.[1] They in turn commonly speak of the sensation of movement. Yet movement is never experienced as a sensation, either a single sensation or a group of sensations. Consider actual experience. When you walk, do you have *sensations* of movement or are you aware of an unfolding spatio-temporal-energic dynamic? When you hammer a nail or tie a shoelace or reach for a glass of water, do you have *sensations* of movement or are you aware of a felt, ongoing, and familiar dynamic? Freud rightly observed that there are both sensations and feelings "from within" (Freud 1955: 19). The difference bears thinking about. Movement is not sensational. To say that someone has sensations of movement is a contradiction in terms. Movement is not punctual: it is quite unlike the proverbial touching hand and the proverbial touched hand, both of which may be spoken of as yielding sensations of touch. Everyday self-movement is in contrast a dynamically felt temporal phenomenon. Any time we care to pay attention to ourselves in everyday movement, we find, in the words of Alexandr Luria ("a founding father of neuropsychology" [Goldberg 1990]), a kinetic melody (Luria 1973, 1966).[2] While sensations might be appropriate descriptions for a *corps morcelé* (Lacan 1977a, 1977b) that feels twinges here, tensions there, cramps here, pains there, and so on – a *corps*, we might note, that is not at all the preserve of infancy, but in many ways constitutes the frequently distant, third-person bodies of adult humans – sensations are not appropriate descriptions for a *corps engagé*, not only one that is reflectively attentive to its own movement in the course of being *engagé*, but one that is pre-reflectively attentive as well, and that, in fact, in being pre-reflectively attentive, is necessarily aware if "something goes wrong."

The assumption that we have sensations of movement distorts the reality of self-movement and has far-reaching consequences. To illustrate these, consider that the difference in use of the terms sensation and perception often rests on a distinction between inner and outer: whatever the modality of objects sensed out there in the world, we have *perceptions* of them; whatever the modality of objects sensed in our bodies, we have *sensations* of them. The perceptual/sensational distinction, however, does not hold when it comes to self-movement. This is not simply because, as shown above, self-movement is not sensational like pains, itches, a scratchy throat, and so on. It is because, in addition, self-movement is at once both a tactile-kinesthetic and kinetic happening: it is perceivable from both within and without; it is a perceptual experience for both mover and any observer of movement. Its double mode of presence has sizable implications for Husserl's notion of pairing in relation to intersubjectivity, as philosopher Soren Overgaard deftly shows in a recent article (Overgaard 2003). Overgaard's findings are based on detailed consultations of Husserl's three-volume analyses of intersubjectivity, in which Husserl calls attention to "the exteriority" of movement as well as to the kinestheses of movement. The intersubjective significance of the double mode of presence can be spelled out beyond Overgaard's insightful article, namely, along the lines of the qualitative dynamics that any movement creates.[3]

To appreciate the double perceptual character of movement and the possibility of its further intersubjective elaboration is in essential ways to heed the earlier cited words of Hans Teuber. Teuber (Teuber 1966: 440–441) was agreeing with physiologist Ernest von Holst that we ought to change our habitual point of departure in perception and begin instead with movement when he stated that such a shift in perspective "requires some different way of looking." Indeed it does. The "different way of looking" readily challenges the terms and concepts 'body image' and 'body schema', as we will presently see. The more general point here is twofold. First, neuroscientific studies anchored in perception tend not to entertain or to investigate the fundamental ways in which self-movement anchors our cognitive/affective lives. On the contrary, self-movement not infrequently appears merely an afterthought in these studies, something that has no significance in and of itself but simply trails along after "input". The work of Giacomo Rizzolatti, Vittorio Gallese, and colleagues (e.g., Rizzolatti et al. 1996; Rizzolatti & Gallese 1997; Gallese 2000) reflects the possibility of changing the favored neuroscientific point of departure and the insights that can come of it.

The second point concerns the fact that life in the animal kingdom starts with movement, self-movement, certainly not in the absence of a perceived world, but just as certainly a phenomenon – an experiential phenomenon – in its own right. More finely stated, it starts with an intrinsic dynamics by which animate movement organizes itself and does so on the basis of the immediate kinetic possibilities of the moving organism itself. J. A. Scott Kelso, Director of the Center for Complex Systems and Brain Sciences at Florida Atlantic University, has consistently shown in his research how, through an intrinsic dynamics, different patterns of movement arise, depending upon changes in a control parameter within the particular system investigated (e.g., Kelso 1988, 1995; Kelso & Zanone 2002; Zanone & Kelso 1992). In other words, in a biological system, as in any purely physical or chemical system, change is not brought about only by *circonstances*, that is, by something external; it is brought about equally by the self-organizing dynamics of the system itself, a dynamic *tendance intérieur*, we might say, to follow through with a remarkably applicable Lamarckian vocabulary. Given this fact of nature, we would do well to pay attention to movement and to probe nature's dynamic strategies through experimental and experiential methodologies. In fact, Kelso has strongly criticized any neuroscience that, rather than probing nature's dynamic strategies, postulates entities and in consequence comes up with "switches," or "schema," or "traces" as explanatory mechanisms, completely overlooking self-organizing coordinative patterns. He states forthrightly, for example, that one of his motivations for working out basic laws of coordination was "to counter the then dominant notion of motor programs, which tries to explain switching (an abrupt shift in spatiotemporal order) by a device or a mechanism that contains 'switches'" (Kelso 1995: 57). In his discussion of research on the dynamics of learning, he points out with equal candidness that "[u]sually, some hypothetical construct located inside the head, such as a *schema* or a *trace*, is said to be built up or strengthened as a result of the learning process" (ibid.: 161), a formulation that reduces to the simple truism that through practice, "[a] subject's performance improves and becomes less variable" – something, he adds, "your grandmother could have told you" (ibid.).[4]

Surely if, as Kelso and other dynamic systems theorists have shown, the tendency of nature is to self-organize, then attention to the self-organizing strategies of nature should predominate over any attempts to organize nature from without by creating structures along a cerebral mall: cognitive maps, feature analyzers, a "corollary discharge of attention module" (Taylor 2002), an "internal, innately specified vocal-tract synthesizer" (Liberman & Mattingly 1985: 26), an "intentionality detector"" (Baron-Cohen 1995), a body image, a body schema, and so on, all of them hypothetical entities conjured to do the trick of explaining how we do what we do. Clearly, Kelso's understandings and explanations of 'how we do what we do' "[require] some different way of looking." They require an open mind-set oriented to the dynamic rather than to the mechanical, and to what I would suggest is thereby properly oriented to the sensory-kinetic rather than to the sensory-motor (Sheets-Johnstone 1999a; see also Sheets-Johnstone 1990, 1994). They thereby require that we cease looking for or designating some *thing* that will answer to a capacity or function, giving the thing the status of an object by spatializing it, locating it in the brain, thereby putting it on the map, however hypothetical the map (e.g., brain modules) or the thing itself (e.g., body image, body schema). It is of more than passing historical interest to note that Aristotle would agree. That nature must be understood dynamically because dynamics are at the heart of nature was a principle readily recognized by Aristotle in his observation that "Nature is a principle of motion and change ... " and in his conclusion that "We must therefore see that we understand what motion is; for if it were unknown, nature too would be unknown" (Aristotle, *Physics*, 2000b: 12–14).

II

To sum up the basic claim, its ready validation in ontogenetical studies, and the waywardness and far-reaching consequences of unexamined assumptions – in reality, *misconceptions* – about movement, we can conclude that to find out what is going on in and through movement – and not only in infancy, I might add, but in the course of human lifetimes and in the course of lifetimes across the animal kingdom – we must turn attention to the thing itself, or more accurately, to the dynamic process itself, hewing to the truths of experience and jettisoning assumptions that shroud movement in something either less or other than movement.

The conclusion brings us directly to the question, what are we naming? – or, following the thrust of the previous line of discussion, what are we *trying* to name by 'body image' and 'body schema'? In answer, we might observe first that to language experience in more than colloquial ways – "I'm on my way to the store"; "I visited my friend this morning" – is challenging. Everyday speech rarely includes a fine-grained descriptive account of experience – whether something as brief as the experience of a hot stove or as extended as the experience of traveling from Yachats, Oregon to Ghent, Belgium. In ways similar to everyday speech – and concomitantly dissimilar from the challenge of descriptively languaging lived-through experiences – observations from a third-person perspective commonly tend to be given a generic name, a ready label by which one can conveniently refer to the phenomenon, something as simple as "hot stove" or as complex as "travel". The point is that languaging experience takes reflective thought and effort beyond the easy flow of everyday speech. Such reflective thought and effort can result in an accurate descriptive analysis and taxonomy of experience, much in the manner of Darwin's keenly detailed descriptive analyses and taxonomies of animate life prior to his formulation of the theory of evolution. Just such accurate *descriptive* analyses and taxonomies are wanted in advance of third-person namings that attempt to capture fundamental aspects of life. A name may otherwise be unanchored in the very reality of life being investigated, and thus be not only an ongoing source of schisms between first-person experience and third-person observational labellings, but an obstacle in the path of truth. In short, attention to the name we give things is of critical importance. The term 'image' in the label 'body image' is a classic example.

The term is unequivocally misleading. In everyday speech, an image refers primarily to something visual. Equally significant, it refers primarily to something not actually perceived. How, then, to begin with, can the term 'body image' be the proper term for "*perceptions* … pertaining to one's own body" (Gallagher 2000: 4), most prominently, kinesthesia and proprioception, modalities that are definitely not only *not* visual, but modalities that are definitely *not* absent but, on the contrary, livingly present. The dictionary leaves no doubt about the disparity. The first Oxford English Dictionary definition of 'image' reads: "a physical likeness or representation of a person, animal, or thing, photographed, painted, sculptured, or otherwise made visible." The second definition begins: "an optical counterpart or appearance of an object ... " ; the third definition begins "a mental representation ... " ; the fourth definition, identified as psychological, reads: "a mental representation of something previously perceived, in the absence of the original stimulus"; and so on. Clearly, the word refers to something visual, something absent, and, equally critical, to "some-*thing*", i.e., an object of some kind. No sense of animation whatsoever attaches to the word. Yet if the quest is to name something that refers to what Gallagher identifies as the "intentionality" (ibid.) of "embodied experience" (ibid.: 2), and if the first "intentional element" of "embodied experience" is "the subject's *perceptual* experience of his/her own body" (ibid.: 4), then the word 'image' not only fails to capture "embodied experience"; it leads us far, far astray, for the first and foremost perceptual aspect of one's own body – and in fact any living body – is its animation: in the beginning and straight through to the end, the quintessential perceptual experience of one's body – and in fact any living body – is its movement.

I respectfully suggest that we need to start from scratch. By this I mean starting with Gallagher's first intentional element of 'body image', for the first intentional element is the ground of the other two intentional elements of 'body image' specified by Gallagher, i.e., "the subject's *conceptual* understanding ... of the body in general; and the subject's *emotional* attitude toward his/her own body" (ibid.: 4–5). Perceptions of one's own body are, in other words, the *sine qua non* of both conceptual understandings of, and emotional attitudes toward, one's body.[5] If one did not *perceive* one's body, one would have no grounds for building or having such conceptual understandings or emotional attitudes. Starting from scratch in this way directs us to the possibility of identifying a *corporeal-kinetic intentionality*, of spelling out the foundations and dimensions of this intentionality, of thus doing justice to our primal animation (Sheets-Johnstone 1999a), and correlatively, to what I would term not "*embodied* experience," but *bodily-kinetic* experience. Other facets of corporeal-kinetic intentionalities could be added to those Gallagher lists, in particular, affective intentionalities, that is, emotional experiences of one's own body or experiences of one's own bodily felt emotions, but consideration of these is not to the point here. Let me also add incidentally that the term "embodied experience," though popular, is problematic in its own right. What is it that is embodied? Our minds? Our "cognitive functions"? Our sex and gender? Our perceptions? Our emotions? Our selves? As I have elsewhere suggested, our minds, sex, gender, selves, and more, are conveniently packaged like frozen orange juice and TV dinners – all thanks to the packaging magic of "embodiment" and its variations (Sheets-Johnstone 1999a: 329). The all-purpose packaging offers a solid and perdurable container that can hold a variety of precious goods. The packaging, however, solidifies experience in ways counter to the animated ways in which we ordinarily live our bodies. Contrary to a fixed and constant *container sense of experience*, bodily experience is basically neither static nor receptacle-like. Life is precisely not a series of stills. It is no surprise, then, that living bodies do not experience themselves as embodying minds, cognitions, perceptions, and so on, and certainly do not experience themselves as embodied. They experience themselves first and foremost as animate and animated, precisely because they are. Our terminology should reflect this fact; it should be true to the truths of experience.

Corporeal-kinetic intentionality puts us rightfully on the path toward such truths, beginning with both felt and perceptual experiences of our own bodies and building from there both to emotional attitudes toward our bodies and to conceptual understandings of bodies in general. In a strongly phenomenological/developmental/evolutionary sense, it puts us on the path toward understanding and explaining the origins and progressive histories of how we do what we do, from learning our bodies and learning to move ourselves to progressively subtle and complex corporeal-kinetic learnings that inform and structure our practical and social lives, and our individual self-cultivations. In a deeply psychological sense, *corporeal-kinetic intentionality* puts us on the further path of understanding and explaining the origins and progressive histories of *why* we do what we do and have done what we have done. Still further, it leaves intact the term 'body image' to refer in its proper sense; that is, corporeal-kinetic intentionality preserves the lexical meaning of 'body image' as something preeminently visual, imagined, and objectified, subsuming that meaning within its corporeal-kinetic compass as one species among many within its genus. It thus leaves intact the visual picture one has of one's body, the imaginative consciousness of what one's body looks like together with one's emotional attitudes toward it, and this not only within a normal range but as in anorexia and as in the various transformations of one's body that occur in schizophrenia.

In sum, we should not rest content with present use of the term 'body image'. It is inapt, and misleads us because it is conceptually wayward. The kinetic dynamics that in the most fundamental sense constitute bodily experience cannot be captured by an essentially static, visually anchored, and thing- or object-tethered terminology.

The fundamental dynamic oversight is actually evident early on in the history of neurology, specifically, in the context of neurologist Henry Head's original formulation of the parallel notion 'body schema'. "By means of perpetual alterations in position," Head states, "we are always building up a postural model of ourselves, which constantly changes" (quoted in Schilder 1950: 12). Clearly, "perpetual alterations in position" and "a postural model of ourselves, which constantly changes" testify to the fact that the term 'body schema' attempts to name something animate and animated. The term, however, gives no sense of the kinetic dynamics that constitute "perpetual alterations in position," nor is it anywhere clear how a body schema that "constantly changes" can do so short of being itself constantly animated and thus being not a vague structure, mental diagram, organizing framework, or whatever, *but a dynamic patterning of some kind*. Earlier, we saw how assumptions about movement can skew understandings of movement. "Perpetual alterations in position" and a postural model that "constantly changes" do just that by reducing movement to a *change of position*, and then subsequently trying verbally to accommodate the existential fact of animation. The attempt to explain movement – how we do what we do – by the term 'body schema' amounts to nothing more than verbal magic. Clearly, Head's use of the term generates positional rather than kinetic understandings and does not penetrate to the core phenomenon – movement; hence, it does not and cannot do justice to a kinetic dynamics.

Gallagher's keen and explorative research has done much to correct the earlier situation, and in fact Gallagher all but specifies a kinetic dynamics in his discussion of body schema as "a system of processes that constantly regulate posture and movement… [and] that function without reflective awareness or the necessity of perceptual monitoring" (Gallagher 2000: 4). For example, in his discussion of aplasic phantoms – limbs that are congenitally absent but are taken in various ways as present by the person so afflicted – Gallagher comes close to affirming outright the kinetic origins of body schemas. Pointing out that "The actual development of embryonic neural tissue depends, in part, on fetal movement," and the fact that "Ultrasonic scanning of fetuses shows that movement of the hand to the mouth occurs between 50 to 100 times an hour from 12 to 15 weeks gestational age," he goes on to suggest that "This kind of prenatal movement may in fact be precisely the movement that helps to generate or facilitate the development of body schemas." He points out that this suggestion is "quite consistent with the traditional hypothesis" concerning the acquisition of a body schema over time, the only difference being that "this movement occurs much earlier, and by implication, body schemas develop much earlier than the traditional account permits" (ibid.: 20).

That body schemas are movement generated and movement dependent, and are in fact themselves kinetic phenomena, means that we should not be content merely to invoke the term *body schema* as an explanation and have done with it, whether in neuroscience, psychiatry, neuropsychiatry, phenomenology, or neurophenomenology. We must first explain a body schema itself. To do this, we must take self-movement and the self-organization of movement seriously, starting with the development of embryonic neural tissue and proceeding to the development of coordinated movement. In the process, we can hardly fail to realize the necessity of choosing a more appropriate term, one that duly captures the true nature of the phenomenon that the words 'body schema' attempt unsuccessfully to capture, namely, *corporeal-kinetic patterning*. Such a term properly identifies the hand-mouth coordination that arises early in fetal life and that Gallagher discusses. Similarly, it properly identifies "perpetual alterations" and "constant changes" that arise and unfold in the course of self-movement. In brief, the term *corporeal-kinetic patterning* does justice to neurological and neurologically-based kinetic dynamics. The term 'body schema' – like the term 'motor programs' – fails to capture these dynamics. It cannot capture them because the dynamics, while structurally played out, are not themselves objects–specifiable "things" – in the brain. They are transitory spatio-temporal phenomena, corporeal-kinetic patternings that, properly identified, are the neurological complement of corporeal-kinetic intentionalities.

Evolutionary and related methodological implications follow from the preceding diagnosis of failings in the term 'body schema', the former implications having to do with a broad pan-animate perspective, the latter with reification and reductionism. How, we might ask with reference to the former, do nonhuman animals navigate or locomote in the world? Do they have body schemas? Is there something equivalent in nonhuman animals to having a feather in your hat and climbing into a car? How about deftly navigating the climbing of a tree with a caught prey in your mouth? *Corporeal-kinetic patterning* goes a long way toward establishing a credible neurological foundation for understanding how we do what we do because the term is ultimately tethered to evolutionary life and to the manifold and diverse kinetic dynamics that sustain that life in all of its forms. Second, corporeal-kinetic patternings do not reduce evolutionary life – *animate* forms – to motor programs and such, but identify the neurological, or better, neurophysiological, dynamics of corporeal-kinetic intentionalities. They are thus not amenable to reification and in turn to reductionism; as indicated above, a corporeal-kinetic pattern is not a posited structure or conjured entity in the brain or any place else. In this respect, it is quite unlike a *body schema*, a term invented to create a structure to explain a function. Corporeal-kinetic patternings identify the neurology, or again, better, the neurophysiology of coordinative dynamics as they are played out in the lives of animate forms.

By recognizing the kinetic dynamics – and correlatively, by not mechanizing life – there is virtually no possibility of reification and, in turn, virtually no possibility of reductionism because no fixed spatial entity is created on which to hang the kinetic dynamics. Moreover there is virtually no possibility of making experiential ascriptions to brains or things in brains because no "thing" exists or is theorized to exist on which to pin verbal predicates, predicates such as "ascertains" (Zeki 1992: 69), "asserts" (Rizzolatti & Gallese 1997: 222), "infers" (Crick & Koch 1992: 153), etc. This is as it should be, and for an even further reason. If we say that the brain or its neurons assert, ascertain, infer, detect, and so on, where do we draw the line? Are the brain or its neurons overjoyed at seeing an old friend? Are they gripped with fear in face of the oncoming car? Do they excuse themselves to go to the toilet? Are they indifferent to whether red wine or white is served with the fish? Experiential ascriptions to brains or to neurons constitute a pernicious linguistic practice that runs hard against the truths of experience. Its reductionistic efforts are, ironically, a form of brain-washing.

III

The above observations on reification and reductionism point us toward the fundamental conceptual deficiency of 'body image' and 'body schema'. Reification concretizes the concepts 'body image' and 'body schema', making each not just a spatial entity, but a spatial entity with no inherent temporal dimensions. Spatialization through reification indeed conveniently evades the temporal, and happily so for reductionists, because the temporal destroys their cultivated ontology of perdurable objects or structures. Temporal dimensions would "kineticize" body image and body schema, forcing recognition of their foundational *im*permanence, and eliminate the possibility of conceiving them as fixed and durable material entities in the brain. As currently conceived, body image and body schema do indeed *pin things down*. They provide a localization of kinetic function; they give "how we do what we do" a structural home, a place along the cerebral mall to explain intelligent, effective, and efficient movement.[6] They are indeed "embodied" structures, and being "embodied," easily lend themselves to talk of body positions, body sensations, and body behaviors, and in turn, to the essentially static and/or mechanical rather than the animated and dynamic.

Kinetic melodies challenge this spatialization; so also does a coordination dynamics. By their very nature, kinetic melodies and coordination dynamics recognize changing, qualitatively modulated kinetic processes that are played out in ways that defy modular – "a place-for-'every-thing'-and-'every-thing'-in-its-place" – explanations. Changing, qualitatively modulated kinetic dynamics exceed essentially *spatial*, i.e., localized, explanations, exceed them in the sense of a temporal dynamics. Luria's studies of complex sequential activity, and his emphasis on muscle innervations and denervations in the course of complex sequential activity (Luria 1973, 1966), attest to these dynamics. Kelso's analyses of coordination dynamics attest to them equally. Complex sequential activity is a spatio-*temporal*-energic phenomenon, whether in the form of articulatory gestures, coherent narratives, calculations of mathematical sums, skilled whole body movement, fluctuating facial expressions, or whatever. Self-organizing kinetic patterns undergirding coordinations are similarly temporal in character, from the macroscopic to the microscopic, that is, from first-person experiences of everyday movement and learning to the kinetic dynamics of brain processes and of the neuromuscular system as a whole. What we see in pathologies is in part precisely the loss of a temporal dynamic, a temporal dynamic that exists not in the absence of a spatial kinetic dimension, but a dynamic that is not either reducible to that dimension. What we see in the course of gained proficiencies is the reverse: the acquirement of complex spatio-temporal-energic dynamic patternings, all the way from the mastery of walking and speaking to the mastery of performing surgical techniques and playing the violin.

The fact that self-movement is always co-articulated (see Sheets-Johnstone 1999a) and is anatomically and physiologically defined in terms of degrees of freedom (Bernstein 1984) testifies in further ways to the necessity of recognizing a temporal dynamic, of eschewing the practice of creating structures to explain functions, and of creating a proper terminology and arriving at proper conceptualizations of life. We might note in this regard that it is not just articulatory gestures that are co-articulated, but any and all movement of our bodies. Any everyday act such as reaching or grasping is a whole body movement, the coordination of which is differentially played out according to context and the specific bodily posture from which movement originates. Even gymnasts and dancers, for example, never kinetically depart from the exact same place twice, nor perform the exact same sequence of movement twice. Everyday movements such as reaching, grasping, getting into a car, and writing one's name are thus aptly described as variations on a theme, a theme whose major contours describe a kinetic melody or coordination dynamic that is differentially instantiated in the corporeal-kinetic temporal flow of a particular patterning of neuromuscular innervations and denervations, precisely as Luria describes. From both a behavioral and brain perspective, kinetic melodies, coordination dynamics, co-articulations, kinetically-defined degrees of freedom are not written in stone – in the brain or anywhere else – but are differentially played out in and through corporeal-kinetic intentionalities and corporeal-kinetic patternings. They are played out in a dynamic that is through and through temporal in nature.

It bears notice that the term *kinetic melody* may sound frou-frou, unscientific, even "arty" to ears accustomed to the hard, rock-solid entities that populate specified regions of our brains in present-day neurology. But then we must face the fact that what is kinetic is not a hard, rock-solid entity, and in turn face the task of describing what is transitory. When proprioceptive awareness is ecologically defined simply in terms of "a spatial presence and a set of capabilities" (Gallagher & Marcel 1999: 290), for example, the transitory kinetic realities of self-movement are ignored. These realities are something sizably more than an ecological sense of oneself as being in a particular spatial setting, i.e., a sense of oneself as being *in* space and as having certain movement possibilities.[7] The living dynamic reality of movement itself and the actual experience of moving that goes with it, i.e., the lived-through experience of a distinctive kinetic melody or coordination dynamic, is not equivalent to being *in* space and as having certain movement possibilities any more than it is equivalent to being *in* time and as having certain movement possibilities. Proprioceptive awareness is not either simply a matter of *whethers* – "whether I am moving or staying still, whether I am sitting or standing, whether I am reaching or grasping or pointing, whether I am speaking or maintaining silence" (Gallagher & Marcel 1999: 290), and so on – but again, a matter of a particular *dynamics*, a kinetic dynamics that, in virtue of its spatio-temporal-energic kinetic patterning, is distinctive and thereby familiar, precisely as the experience of running, turning, reaching, throwing, picking up, putting down, and so on, indicates. In short, proprioception, like kinesthesia, centers on the experience of movement itself. We must therefore indeed heed Aristotle and "see that we understand what motion is." From an evolutionary perspective, our challenge could hardly be otherwise. As the categorization 'kingdom Animalia' incontestably indicates, living forms are animate and animated.

Conclusion

In conclusion, and to suggest in broad terms possible directions for future research, I would like briefly to adduce two final reasons – one psychoanalytic, one neuroscientific – in support of my critique of the terms and concepts 'body image' and 'body schema' and my recommendation of their replacement by corporeal-kinetic intentionality and corporeal-kinetic patterning.

Conclusions reached by psychiatrist Giovanni Stanghellini in his clinical work with schizophrenics are topical to the critique and to the recommendations. Quotations from his interviews with patients document his twofold diagnostic of schizophrenia and his explanatory thesis of its emergence: a morbid bodily self and a complementary morbid sociality are undergirded by "*the same objectifying attitude*" (Stanghellini 2003: 24; see also Stanghellini 2000). More precisely, the anchor post of each component is what Stanghellini terms a "de-animated body," a body that is lived at a distance from itself and that lacks spontaneity, and correlatively, that lives among others in the same distanced and non-spontaneous manner. As Stanghellini writes, "If one feels his self as a de-animated body, then the others' bodies are to him lifeless too. The disintegration of one's own sensory self-awareness implies the impossibility of attunement and without attunement the others are meaningless things – *Körper*" (Stanghelllini 2003: 24). That attunement disintegrates along with "one's own sensory self-awareness" is no wonder since a de-animated body is a de-temporalized one, one in which the flow of life stops dead in its tracks. *Körper* are indeed objects, spatial entities. A living body that is present only as a spatial entity is one incapable of a fluidity of movement and of a shared dynamics. An objective form – a *Körper* – is there, in other words, but the preeminent spark of life – spontaneous animation – is missing. The fundamental deficiency is not a deficiency in body image or body schema, but something far more basic: a sense of aliveness and the spontaneous animation that goes with it.

We see this sense of aliveness and the spontaneous animation that goes with it in non-pathological animate bodies, animate bodies that, from the beginning and across the animal kingdom, are kinetically motivated. In human terms, they are kinetically motivated to suck, to cry, to kick, to grasp, to reach, to smile. The ego is indeed "first and foremost a bodily ego" (Freud 1955: 26), a bodily-*kinetic* ego. It is kinetically motivated not only to suck, to cry, and so on, but to turn toward and to attend – to movement, touch, sound, light, smell – and others. It is kinetically motivated to develop coordinated kinetic dynamics in relation to what surrounds it. In effect, corporeal-kinetic intentionalities and patternings develop on the basis of kinetic motivations into a kinetic repertoire that is at once both personal and social, a repertoire of temporally constituted coordinated patterns of movement and possibilities of movement, and of ever more complex sequential activities.

Kinetic motivations that are fundamental to life find no home in what Stanghellini terms de-animated bodies. From this perspective, schizophrenia might be described as a kinesthetic/kinetic illness, that is, *a corporeal-kinetic illness*;[8] not that something is amiss with Golgi tendon organs, muscle fibers, or the like, but that there is a break in the dynamic flow of aliveness, of one's own aliveness and one's aliveness in concert with others. Objectified bodies – mere spatial presences – are either no longer naturally kinetically motivated or no longer find a natural attunement in whatever kinetic motivations they might have. They may indeed be kinetically motivated in self-damaging ways, as Stanghellini points out.

The neuroscientific research studies of philosopher Dan Lloyd are similarly topical to my critique and recommendations. Lloyd's fine-grained and highly original re-analyses of functional magnetic resonance imaging data recently won the $5,000 award offered by the fMRI Institute in New Hampshire for the most innovative use of its data (see Bower 2002 for report). What is of moment for us here, among the many significant aspects of Lloyd's re-analyses,[9] is his finding that, in the course of a variety of tasks performed by subjects in experimental situations, brain activity not only consistently changes, but does not come to an end on completion of the task. Brain activity is ongoing and inherently temporal (Lloyd 2002). Lloyd's re-analyses furthermore document that changes in brain activity are formally distinct: images temporally closer to one another resemble one another, while those farther away do not. At any particular moment, brain activity thus engenders aspects of its past and future activity (ibid.). Lloyd ties the temporal dimensions of fMRI recorded brain activity to Husserl's analysis of internal time consciousness, that is, to the foundational *flow* of consciousness and to the temporally constituting nature of consciousness (ibid.; see also Lloyd 2000). His remarkable findings concerning the temporal nature of brain activity clearly document not hypothetical spatial entities or structures in the brain, and not dedicated modules of brain activity, but ever-changing corporeal-kinetic patternings.

Lloyd's remarkable findings furthermore drive home the importance of Teuber's observation, for the temporal has conceptual links to the kinetic. Since the two are conceptually intertwined, it is not surprising that each "requires some different way of looking." Lloyd's different way of looking at already analyzed fMRI data discloses a dimension of brain activity hidden by the ontological commitments, even metaphysical baggage, that present-day neuroscientists typically bring with them. Their entity-oriented commitments precipitate attitudes akin to those of real estate enthusiasts who claim that "location is everything." Hence, in their zeal to pin things down, they typically overlook the fact that, as Aristotle long ago pointed out, "Matter will surely not move itself" (*Metaphysics*: 1071b30). Documenting the temporal nature of brain activity and opening us to a proper temporal conception of brain activity, Lloyd's findings affirm that studies of nature cannot rest secure on purely material foundations. The brain's inherent and coherent dynamics document the fact that neither time nor movement can be localized in the brain in the way that specific neurons, lobes, and myriad other brain structures can be; time and movement lack the solidity and permanence of objects and thus cannot be object-ified. Corporeal-kinetic intentionalities and corporeal-kinetic patternings accommodate this fact. They accommodate the moving nature of time and the fleeting nature of movement. In a word, they accommodate the animate.

Notes

* This essay was presented as the keynote address at the Body Image and Body Schema Conference at Ghent University in 2003, and, as requested, articulated an overall thematic for the conference.

1. For philosophers, at least, the example may well have its origins in the writings of A. I. Melden. See Melden 1966.

2. Luria speaks in fact of "*kinaesthetic melodies*" (Luria 1973: 253).

3. For a fuller discussion of the significance and its experiential foundations, see Sheets-Johnstone 2003b.

4. It is not only Kelso who decries the practice of explaining something by conjuring an entity in the head. Lecours, Nespoulous, and Desaulniers do the same in their discussion of the deficient heuristic value of psychological and psychopathological typologies of apraxia:

> "[U]nless one considers, for example, that it is an explanation to say, after observing ideatory apraxia, that this behavior testifies to the existence of a programming mechanism, and that dysfunction of this programming mechanism will lead to ideatory apraxia," the typologies are useless.
>
> (Lecours, Nespoulous, & Desaulniers 1986: 240)

Their earlier observation is similarly to the point. After reviewing standard teachings on apraxia and declaring that "Standard teaching on apraxia is no doubt coherent," they write, "To what extent … it correspond[s] to reality is another question" (ibid.).

5. Space does not permit clarification of the importance of distinguishing between perceptions of one's body, which are commonly static and punctual, and feelings of one's body, that is, kinesthetic awarenesses of the unfolding dynamics of one's body in movement. See Sheets-Johnstone (2003b).

6. Thus, with respect to mirror neurons, grasping happens here; holding happens here; and so on.

7. In a subsequent section of their article, Gallagher and Marcel attempt to provide the "ecological self" with "temporal extension," and thus temporalize its essential spatial character. They state, for example, "But proprioceptive and ecological awareness also must include a sense of self over time, a sense of self as temporally extended" (Gallagher & Marcel 1999: 23). The problem is that they nowhere recognize nor spell out how temporality is inherent in movement, hence inherent in proprioceptive and kinesthetic awareness. Indeed, the problem is indigenous to their point of departure, which upholds the following received wisdom: "Ecological self-awareness is normally considered to be momentary, providing a sense of posture or movement at any particular instant" (ibid.). It is equally indigenous to their reliance on an "implicit" sense of time with respect to capabilities and to past learnings (ibid.: 23–24). Foundational understandings of self-movement and its kinetic dynamics are obscured in both instances. In fact, they are obscured from the start by a "momentary" conception of proprioceptive awareness, as is evident not only in the above citation, but in the following statement concerning capabilities: "the very doing of an action brings into the momentary proprioceptive awareness of the actor the sense that he knows how to do *x*" (ibid.: 24). "Momentary" proprioceptive awarenesses are closely connected with sensational conceptions of self-movement discussed earlier in the text of this paper.

8. Subsequent to the writing of this paper, I chanced upon discussions of the work of psychiatrist Andras Angyal in Harry Hunt's *On the Nature of Consciousness*. Hunt quotes from one of several of Angyal's papers on "the phenomenology and cognitive bases of somatic hallucinations in schizophrenia" (Hunt 1995: 200), and speaks of "Angyal's model of the kinesthetic bases of somatic hallucinations in schizophrenia" (ibid.: 205).

9. Specific mention should be made of Lloyd's extraordinarily novel and meticulous methodology, which distinguishes itself from the subtractive methodology of fMRI researchers. The latter commonly calculate the average blood-flow in the brains of experimental subjects, then measure brain blood-flow in the subjects during a different activity. The latter measurement is then subtracted from the former, the former being taken as a measurement of brain activity in the subjects during the experimental procedure alone. Lloyd proceeds not by subtraction but by taking the experimental data, i.e., measured brain blood-flow during experimental procedure, as a whole into account. In particular, he considers blood flow changes as they are reflected in all of the digitized dots on an fMRI recording of experimental subjects while they are engaged in the task set them. He then performs a multivariate analysis of all of the thousands of dots generated in each subject's data, specifying volume patternings and relationships.

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Dynamic models of body schematic processes

Shaun Gallagher

1. Introduction

The terms "body image" and "body schema" have been used in a variety of disciplines, including psychology, neurology, medicine, psychopathology, psychoanalysis, and philosophy. In and across all of these literatures, however, one finds numerous conceptual confusions concerning distinctions that are either made or not made between these terms and other associated terms (such as "body concept" or "body-representation"). This confusion extends not only to definitions, but also to their clinical applications.[1] In this context, a number of researchers have objected to the very use of the concepts of body image or body schema. For example, De Renzi (1991):

> There have been attempts to attribute [various symptoms of spatial disorders] to the disruption of a common mechanism, identified as a hypothetical body image or scheme, but it is doubtful whether such a vaguely defined concept can provide a basis for interpreting symptoms dissimilar in nature and associated with different loci of lesion. (1991: 51)

Poeck and Orgass (1971) develop a systematic critique of the notion of a body schema. They complain that the concept of body schema is ill-defined and "difficult to reconcile with modern theories of central nervous functions" (Poeck & Orgass 1971: 254). They suggest that pathologies classified in terms of the body schema are too heterogeneous to be explained by this term. They note the lack of studies devoted to the development (ontogenesis) of the body schema. They conclude that the term "body schema" does not have an unequivocal meaning and that it should be given up. At the same time, they confirm that there is some well-circumscribed function subserving the control of posture and movement, and that this needs to be explained, preferably in neurophysiological terms.

To address these objections I have offered elsewhere a clear conceptual distinction between the concepts of *body image* and *body schema*. In specific, I have explored their neurological substrates, traced their ontogeny, and, with the benefit of a clear distinction, discussed specific pathologies that are well understood within this conceptual framework (Gallagher 2005; Gallagher, Butterworth, Cole & Lew 1998; Gallagher & Cole 1995; and Gallagher & Meltzoff 1996). In this paper I will provide a brief review of this work and its limitations. In addition, however, I want to consider some more recent objections that have been raised against the usefulness of the concept of body schema. Specifically, objections have been raised in critiques that have come from two very different directions: the neuroscientific and the phenomenological. Both sets of criticisms complain that the concept of the body schema is too static, and that to adequately explain movement and intentional action, a more dynamic concept is needed. I will argue that the body schema is a dynamic concept and is best understood in this way, and that these recent criticisms miss the mark.

2. The conceptual distinction and its applications

A clear distinction between body image and body schema is absolutely necessary if these terms are to serve any useful purpose. I have proposed the following definitions.

> *Body image:* a system of (sometimes conscious) perceptions, attitudes, and beliefs pertaining to one's own body.
>
> *Body schema:* a nonconscious system of processes that constantly regulate posture and movement – a system of motor-sensory capacities that function below the threshold of awareness, and without the necessity of perceptual monitoring.

The difference between body image and body schema is like the difference between having a *perception* of (or belief about, or emotional attitude towards) one's own body and having a capacity to *move* one's own body. Just as perception and movement are essentially linked, however, on the behavioral level, body image and body schema are normally integrated. What that integration is like, and to what degree it exists in any particular case, however, cannot be sorted out unless one first establishes the conceptual distinction. One way to establish the difference between body image and body schema is to examine certain pathological dissociations.

Consider, for example, unilateral personal neglect following brain damage from stroke. In some cases one may find the body schematic system for motor control intact, but the body image disrupted. A patient described by Denny-Brown suffers from personal neglect of the left side; she fails to notice the left side of her body and excludes it from her body percept. She fails to dress her left side or comb the hair on the left side of her head. Yet there is no motor weakness on that side. Her gait is normal, although she does not notice if her slipper comes off as she walks. Her left hand is held in a natural posture most of the time, and it is used quite normally in movements that require the use of both hands, for example, buttoning a garment or tying a knot. Importantly, she uses her left hand, and thus relies on the motor ability of the neglected side, for example, to dress the right side of her body (Denny-Brown, Meyer & Horenstein 1952). In this and similar cases (Ogden 1996; Pribram 1999) the motor functions of the body schema system are intact despite obvious problems with body image on the neglected side.

One can find a dissociation of the opposite kind in rare cases of deafferentation. There are a few documented cases of people who have lost tactile sense and proprioception (a felt sense of their own posture) below the neck. These people have profound difficulties with motor control. They control their movements only by cognitive intervention and visual guidance of their limbs. In effect they employ their body image (primarily a visual perception of the body) in a unique way to compensate for the impairment of their body schemas (see Cole 1995; Cole & Paillard 1995; Gallagher & Cole 1995). The lack of proprioception in these cases affects both the body schema (which becomes impoverished or non-existent) and the body image (which becomes enhanced and capable of use in motor control).

These two kinds of dissociations, then, provide empirical reasons for thinking that there is a real and useful distinction to be made between body schema and body image. Furthermore, the discussion of these pathologies in terms of body image and body schema provides a useful characterization that throws into relief our everyday non-pathological experience of embodiment. Use of this conceptual distinction is clarifying not just for these kinds of cases, but for a number of pathologies that involve embodiment (Gallagher & Vaever 2004).

To address the full range of criticisms made, for example, by Poeck & Orgass (1971), however, it is not sufficient to study cases in which there is a loss of body image or loss of body schema. One must also answer the question about how such things are gained developmentally. There is good evidence that body schematic processes are innate (emerging very early in pre-natal development) and that perceptual features of the body image begin to develop early in infancy, with emotional and conceptual aspects developing later.

It is known that proprioception functions even before birth, and the phenomenon of neonate imitation suggests that infants are born with good, albeit limited, motor control. Infants less than an hour old are able to imitate perceived facial gestures (e.g., tongue protrusions, mouth openings) and the movement involved in this performance is not reflex movement. Meltzoff and Moore (1989) were able to demonstrate a range of imitation behaviors in neonates, and to show that memory for the perceived gesture is involved in situations where the imitation is delayed (1994). Through a proprioceptive-visual intermodal mechanism, the infant is able to "translate" the perception of the other person's face into its own movement. This kind of imitative performance and the control of the movement involved in it is possible only on the basis of some body-schematic processes that function from the very beginning of post-natal life (Gallagher & Meltzoff 1996).

What is not clear, however, is how much of this depends on a primitive embodied self-awareness, or to what extent it may be the product of a perceptual priming (see Meltzoff & Prinz 2002, for debate). In either case, however, the phenomenon requires a body schema. If one can speak of a primitive self-awareness in this performance, one might also argue that this is the ontogenetic beginning of the perceptual aspect of the body image. Whether or not this proprioceptive aspect of the body percept (or in terms of Gibsonian psychology, the ecological self-awareness involved in movement and perceptual experience) is present at some level in the newborn infant, certainly before 12–18 months when the child recognizes itself in the mirror, some form of body image is generated. And it is subject to further development, emotionally and cognitively, in social, and later cultural and reflective experiences.

Cognitive, social, and cultural dimensions are important for understanding body schematic development.[2] One can, however, focus on more biological, genetic and phylogenetic factors that influence the process of body-schematic development even prior to birth. Evidence for this process can be found in studies of fetal development, and in the pathology of aplasic phantom limbs (that is, phantom limbs in cases of congenital absence of limbs). We can summarize the evidence as follows:

– Proprioceptors in the muscles (muscle spindles) ultimately responsible for a sense of position and movement first appear at 9 weeks gestational age (Humphrey 1964); spontaneous and repetitious movements follow shortly (De Vries et al. 1982).

- The development of semicircular ear canals that, as part of the vestibular system, later provide a sense of balance begins as early as the fourth month of gestation (Jouen & Gapenne 1995).
- Ultra-sonic scanning of fetuses shows that movement of the hand to the mouth occurs between 50 to 100 times an hour at 12 to 15 weeks gestational age (DeVries, Visser & Prechtl 1984). Hand-to-mouth movement is an aspect of an early, centrally organized coordination that eventually comes to be controlled proprioceptively. This kind of prenatal movement may in fact be precisely the movement that helps to generate or facilitate the development of body-schematic processes.
- These fetal hand-to mouth movements are mirrored in spontaneous but relatively organized movements that occur in human neonates until approximately the third month of life.[3] They suggests an innate coordination between the hand and the perioral region (Butterworth & Hopkins 1988; Lew & Butterworth 1995).
- Important here is the fact that in hand-to-mouth movements in early infancy the mouth "anticipates" arrival of the hand, unassisted by sight. Furthermore, these movements are not the result of reflex responses such as the Babkin reflex where the infant's mouth opens when the palm is pressed, or the rooting reflex.
- Anatomically, there is a network of interconnections in the primate between regions in the orbital and medial prefrontal cortex which receive gustatory inputs from cortical, and subcortical areas, as well as inputs from regions of the somatosensory cortex that represent the hand, arm and face. There are also projections from the ventral premotor cortex to these same prefrontal areas (Carmichael & Price 1995).
- Rizzolatti, et al. (1988) identified neurons in the prefrontal cortex (ventral area 6) that fire in relation to movements that can be described as "grasping with the hand and/or mouth." It is also the case that stimulation of ventral premotor cortex elicits both oral and hand movements in owl monkeys (Preuss, Stepniewska & Kaas 1996). This is consistent with the observation that the area of ventral premotor cortex plays a role in hand-to-mouth movements (for review see Jackson & Husain 1996).
- Carmichael & Price (1995) postulate a network in the prefrontal cortex (especially area 13l) that involves hand-mouth coordination and is dedicated to feeding behavior.

The complexity of the neuronal network makes it difficult to pin down all of the details. Such a network, however, is a good candidate for the innate neural basis for a specific body schema, the behavioral evidence for which we see in fetal and neonate hand-mouth coordination, and aplasic phantoms.

The notion of aplasic phantoms has been controversial because of the traditional understanding of the role of experience in the development of the body schema, and the requirement that a phantom depends on the existence of a body schema for the limb in question. Older theories suggested that someone born without a limb could not have a phantom of that limb since there had been no experiential use of that limb, and therefore no development of a related body schema (Piaget 1962; Merleau-Ponty 1962; Simmel 1961). A number of reports of phantoms in cases of aplasia, however, suggested that some aspects of the body schema may not depend on experience, but may be genetically encoded in the neurological substrate. The notion of an innate motor schema in connection with hand-mouth coordination is consistent with two hypotheses, both of which can help to explain the aplasic phantom as a product of innate mechanisms (Gallagher et al. 1998).

> *Hypothesis 1.* When a functional system is disrupted by failure of limb formation, the missing limb may nevertheless manifest itself as a phantom because a specific movement coordination is represented within a neural matrix that generates a body schema.[4]

As noted, the mouth moves to anticipate the arrival of the hand in the movement of early infancy. This implies that even if the hand is missing, it is not just the intact body part (the mouth) involved in the coordination. Insofar as the motor coordination schema itself is represented, there will also be an implicit representation of the "other end" of the coordination. Both sides of the circuit are neurally defined. Thus, stimulation of the mouth may be sufficient to activate the joint mouth-limb neural system. The phantom comes into existence when the coordination is activated.

> *Hypothesis 2.* In the developing cortex some aspects of the missing arm and hand come to be neurally represented simply on the basis of genetic instructions – that is, in development that takes place independent of actual arm movement (see, e.g., Rakic 1995).

If, in aplasia, the arm itself does not develop, the corresponding developing neural representations are not reinforced by movement or tactile experience as they need to be for normal and full development (see, e.g., Shatz 1990). Lacking experiential reinforcement they deteriorate to some degree, and are displaced or dominated by neighboring neurons, stimulation of which can generate phantom limb experience. This would explain the rarity of the aplasic phantom (reported in approximately 18% of aplasic subjects, in contrast to reports of phantoms in over 80% of amputees).

It is important to note that although one can specify central neural matrixes for body schematic processes, the body schema is not reducible to a purely central mechanism. Neurologically, the body schema depends on proprioceptive / kinesthetic / vestibular (and other sensory afferent) processes, registering in centrally organized neural matrixes, and issuing in (efferent) motor control commands. The cases of deafferentation mentioned earlier demonstrate the contributions of the peripheral systems (proprioceptive, but also vestibular and visual systems) operating in a living body. More generally, what we call balance and posture and movement are not things achieved by a body that is independent of an environment. Functioning body schematic processes are what they are because moving bodies move through environments; balance and posture is maintained or changed within a field of gravity – indeed, proprioception is attuned to the earth's gravitational field and is thrown off in the case of weightlessness in space or multiple Gs in supersonic flight. In addition, although the body schema does not involve a consciousness of the body as a direct intentional object, body schematic processes may generate an ongoing pre-reflective experience of the body as it performs and moves in ways that are intentional as well as sometimes automatic.

3. Body schema: Static or dynamic?

If the points outlined above respond to certain criticisms about the use of the concepts body image and body schema, they do not explicitly address a more recent criticism that has been developed in both phenomenological (Sheets-Johnstone 2003) and neuroscientific (Jeannerod 2002) perspectives. In effect, both of these recent critiques complain that the notion of the body schema is too static to be of use in recently developed dynamic models of movement. Do these critiques offer a principled or substantial objection to the concept of body schema – or do they simply offer alternative terminologies?

Sheets-Johnstone (2003) begins with a multi-pronged critique of Merleau-Ponty's use of the concept body schema. In place of the body schema, she offers Aleksandr Luria's notion of "kinetic melody" and insists that movement is a flowing, dynamic process involving a temporal dimension. Developed motor skills are "*integral kinaesthetic structures* or *kinetic melodies* . . . a single impulse is sufficient to activate a complete *dynamic stereotype* of automatically interchanging elements" (Luria 1973). She suggests that these *integral kinaesthetic* *structures* are "essentially, i.e., in a living, experiential sense, not brain events but corporeally resonant ones, in-the-flesh dynamic patterns of movement . . .. [that] constitute that basic, vast, and potentially ever-expandable repertoire of "I cans" (Husserl 1970) . . . permeating human life: walking, speaking, reaching, hugging, throwing, carrying, opening, closing, brushing, running, wiping, leaping, pulling, pushing." (Sheets-Johnstone 2003: 71). Let's see precisely how this forms the basis for her complaints against Merleau-Ponty, and how Luria's concept is an improvement.

First, despite Merleau-Ponty's extensive discussion of ontogenetic issues in which, on the basis of the psychology of his time, he specifies the developmental route of the body schema as dependent on experiential use, Sheets-Johnstone claims that Merleau-Ponty ignores the developmental story of the lived body – his concept of the habitual body, she claims, is ready made. "Merleau-Ponty's *habit body* is not only without kinesthesia but is also preeminently an adult body without a history" (2003: 81). Second, despite the fact that it doesn't seem possible to be correct about both of the following claims, Sheets-Johnstone suggests that (1) Merleau-Ponty's analysis of Goldstein's brain-injured patient Schneider, in *Phenomenology of Perception,* makes kinesthesia into something that does not exist "unless we sense it," and (2) Merleau-Ponty pushes kinesthesia into the pre-personal background. Third, despite the fact that Merleau-Ponty uses phrases like "a kinetic melody" (1962: 134), "melodic whole" (Ibid.: 132) the "melodic character" of a gesture (Ibid.: 105), and explains how a patient's movements have lost their "melodic flow" (Ibid.: 116) – and despite everything else that Merleau-Ponty says about the relationship between bodily movement and temporality – Sheets-Johnstone claims: "Because Merleau-Ponty does not examine *the experience* of movement, however, he never arrives at its dynamic kinetic structure" (Sheets-Johnstone 2003: 79).

Sheets-Johnstone maintains that the dynamism of movement is obscured by what Merleau-Ponty characterizes as the ambiguity, the anonymity, and the pre-personality of movement. I would argue that these are not incompatible characteristics. Dynamism is not necessarily characterized as unambiguous or personal. Indeed, robotic movement may be both unambiguous and non-dynamic. And the cases of deafferentation mentioned above are good examples of movement that depends entirely on conscious, personal-level control; observation of such movement shows a complete lack of dynamism. The fact that body schematic processes operate anonymously and pre-personally in fact allows for the dynamic character of movement. In the end, however, Sheets-Johnstone takes Merleau-Ponty's claim that the body schema involves a dynamic postural engagement with the world, a situated movement, rather than just a summary of sensation, to be a claim without effect.

Sheets-Johnstone also targets the specific concept of body schema as I have defined it above and as it is developed in other places (especially, Gallagher & Cole 1995). In this regard she writes:

> To begin with, a body schema has no basis in experience. It is at best an explanatory convenience, a hypothetical entity in the brain ... In contrast, a kinetic melody describes both what is constructed neurologically in the course of learning – a distinctive temporal course of innervations and denervations, as in learning to walk, to brush one's teeth ... and what is experienced – a distinctive dynamic flow of movement. (Sheets-Johnstone 2003: 85)

In effect, Sheets-Johnstone contends that the body schema is a static thing, whereas the "kinetic melody" describes a dynamic flow of movement.

> A kinetic melody is not a *thing* in the brain (or in the central nervous system) but a particular neurological and experiential dynamic. Each melody is in fact a *neuromuscular dynamic* whose innervations and denervations, together with the constantly changing muscle tone they generate, constitute a particular temporal organization. (Sheets-Johnstone 2003: 85)

Significantly, Sheets-Johnstone suggests that the dynamic nature of this movement can be modeled by Husserl's analysis of time-consciousness.

> A coordinated series of movements whose dynamics are engrained in kinesthetic memory is run off and recognized kinesthetically. As it runs off, it is unified by retentions and protentions (Husserl 1964) until the series and its familiar and unique dynamics come to an end. (Sheets-Johnstone 2003: 75)

In response to Sheets-Johnstone, I must say that the body schema has always been characterized as dynamic in a way that is perfectly consistent with Husserl's analysis of temporality and the requirements for a dynamical model in contemporary science. For instance, in its original definition, for Henry Head, the body schema is *retentional* in that it dynamically organizes sensory-motor feedback in such a way that the final sensation of position is "charged with a relation to something that has happened before" (Head 1920: 606). Head used the metaphor of a taximeter, which registers movement as it goes. Merleau-Ponty, borrows this metaphor from Head and explicitly associates it with temporality – movement is organized according to the "time of the body, taximeter time of the corporeal schema" (Merleau-Ponty 1968: 173). This includes a retentional component:

> At each successive instant of a movement, the preceding instant is not lost sight of. It is, as it were, dovetailed into the present .... [Movement draws] together, on the basis of one's present position, the succession of previous positions, which envelop each other. (Merleau-Ponty 1962: 140)

The *protentional* or anticipatory aspects of motor schemas are also well known. Indeed, a recent neuroscience account of the body schema makes reference to precisely the Husserlian account of time-consciousness that Sheets-Johnstone mentions (Berthoz 2000). Movement that is easily described in body-schematic terms clearly is described in terms of this protentional dimension. For example,

- The mouth of the newborn *anticipates* the hand.
- The grasp of a reaching hand tacitly *anticipates* the shape of the object to be grasped, according to the specific intentional action involved.
- Eye-tracking involves moment-to-moment *anticipations* concerning the trajectory of the target.
- Reaching for an object involves *feed-forward* components that allow last minute adjustments if the object is moved.

In effect, I see nothing that prevents us from translating Sheets-Johnstone's claim about kinetic melodies into a claim about body schemas.

> A [*body schema*] is not a *thing* in the brain (or in the central nervous system) but a particular neurological and experiential dynamic. Each [*schematic*] process is in fact a *neuromuscular dynamic* whose innervations and denervations, together with the constantly changing muscle tone they generate, constitute a particular temporal organization.

4. Body image: Dynamism and synchrony

Acknowledging the distinction between body schema and body image, Sheets-Johnstone also offers a critique of the notion of body image. She contends that the body image is a construct rather than an experience, and it doesn't adequately capture the unfolding dynamics of movement – the body image is "not up to the task" of describing self-movement. To this I would respond that although the body image often plays an important part in *learning* specific movements and skills, it was never meant to be a concept that captures the dynamics of movement. Nonetheless, recent research on shared neural representations for both movement and imagining movement (Georgieff & Jeannerod 1998; Grezes & Decety 2001) suggest that movement and the conscious representation of movement, body schema and body image, are not completely divorced in normal behavior. We normally activate the same neuronal patterns whether we act out a certain movement, or simply think about acting it out. Thinking about action is as dynamic as action itself.

Such shared neural representations may explain the ability of deafferented subjects to control their movement consciously. In this regard, however, Sheets-Johnstone claims that such deafferented subjects do *not* use a body image to control movement (contra Gallagher & Cole 1995), rather they know how to move because they have "a kinetic memory of what it is to reach, to grasp, to sit, to stand" (Sheets-Johnstone 2003: 86). This claim, however, goes directly against all evidence developed in these cases, and misses the serious motor deficiencies in cases of deafferentation. One deafferented subject, IW, is perfectly capable of remembering how to move, and precisely where his limbs are. But it does not help him move if he is in the dark. He requires vision and cognitive effort to make it happen. If after extending his right arm and holding it in front of him he is asked to close his eyes, the experimenter can move IW's arm to his side without him knowing it. If he is then asked to point to his right hand, IW will first remember where his left hand is (and this is a cognitive rather than a kinetic memory), and then move it under cognitive control to point to where his right hand had been before the experimenter moved it. So although IW does depend on a memory in some circumstances, this is not a kinetic memory, but a cognitive memory that is imposed on his body. Kinetic memory, if there is any in this case, is simply not sufficient for IW to control his movement. He requires conscious perceptual information for initiation, and he requires constant conscious monitoring of his movement. That is, he makes use of an enhanced body percept (body image) for control of movement. Moreover, he has to do this each time he moves. That is, although he is capable of forming cognitive habits for the control of movement (certain ways of thinking about how to move) he is incapable of forming motor habits. Every time he has to pick up a glass, for example, he has to think about how to pick up a glass.

Dynamics is not just about the flowing sequence of change of movement or experience, but about forces and structures implicit in that change. Sheets-Johnstone emphasizes the diachronic aspects of dynamics; but dynamics also involves synchronies that constrain and structure movement. Body schematic processes are not simply about change of position over time, the pure kinetic flow, but about the complex interactions of different parts of the body that are changing relationships throughout the movement, but that also impose limits on that movement. Synchrony is not something like a momentary snapshot –

as if relations between e.g., hand and mouth were frozen in a simple linear way in any particular moment.

A recent study shows this kind of dynamic sychronization in relation to the body image. Hunter et al. (2003) show that following regional anaesthesia of the hand, and along with the accompanying perceptual changes to the hand and arm, a significant number of patients also felt their unanaesthetised lips and mouth to swell. The experimenters theorized that this body-image change was due to the "unmasking of dynamic interactions between somatotopic adjacent cortical representations." Whatever the neurological explanation may be, the point is that there are organic synchronies that involve dynamic transformations among body parts that are functionally and experientially linked – and such dynamic transformations cut across both body schematic processes and body image.

5. The neurological critique

Marc Jeannerod develops a critique of the concept of motor schemas from a neurological perspective that mirrors the one offered by Sheets-Johnstone from the phenomenological perspective. Jeannerod targets the concept of schema put forward by Michael Arbib (1985; Arbib & Hesse 1986). Central to Jeannerod's view is the cognitive science notion of representation, taken to mean the complex neuronal firing patterns responsible for planning and carrying out bodily movement and action. The neuronal concept of motor schema is a way of describing the lower levels of a motor representation. According to Jeannerod (Jeannerod & Gallagher 2002[5]), it is a way of breaking through the levels of processing that may involve motor imagery and intention and going down to the most elementary one, perhaps at the level of a small neuronal population. But action, Jeannerod rightly insists, is something more than a snapshot activation of some neuronal population. For a correct characterization of actions the correct level of discourse involves the complex and dynamic representations and networks.

In addition, Jeannerod argues, networks, in contrast to schemas, are things you can see by means of brain imaging techniques. Networks are physical processes and one can actually see the activation of specific neural ensembles, and the possible overlaps and distinctions among such networks. In contrast, Jeannerod considers the notion of schema to be a theoretical construct. Of course, for Jeannerod, capturing a snapshot of a network in action by means of brain imaging is not enough: one needs to capture the dynamic nature of networks. In contrast to networks, however, schemas seem to be just these kinds of snapshots and remain too static.

> . . . here is the problem of the temporal structure of nervous activity. There are no real attempts to conceive the temporal structure in the schema. The schema is a static thing, ready to be used. You take one schema, and then another, and another, and they add up to an assembly or a larger schema.
> (Jeannerod & Gallagher 2002: 12)

Thus, Jeannerod conceives of schemas as inadequate synchronic snapshots of motor-neuronal processes – or as Sheets-Johnstone says, "things in the brain."

In response to this critical view of motor schemas there are many things to be said. Let me begin with Arbib's response (Arbib & Gallagher 2004). Arbib traces his concept of motor schema back to Henry Head's notion of body schema, and in this sense it is, in some degree, consistent with the concept outlined earlier in this paper. It is clear, however, that for Arbib, as for Jeannerod, motor schemas, like networks, are specific brain processes. Arbib emphasizes the complex synchronic features of schemas, and in the process of describing movement does not leave out the perceptual experience that goes with motor control.

> For example, in a particular situation, a person has to recognize many things – the people sitting around the room, the furniture in the room, the location of a particular object the person is looking for – and this means that one has different schemas for recognizing the object, the furniture, and the people. Furthermore, such schemas may have to be combined in order to represent a totally novel situation. One thus calls upon the appropriate knowledge for making sense of that situation. I call this schema assemblage. At any particular time there is a network of interacting schemas pulled together to represent the situation. It's possible to provide a microanalysis of how schemas are integrated into abilities for recognizing objects and acting on them. This kind of integration gives you a wide ability to cope with novel situations in their complexity. (Arbib & Gallagher 2004: 54–55)

In contrast to Jeannerod's characterization of schemas as lower level static structures, Arbib emphasizes their hierarchical complexity which cuts across motor, perceptual, and cognitive aspects of experience, and their dynamic nature.

> The schema concept is hierarchical, bridging from the highest cognitive levels to networks of schemas localized to specific neural networks. Schema theory has long made contact with "higher cognitive functions", including language. Elementary motor schemas are stored for "automated actions," but they should be distinguished from *dynamic coordinated control programs* which can

> recursively define new schemas as a network of previously defined schemas which includes the ability to activate and deactivate these subschemas as the situation demands. The point is that something like higher-order or intentional "deliberation" may require explicit construction of a symbolic model (but that's still schemas!) to guide construction of the *executed* coordinated control program – which may then need to be restructured in the face of unexpected contingencies – and so we put stress on *dynamic planning*.
>
> (Arbib & Gallagher 2004: 55–56)

For Arbib, schemas are not snapshots, but dynamical processes that involve assimilation and accommodation (borrowing Piaget's terminology). Schematic combinations that define a certain action may become stabilized but then may be tuned in a way that over-rides their original schematic structure. "Schemas contribute to the generation of an assemblage of schema instances and these in turn generate new tunable schemas" (Arbib & Gallagher 2004: 56). In this regard, however, Jeannerod and Arbib are in general agreement and seem only to be deploying different terminology to describe the brain processes important for action.

In response to both Arbib and Jeannerod's emphasis on brain processes, I would take up a position that is favored by Sheets-Johnstone, as well as by Merleau-Ponty, and others. That is, that brain processes, whether they are motor, emotional, perceptual, or cognitive, cannot explain everything that we need to explain in regard to such aspects of experience. As emphasized above, body schemas are not purely brain schemas; they involve more general constraints placed on action by the whole body as it moves through an environment. In this regard a conception of a dynamical system that extends across these different dimensions, that is enactive, embodied and ecological, and consistent with a Husserlian conception of time-consciousness, avoids the implicit reductionism that focuses purely on brain processes (see Gallagher & Varela 2002).

6. Conclusion

I want to reject the specific conclusion reached by Sheets-Johnstone, and at the same time embrace the general tenor that motivates her critique. I find her specific conclusion unacceptable, namely that

> (...) kinetic melodies describe the reality of movement in neurological and experiential ways that neither body schema nor body image can approximate. Body image and body schema are no match for this bodily-kinetic dynamic.
>
> (Sheets-Johnstone 2003: 86)

I am tempted to say that both Sheets-Johnstone's and Marc Jeannerod's suggestions are at best terminological and not conceptual points, since there are clear ways to think of body schematic processes and even the body image as dynamical processes.

While the terminologies of "network" and representation offer no improvement over the terminology of schema, as Arbib shows, I think that the notion of "kinetic melodies" seems more metaphorical than what one requires for specific descriptions of neurological or experiential aspects. I have not attempted to argue, however, that schema terminology is *better* than the terminologies of kinetic melodies, networks, representations – I'm quite willing to let the democracy of science decide that in the long run. In the short run I find myself in agreement with Alain Berthoz: The concept of the body schema is "a little woolly but turns out to be surprisingly useful" (2000: 227). I think the terms *kinetic melody*, *network*, and *representation* are no less woolly, but I also think that further conceptual clarification of such things, including *body schematic processes*, is quite possible especially in an enactive framework that employs the phenomenological model of retentional-protentional structure, and the neuroscientific model of dynamical systems theory.

Notes

1. I review the nature and extent of these confusions in other texts (see Gallagher 2005; Gallagher 1995; Gallagher & Cole 1995).

2. One should not rule out social and cultural aspects in this respect. As previously noted, on the behavioral level body image and body schema are normally integrated. One's gate (a body schematic function) may have much to do with one's gender, the sports or exercise routines that one participates in, or simply observes, whether or not one is depressed, or treated well at work, or even the neighborhood in which one lives. These factors modify one's body schema either directly or indirectly through one's body image.

3. De Vries (et al. 1984: 48) states: "There was a striking similarity between prenatal and postnatal movements, although the latter sometimes appeared abrupt because of the effect of gravity." Also see (Hopkins & Prechtl 1984; Prechtl & Hopkins 1986).

4. This hypothesis was first suggested by George Butterworth (see Gallagher, Butterworth, Lew, & Cole 1998). The view summarized here is consistent with Melzack's concept of an innate neural matrix (Melzack 1989 1990).

5. Jeannerod & Gallagher (2002), and Arbib and Gallagher (2004), cited below, are interviews that I conducted with these two neuroscientists, published in the *Journal of Consciousness Studies.*

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Part IV

Clinical approaches and the mirror stage

Phenomenology and psychoanalysis on the mirror stage

Different metaphysical backgrounds on body image and body schema

David Van Bunder and Gertrudis Van de Vijver

(...) virtually the entire body of modern science is an attempt to explain phenomena that cannot be experienced directly by human beings. (Lewontin 2000: 3)

1. Introduction

The current distinction between body image and body schema rests on the distinction between reflective (self-referential) versus non-reflective intentionality. The body image consists of representations and beliefs that have a reflective status in that they have as their object the own body. The body schema is non-representational and non-reflective in that the object is not the own body. This paper aims at (i) clarifying the status of reflective versus non–reflective intentionality, (ii) articulating in what sense body image and body schema capture, each in their own way, a form of unification of bodily experiences, and (iii) highlighting the basic ontological and methodological differences between phenomenological and psychoanalytical viewpoints at this point, as can become clear from Lacan's and Merleau-Ponty's viewpoints on the mirror stage.

In Gallagher and Cole (1995), the idea of a *reflective intentionality* is crucial in distinguishing between body image and body schema. The *body image* "consists of a complex set of intentional states – perceptions, mental representations, beliefs, and attitudes – in which the intentional object of such states is one's own body" (Gallagher & Cole 1995: 371).[1] The body image thus takes the "own body" as the object of intentional reflection. The *body schema,* on the other hand, "involves a system of motor capacities, abilities, and habits that enable movements and the maintenance of posture", and thus "operates below the level of self-referential intentional activity" (Gallagher & Cole 1995: 371). So, the distinction suggests that there are at least two ways in which the body is given to us in a more or less cohesive way: one in which it "moves together", on itself, in a way non-mediated by representations, beliefs or attitudes, that is, without being taken as an object (body schema), and another in which the own body is *taken as* an object, giving rise to a different functioning mediated by representations, perceptions, attitudes and beliefs (body image). Even if these two ways of functioning are intimately interwoven, they are often placed within a stratified viewpoint – the body schema is a requisite condition for the body image, that seems to come "on top of" it or "in addition to" it – and various forms of pathology are taken to argue for their separability in principle.

The proposed distinction seems straightforward in as far as it applies to our daily experience. Indeed, most of us would agree with the fact that a body is something that "moves together" on its own, in driving a car, in walking down the street, in correcting posture. Also, most of us prove to be capable of distinguishing, verbally and perceptually, between the own body and that of others. This involves the capacity to identify "something that moves together" as in some sense belonging to our selves. These daily experiences, either at the level of the body schema or of the body image, are so evident that most of the time they pass unnoticed and are silently and commonly entertained. As long as the body is left immersed in motor or kinetic activity, it seems to function relatively well. Similarly, as long as the collection of representations and beliefs about the body is immersed in verbal, perceptual or emotional activity, it remains largely unquestioned.

The trouble begins, however, from the moment one endeavours to precisely identify their status, or to define exactly their mutual relation, something which is only possible from within a representational, symbolic point of view. From that moment, their evidential immersion has to make place for a specific kind of reflective extraction, in which the body, in its status as body schema or body image, is "lifted out" of its so-called evidential basis, and in which it comes under discussion in a radically perspectivist way. Indeed, with the adoption of a *symbolic (cognitive), reflective perspective* on the body, bodily meanings (or experiences) are no longer evident but are to be specially argued for from within the perspective.[2]

What then is the merit today of those scientists and philosophers who stress the need to include the perspective of the body? In what sense does the perspective of the body make a difference with regard to so-called disembodied views?

What is the status of reflection from an embodied viewpoint? Does the naturalistic turn in phenomenology really make a difference with regard to Husserl's account? Does it make a difference with regard to the Cartesian point of view? And what is the difference between psychoanalysis and phenomenology on this point?

One of the objectives of the present volume is to clarify these multiple perspectives as well as their sources of divergence. This paper attempts to contribute to this aim on the basis of two ideas. A first idea is that the differences between various perspectives can be relevantly interpreted in terms of divergent metaphysical backgrounds, in which different ontological priorities and interests prevail. It is our conviction that ontological priorities to a large extent determine methodological issues. A second idea is that it is useful to consider the development and functioning of a reflective perspective as an instantiation of the dialectics between organisational levels. Within an organisational or structural viewpoint, not only will the idea of the body as well as the experience of the body be layered out. In addition, the idea of a direct experience of the body will be considered as having only a negative relevance, in terms of an absence, a friction, a disturbance, around which more or less convenient myths or metaphors, such as the body schema or the body image, that function as interpretive contexts, are constructed. These two ideas will be illustrated on the basis of the mirror stage as dealt with by Lacan and Merleau-Ponty.

2. Metaphysics of presence versus metaphysics of non-presence

Let us start with the idea of metaphysical backgrounds,[3] and return therefore to Gallagher's and Cole's account of body image and body schema. As we know, their viewpoint on the body image rests on the idea of a reflective or self-referential intentionality: the body image has the "own body" as its object. What is the status here of "the own body" and what is the status of reflection or "self"-reference? It seems obvious to consider the "own body" in this context as some entity that moves together coherently, that impresses by its constant structure, as Freud formulates it in his *Project* (Freud 1950c [1895]). What Maxine Sheets-Johnstone refers to (this volume) in terms of corporeal kinetic patterning can be considered as the body that "moves together" on its own. Or in other words, we take it that the object is, at least partially, based on the global and coherent motor and kinetic functioning, an idea which is captured through the notion of the body schema. Thus, in a sense the body image is the result of a process of reflective intentionality that has the motor and kinetic body as its object. But again, what exactly is meant by reflection here? What does it mean that the body image *takes* the own body *as* an object? Let us start from two possibilities that can be encountered in the literature today.

Firstly, within a *naturalistic* perspective, reflective intentionality can be considered in terms of particular feedback processes that are embedded in the overall interactive processes of the living system. The basic terms of the feedback loop then seem to be on the one hand the global motor and kinetic functioning and on the other hand the representational and perceptual account of the body.

A first group of questions arises around the specific relation between the two terms. What exactly shall the relation between the representational and the motor system, consist in? Does the representational system come "on top of" the motor system? Does it *emerge* from it? How to understand its formation as well as its functioning in terms of a form of reflective intentionality? In other words, does the idea of being part of a feedback loop sufficiently account for the idea that the other part is "taken as" an object? Or in other words, what is the difference, if any, between a simple causal interaction and a reflective interaction?

A second group of questions arises regarding the body schema. What reasons are there to assume that the own (motor) body is "directly" and "evidently" experienced as a moving object, is "present" to itself, and can serve in this capacity as the "objective" basis for the intentional relation, that on its own it gives rise, so to speak, to the intentional reflection? Why should the body be *taken as* an object?

The account of Gallagher and Cole, that seems to be shared today by many scientists and philosophers, suggests that the "own body" is something that feeds in to the construction of the body image, something that provides in some sense for content, however partial and temporal it may be. Reasonings in terms of synchronization, imitation, or empathy, in as far as they are based on resonance, suggest a stage-wise construction, in which the underlying stage provides as such for the contentful input in the construction of the upper stages.

This is one possible metaphysical option underlying the distinction between body image and body schema. It implies a hierarchical and quite static view on reality, in which the body is at some point evidently present to itself. This is a metaphysical position that we identify as a metaphysics of presence.[4]

It is problematic for a number of reasons. Firstly, it is questionable whether the intentional reflective relation is to be seen as a "gratuitous" perspective on the body, one that leaves the "presence to itself" of the own body unaltered.

Secondly, it is questionable whether "the own body" is a term that can be unambiguously and positively identified on the basis of its direct experience. Thirdly, it is vague what the term "self" here refers to (the body image is self-referential and the body schema is underneath the level of self-referentiality). The self seems to be assumed as the point that somehow, at some level, is evidently present to itself. And finally, the abstract difference between a mediated and non-mediated treatment of the body is not really made clear, as it is not clearly linked to different modes of accessibility of bodily experiences.

An alternative option, to be situated within a naturalistic account as well, considers the distinction between body schema and body image as the result of a process of co-construction and even re-construction in the development and functioning of the human being. Within such a viewpoint, the accessibility to the "own body", seen in its capacity of a thing moving together, will be realised and created as a consequence of the functioning of a representational, perceptive and emotional system. In other words, the presence to itself of the "own body" will be revealed as a reconstruction after the facts, a mythical artefact of the representational system. Instead of a stagewise progression, the operation of "taking something for something else" can be seen from within a dynamic, triadic (Peircean) relation, one in which there is the sign – that which stands in need of interpretation (the own body) – the interpretant – that to which it refers – and the interpreter – that which constitutes the context or perspective of interpretation (cf. Van de Vijver 1999, 2000). In this case, the intentional reflective relation can no longer be viewed as a gratuitous relation, it is part of an interactive process in which the terms are continuously co-constructing each other. To our knowledge, Gallagher and Cole do not consider the intentional relation in triadic or interactivist terms. On the contrary, their way of dealing with "the own body" suggests that the body is in some sense objectified or at some level evidently present and can serve in this quality as a basis for intentional reflection.

The second option, identified here as witnessing of a metaphysics of non-presence, is closer to a process view in which the dynamical interactions have ontological priority over the more or less fixed states to which dynamics can give rise, and in which the experience of the body is unavoidably mediated, making its direct access through experience an impossibility, and the belief in such a direct access a point of mythical convenience.

It is, however, also possible to think about intentionality along non-naturalistic lines. Here, the reflective intentional relation will be seen as a purely *constitutive* relation, whereby constitution is not at all conceived of in naturalistic terms, but explores, from the viewpoint of consciousness, the logical space of conditions of possibility of a particular object under study. Here also, two different metaphysical options, related to presence and non-presence, are possible.

As far as Husserl is concerned, it can be said that the constitutive interpretation of intentionality rests on a *metaphysics of presence*. As Derrida has brilliantly shown in *Speech and Phenomenon* (1967), with regard to Husserl's first Logical Investigation (Husserl, Logical Investigations 1900–01), the phenomenological endeavour of Husserl metaphysically rests on the assumption of a "point-source", a point of absolute and original presence of consciousness to itself, that serves, time and again, as the background against which intentional processes take place. This metaphysics makes itself felt most clearly in Husserl's ideas about intuition, that present us with prototypical cases of provisional and incomplete fulfilment (Erfüllung) that nevertheless are situated against the background of the unreachable limit of completeness. Husserlian phenomenology is deeply faithful to a metaphysics of presence of consciousness to itself, even where he explicitly takes the body into account.

In criticizing Husserl, Derrida proposed, instead of a metaphysics of presence, a *metaphysics of non-presence or "différance"*, in which the starting point is not the evidence of the self as originally present, but on the contrary the irreducible, original non-presence of the self. Starting from a metaphysics of non-presence, it becomes crucial to define the means of accessibility, in our case, for instance, of a body that in the movement of being accessed is simultaneously constructed in a particular way. In other words, the task here is to explore the means of *detour* or of mediation on the basis of which something as a self, or an own body, is constructed or constituted. How to be present to oneself, on the basis of which means, on the basis of which reflections, of which perspectives? Where is our self located? Or better: where is our self, time and again, provisionally and locally, located by which instances? These are the crucial questions from within a metaphysics of non-presence.

Our analysis in terms of metaphysical backgrounds suggests that the difference between naturalistic and non-naturalistic approaches of intentionality is perhaps not the most crucial one in the debate about the body. As a matter of fact, as there can be, metaphysically speaking, basic similarities between naturalistic and constitutive approaches, it might be more relevant to search for possible connections between fields as different as phenomenology, psychoanalysis and neurosciences, on the basis of their possibly divergent metaphysical backgrounds.[5] This is what we intend to do in the rest of this paper, in elaborating a comparison between phenomenology and psychoanalysis on the basis of Merleau-Ponty's and Lacan's discussion of the mirror stage.

3. Lacan and Merleau-Ponty on the mirror stage

In reviewing Lacan's and Merleau-Ponty's viewpoints on the mirror stage, it has become clear to us that a comparison between (recent) phenomenology and psychoanalysis, regarding the concepts of body image and body schema, is not at all straightforward. Firstly, these concepts apparently have different meanings in both fields. Not only is the notion of body schema simply absent in psychoanalysis, the concept of body image is used in a way that clearly differs from recent phenomenology. Secondly, there is a discrepancy already between Merleau-Ponty's use of these concepts and that of recent phenomenologists. A close reading of Merleau-Ponty's texts reveals that his handling of these notions is at many points closer to psychoanalysis than to current phenomenological interpretations. So, whereas Gallagher's viewpoint seems to take Merleau-Ponty as one of the major sources of inspiration, it does not seem so evident to call upon him as a support for the (naturalistic) phenomenological viewpoint on body image and body schema as it is currently sustained.

3.1 Merleau-Ponty

As we have seen above, current phenomenology articulates the difference between body schema and body image on two points:

1. The body schema consists of (mostly) non-conscious processes that regulate posture and movement. The body image, on the other hand, is a (conscious) representation of the own body. It consists of perceptual, cognitive and/or emotional representations.
2. The body schema refers to the possibility to move, the body image to the capacity to reflect.

Gallagher notes that body image and body schema do not necessarily function independently of one another, but he remains largely silent on their possible cooperation, except in a negative sense. Indeed, unless one of the two terms is deficient, implying that the other takes over those functions until then exercised by the first, their cooperation remains quite mysterious (i.e. the case of IW, Gallagher & Cole 1995: 385). It is clear also that both body schema and body image involve intentional modalities of bodily functioning: the body schema concerns some kind of bodily intentionality in which the world is taken as intentional object, the body image is an intentional modality of consciousness in which the "own" body is taken as intentional object. Both play an important part in the constitution of body ownership, however in different ways. The body schema interacts with the world and gives us an idea of our own body, as something that remains constant during different perturbations. The body image takes the body as the object of an act of consciousness and thus creates a relation between consciousness and the "own" body. We reissue therefore the question addressed in a more theoretical way above: what is the exact nature of this "own" body? What can we learn from Merleau-Ponty and Lacan on this point?

Merleau-Ponty discusses these questions in his Sorbonne course on the relation between the child and the other (Merleau-Ponty 1988: 303–396). This course revolves around the question as to how the other comes into being for a child, how the relation between a child and the other is established. Departing from the corpus of psychological science of his days, Merleau-Ponty concludes that this question can not be answered because it starts from the notion of coenaesthesia. According to Merleau-Ponty, coenaesthesia concerns purely individual experiences of the own body. As an alternative to the concept of coenaesthesia he proposes the notion of a body schema or a postural schema. This body schema is a system in which different perceptual modalities are integrated and that contains information about the relation between the body and its environment. The difference between body schema and coenaesthesia is precisely related to the latter point. The idea of a body schema implies that we can not think of the experience of the body apart from the environment: the bodily experience is organised on the basis of this interaction. Perceptual (and maybe even cognitive and emotional) reflection on the own body, interacting with the environment, is not necessarily excluded from this. In our view, this is a first difference with the way in which the concept of body schema is used by Gallagher. According to Merleau-Ponty, reflective intentionality, whereby the own body is the object of reflection through the mediation of he environment, is not necessarily excluded from the body schema.

Moreover, Merleau-Ponty states that the experience of the body is in first instance interoceptive; exteroceptive experience is added later on. Gallagher and Meltzoff interpret this passage as applying to perception. In their view, Merleau-Ponty states that the newborn does not have the capacity of outer perception. Merleau-Ponty, however, states the following: "Originally, it is an interoceptive body. Exteroceptivity can only be exercised in collaboration with interoceptivity. It is a *buccal* body (*buccal* space of Stern) and a *respiratory* body. In the next phase, the child perceives the regions that are linked with the functions of excretion. The interoceptive organs will function as exteroceptive organs, until the moment when these two domains will be welded (this justifies the importance psychoanalysis accords to the mother child relation)"

(Merleau-Ponty 1988: 312–313, our translation, italics original).[6] It is not at all obvious to interpret this passage as an indication of the absence of outer perception. Rather, Merleau-Ponty seems to suggest that the experience of the body is generated on the basis of an interaction with objects of the outer world. A first sense of the "own" body originates because in the child's experience certain things disappear and others remain present. This experience is related to those regions of the body in which a passage between an inside and an outside is possible.

This implies that, still according to Merleau-Ponty, consciousness of the own body is, at first, fragmented. At the age of approximately six months, the child develops a visual representation of the body. Merleau-Ponty does not mean that before this time, the child has no visual representations of the own body or of the other. What happens at the age of six months is that the child develops a representation of the complete body as being one. At this moment in his course he discusses Wallon's mirror stage, combined with Lacan's comments. Both Guillaume and Wallon assume that the child is able to recognise the other's mirror image prior to its own. Furthermore the child is able to differentiate between the visual image of the other and the mirror image of the other. Thus, the infant has two images of the adult in front of the mirror, but only one visual representation of its total body. Merleau-Ponty summarizes what happens during the mirror stage as follows: "The child needs to understand that this image is not him, because he is where he feels himself interoceptively. However, it also needs to understand that it is visible for the other at the place where it feels itself, just like it can see its image in the mirror (our translation)"[7] (Merleau-Ponty 1988: 316) The child notices its mirror image prior to the mirror stage, but is unable to relate this image to the experience of its body. Furthermore it appears that the child is unable to recognize the virtuality of the mirror image. Thus, what happens during the mirror stage is that the child recognizes itself in the mirror image, in other words, the child relates two perceived instances. How then, is this relation established?

According to Wallon, this occurs as the result of an intellectual operation. But not so according to Merleau-Ponty. He enumerates a number of experiments that demonstrate that the child continues to question the relation between image and reality for a long time. The correspondence between the experience of the own body and the perception of the Gestalt in the mirror is not perfect. This will be his major disagreement with Wallon, who interprets the mirror stage as an intellectual operation. "*This is not an intellectual phenomenon*, as Wallon thinks, *because such a phenomenon is understood once and for all or is not understood at all (law of all or nothing)*" (our translation).[8]

(Merleau-Ponty 1988: 317, italics original) Furthermore, Wallon is unable to explain either the interest of the mirror image for the child, or the jubilation that accompanies the mirror stage. Thus, Merleau-Ponty concludes that Wallon's account needs completion. This completion will allow us to differentiate on a number of points between the meaning of the notion of body image in current phenomenology and in Merleau-Ponty's account.

3.2 The body image is an identification and not a representation

Merleau-Ponty appeals to Lacan and psychoanalysis to complete Wallon's account. In his famous paper on the mirror stage, Lacan stresses the jubilatory reaction of the infant to its mirror image. Furthermore he notices that this jubilatory reaction to the mirror image disappears rather abruptly at the age of approximately 18 months (Lacan 1975: 190–191). This leads Lacan to the assumption that we need to understand the mirror stage as an *identification*: "We have only to understand the mirror stage as an identification, in the full sense that analysis gives to the term: namely, the transformation that takes place in the subject when he assumes an image (...)" (Lacan 1977: 2)[9] Merleau-Ponty takes this sentence as a starting point to complete Wallon's account of the mirror stage. He remarks that the child constructs an Ego during the mirror stage, an Ego that is visible to others. This enables the child to take a different viewpoint on itself: "The child becomes capable of being a spectator of himself. He is no longer just a sensed ego, but a spectacle; he is someone that can be seen". [our translation] (Merleau-Ponty 1988: 319)[10]

The disappearance of the triumphant reaction of the child is an indication of the fact that it has assumed the body image. At the same time Merleau-Ponty draws our attention to a paradox, inherent to the mirror stage. The child creates an Ego, but it does so by alienating itself to an image, to an other: "At the same time, this image of the own body allows for a sort of alienation, appropriation of me by my spatial image." [our translation][11] (Merleau-Ponty, 1988: 319).

According to Merleau-Ponty this constitutes one of the main differences between Lacan and Wallon. The mirror stage is not just about integrating various sensations. By considering it as an identification it is first and foremost an indication of an altered relation with the other and with oneself. The identification with the image is an identification with the other (cf. Le Gaufey, this volume). The relation we have with our body is, from that moment on, mediated by the image, by the other.

As a result of considering the body image as an identification, the meaning attributed to it by Lacan and Merleau-Ponty is different from the meaning we find in current phenomenology. Gallagher seems to assume that the body image is an objective (or at least objectifying) representation of the own body. The (moving) body is the object of the body image.

The body image, conceived of as the mirror image, on the other hand is not a gradually developing representation. The mirror stage indicates the moment at which the subject alienates itself to an already existing image and assumes the mirror image. This body image is not the result of reflectively perceiving one's own body. Rather, the fragmented perception of the own body is identified with the total image in the mirror. This mirror image was already perceived by the infant, however, it was not assumed.

Identification is a therefore process in which an individual considers an external element as being part of itself. Paradoxically, the identity that is thus acquired originates in the assumption of an external element. Thus, according to psychoanalysis and Merleau-Ponty, the body image is not the result of representing one or the other aspect of the body, such as the moving or kinetic body. It results from the recognition of the image in the mirror, of the human *Gestalt*.

To summarize, it can be said that according to current phenomenology the body image is constructed as a representation, while according to psychoanalysis the body image already exists and is, so to speak, waiting until someone identifies with it.

3.3 The body image has a unified character and is not partial

Lacan stresses a second property of the body image: it has a unifying character. This is a direct consequence of the context in which Lacan thinks about the body image. Contrary to current phenomenology, Lacan's main focus is not on experiments with children or people with neurological lesions. His frame is constituted by psychoanalytical praxis, and the way in which the body image appears in this praxis by means of speech. Furthermore, he accounts for the alternative ways in which the body image functions with neurotic and psychotic people. Central in his account, is the tension between unity and disintegration of the body image. Whereas neurotic people generally have a unified body image, in psychosis, on the other hand, one is confronted with its disintegration. In schizophrenia, the body is not experienced as a unity, but more as a collection of loosely linked parts that can dissociate from the rest of the body. Whereas this disintegration may be exemplary in psychosis, it is not strange to "ordinary" people either. Lacan points to it in hysteric conversion symptoms, which do not follow the laws of human anatomy, but rather those of an imaginary anatomy. Foremost however – Lacan is a psychoanalyst –, this tension is present in human sexuality. Just as certain ethologists, Lacan stresses the importance of the image (as a *Gestalt*) in the sexual function. The object searched for by human beings to satisfy their sexuality, however, is always a partial (disintegrated) object that needs to be integrated in an image (Lacan 1975: 159). In other words, from the viewpoint of human sexuality, the image is not the consciousness of an object, but rather serves to camouflage the (disintegrated) object.

Merleau-Ponty also indicates that the body image is a Gestalt, a total form of the human body. Like Lacan, he states that the global character of the body image is not a permanent acquisition. The possibility of regression remains present. The unity, acquired during the mirror stage, can disintegrate: "The phenomenon, understood in this way, will necessarily have an imperfect character and there is no longer question of an ideal synthesis in which anticipations and regressions become hard to think." [our translation][12] (Merleau-Ponty 1988: 320).

Again we can notice that Merleau-Ponty's use of the notion of body image has more points in common with Lacan than with current phenomenology. Both Lacan and Merleau-Ponty stress the *Gestalt* character of the body image, while Gallagher and Cole state: "(...) body image involves a partial, abstract and articulated perception of the body insofar as thought, attention, and emotional evaluation attend to only one part or area or aspect of the body at a time." (1995: 373) This conclusion is a direct consequence of their definition of the body image as a form of reflective consciousness. According to Lacan and Merleau-Ponty, the body image rather is a system that organises and structures our perception.

3.4 Body image and body schema: a matter of dialectics between organisational levels

Above we mentioned that Lacan and Merleau-Ponty think of the body image in terms of *identification*, and Gallagher in terms of *representation*. This idea has far-reaching consequences as to the relation between the image and the body. Furthermore it allows us to elaborate a developmental viewpoint on this relation that is absent from current phenomenology.

The relation between the body and the body image is little developed and remains vague in Gallagher's work. The idea of representation suggests that the body image takes the body as an object of consciousness. But, as noted above, the question with regard to the nature of this body remains unanswered. From certain passages we might even conclude that the body schema is the object of the body image, whereby the body schema is equalled to the motor and kinetic functioning itself: "The conceptual distinction between body image and body schema is related to the difference between having a perception of (or belief about) something and having a capacity to move (or an ability to do something). [...] So the difference between body image and body schema is like the difference between a perception (or analysis or monitoring) of movement and the actual accomplishment of movement." (Gallagher & Meltzoff 1996: 215) Furthermore, Gallagher suggests that body image and body schema function to a high degree independently of one another. In their discussion of IW, Gallagher and Cole reach the following conclusion: "The fact that IW, who lacks proprioception, is forced to think about his bodily movements and his posture all the time shows us the degree (...) to which the body schema functions to control posture and movement non-consciously without the intervention of a body image." (Gallagher & Cole 1995: 385)

Merleau-Ponty and Lacan have allowed us to clarify the relation between the body and the body image. According to them, we need to think of this relation in terms of different levels of organisation. These levels are not static structures, which exist once and for all, but need to be understood as dynamic interaction patterns between a system and its environment. The emergence of a new level, that is a new pattern of interaction, dramatically alters the way in which a system acts.

The mirror stage can be understood as involving a qualitative change in the interaction between a system and its environment. The assumption of the mirror image opens up a wide set of new behavioural patterns, it restructures and reorganises the way in which a system interacts with the environment. Furthermore, the identity of the system changes through this qualitative shift. The mirror stage marks the moment at which the image (as the *Gestalt* of the human body) begins to play an important part in our interaction with the surrounding world, including, from that moment on, our own body.

The idea of different organisational levels, and an elaborated theory on how we need to conceive of the relation between these levels, is prominently present in Merleau-Ponty's *La structure du comportement* (1990 [1942]). We find a similar framework in Lacan's elaboration of the mirror stage.

What happens when a new organisational level emerges? Merleau-Ponty states the following: "The advent of higher orders, to the extent that they [sic] are accomplished, eliminate the autonomy of the lower orders and give a new signification to the steps which constitute them [...] It is not a question of two *de facto* orders external to each other, but of two types of relations, the second of which integrates the first. [...] These modes of [vital] behaviour do not even subsist as such in man. Reorganized in its turn in new wholes, vital behaviour as such disappears. (Merleau-Ponty 1963: 180–181)".[13] With regard to mirror stage Merleau-Ponty also remarks that what existed before the assumption of the image, is not simply cancelled by this image (Merleau-Ponty 1988: 320). Thus, according to Merleau-Ponty's view, the emergence of a new level puts a stop to the autonomous functioning of the previous level.

We find similar ideas with Lacan. Before the mirror stage, the child gradually integrates its motor functions thanks to physiological maturation. Lacan calls this the real mastering of the body (Lacan 1975: 93). The identification with the gestalt of the body is termed imaginary mastering by Lacan. The child gains consciousness of the body as a totality during the mirror stage. This process happens at a time when the motor functions are not fully integrated, so consciousness of the body as a totality is not yet possible at this level. Thus, Lacan states that the imaginary mastering accessed through the mirror stage (identification with the image) anticipates the real mastering (integration of motor functions). "It is a moment at which, by means of the image of the other, the jubilatory assumption of a not yet obtained mastery takes place in the subject. The subject shows itself capable of assuming this mastery internally." [our translation][14] (Lacan 1975: 192)

Similarities can be observed between this real mastering and what current phenomenology calls the body schema (and even to some extent with what they call the body image). The meaning of the notion of body image, however, is radically different in both views. In Lacan's view, the body image is not a representation that has the own body as its object. It is a virtuality that is projected onto the body, onto the real mastering of the body. Furthermore, the access to this real body is closed-off. It is only negatively accessible, it shows itself as an absence. In other words, what is lost in the operation of the mirror stage is the direct contact with the own body. At the risk of oversimplification, it might be said that the difference between real and imaginary mastering of the body is that between being a body and having a body.

4. Conclusion

The mirror stage, as discussed by Lacan and Merleau-Ponty, teaches us that the distinction between a moving body and an image can be elegantly fitted within an organisational viewpoint on living systems. According to this viewpoint, living beings are seen as *complexly organized dynamical systems*, as such capable of entertaining signifying practices with their surroundings.[15] It considers that structures emerge out of dynamic processes, and focuses on the levels, the moments and the modalities of this process of emergence, as well as on the constraining impact these structures can have in return on the dynamical processes. It sees living systems as the more or less fixed, constrained and constraining, emergent results of particular dynamic histories. Living systems have a global, constraining impact because they are cohesive wholes that globally determine the scope and the meaningfulness of the local interactions. In other words, the actively maintained cohesion of living systems has a determining, constraining, selective, interpretive impact on the environment, which no longer dictates in itself the ways of being interpreted.[16]

The *emergence of psychic structures*, characteristic of human beings, is to be conceived of in line with the biological viewpoint on the emergence and maintenance of living structures (Van de Vijver 1999, 2000). The psychic system is seen as a complexly structured dynamical system with a particular evolutionary and developmental history. As such, it determines the scope and the meaningfulness of the interactions with its environment, including the environment consisting of the own body. Various psychic structures can emerge depending upon the structural and developmental conditions.

Within an organisational or structural viewpoint on body and mind, the idea of the body as well as its experience are layered out, and in addition, the idea of an access or an experience of the body is linked to the issue of accessibility between organisational layers. Furthermore, an adequate account of meaning can only be *a relational or triadic* one, in the sense of Peirce's pragmatism. In stating that "a sign (...) is something which stands *for* something *to* somebody in some respect or capacity" (Peirce 1897, in Buchler 1955: 125), Peirce clearly stressed that if there are 'signs of meaning' in the universe (Hoffmeyer 1996), they are always signs *to* someone, never signs as such. Only when there is a "someone" capable of interpreting something as meaningful, can there be signs. As a consequence, the Peircean sign-conception is committed to a universe populated by dynamical, active, 'subjective' systems, i.e., beings that have developed some kind of autonomy or agency out of which they are able to take something as standing *for* something else. Hence, there are no signs as such, and no meanings as such. Meaning is realized *in between*, in the dialectics between the sign vehicle (including representations or symbols or language), the interpretant or processing activity (wherever it is located), and the object or the referential aspect (the aboutness). Meaning is neither in the representations, nor in the things themselves, nor in the processing activity as such. Meaning is the '*in-between*' itself.

The distinction between body image and body schema, viewed as a distinction between reflective and so-called non-reflective intentionality, can now be stated in more precise terms.

- In its most basic and abstract sense, a reflection upon something implies the adoption of a certain perspective – e.g. the development of a particular dynamic, constraining structure. Each perspective determines a certain kind of accessibility towards that which it is initially aiming at, enables certain types of interactions and excludes others. In this way, the body image represents a perspective upon the own body, it defines a particular way of accessibility towards the motor and kinetic functioning of the body, and is co-constructive through an interactive history with the body schema.
- In accordance with a metaphysics of non-presence, it is assumed that there is no direct and full access to a starting point, be it in the form of the body schema or in any other form of experience. The starting point in a stratified account of living systems, is an absence, a point of non-differentiation, of vagueness, always situated at the level below. For instance, at the level of daily experience, the body schema becomes manifest only in the form of a divergence, a friction, a disturbance in relation to the body image. It is only when the automaticity of certain motor patterns is broken, which happens when (consciously) reflecting about them, that the body schema is lifted out of its otherwise immersed status. It is therefore from the patterns of friction between motor functioning and perceptual or verbal reflection, from its moments of vanishing, from its absence that something about the body schema is inferred, assumed, or constructed.
- Developing a perspective, therefore does not imply a reconstruction of a "point-source" in any sense, it implies a reorganization, a reconstruction of that upon which the dynamics is directed. The construction of a new perspective thus has the merit, perhaps even the function, of making the level below possible as meaningful, of creating an access to the level below, an access which is inevitably indirect and thus incomplete.

Notes

1. Three modalities are distinguished: (i) the subject's *perceptual* understanding of his/her own body, (ii) the subject's *conceptual* understanding of the body in general, and (iii) the subject's *emotional* attitude toward his/her own body (Gallagher & Cole 1995: 371).

2. This is, in a quite general sense, what Kant's philosophy shows exquisitely, involving an epistemology that accounts for the *conditions* (e.g. perspectives, contexts) within which any knowledge and any experience are possible. However, whereas Kant had the merit to depart from the idea of absolute meanings in stressing the constitutive role of the human knowledge perspective, he remained enclosed and even enslaved to the objectivist purposes of classical mechanics. Husserl, following the same track, had the merit to "deconstruct" many of the sources of slavery of Kant in analysing the structures of human consciousness, but he remained himself enslaved to the purposes and interests of a disembodied conscious self, perfectly and totally present to itself. Both philosophers, although in different ways, didn't consider the body as an element intrinsically conditioning or determining the structure or the content of knowledge. In that sense, they are both to be seen as basically Cartesian thinkers.

3. We take inspiration here from Lynn Rudder Baker's account of metaphysical backgrounds (1995), articulated within the frame of philosophy of mind. In that domain, she is one of the rare philosophers to have argued for the need to clarify the metaphysical backgrounds out of which certain presuppositions arise, and out of which solutions are proposed. This she has shown with regard to the discussions about causality and explanation in relation to human action. In this regard, she has described unbridgeable divergences of viewpoints about reality, causality, and human behaviour, underlying these discussions. For a further treatment of this topic, see Van de Vijver (1998).

4. This terminology comes from J. Derrida in *Speech and Phenomenon* (1967), and will be explained further on.

5. It is our intuition that the naturalistic account of intentionality present in the distinction currently made between body image and body schema still rests on a metaphysics of presence, that is not exactly interpreted in Husserlian terms of a consciousness that is present to itself, but rather finds support in the idea of a body that is at some point objectified by the sciences, and that serves as a basis in the process of intentional reflection. The metaphysics of presence prevails here also to the extent that it is believed that there is a non-altered starting point that serves as a limit point to which all intentional reflection is directed.

6. "D'abord c'est un corps intéroceptif. L'extéroceptivité ne peut s'exercer qu'en collaboration avec l'intéroceptivité. C'est un corps *buccal* ('espace buccal' de Stern) et un corps *respiratoire*. Dans la phase suivante, l'enfant perçoit les régions liées aux fonctions d'excrétion. Les organes intéroceptifs vont servir d'organes extéroceptifs, jusqu'à ce qu'il y ait soudure entre les deux domaines. (Cela justifie l'importance accordée par la psychanalyse à la relation mère enfant)" (Merleau-Ponty 1988: 312–313, italics orginal). We have chosen to add here the French edition of Merleau-Ponty's notes on the relation between the child and the other as there seem to exist rather a lot of discrepancies between this text and the English version used by Gallagher and Meltzoff.

7. "Il s'agit qu'il comprenne que cette image n'est pas lui car il est où il se sent intéroceptivement, mais aussi qu'il est visible pour autrui en ce lieu où il se sent, comme il voit son image dans le miroir." (Merleau-Ponty 1988: 316)

8. "*Il ne s'agit pas d'un phénomène intellectuel*, comme Wallon le pense, *car un tel phénomène est compris une fois pour toutes ou ne l'est pas du tout (loi du tout ou rien)*." (Merleau-Ponty 1988: 317, italics original)

9. "Il y suffit de comprendre le stade du miroir comme une identification au sens plein que l'analyse donne à ce terme: à savoir la transformation produite chez le sujet, quand il assume une image [...]." (Lacan 1966: 94)

10. "L'enfant devient capable d'être spectateur de lui-même. Il n'est plus seulement un moi senti, mais un spectacle; il est quelqu'un qu'on peut regarder." (Merleau-Ponty 1988: 319)

11. "En même temps, cette image du corps propre rend possible une sorte d'aliénation, de captation de moi par mon image spatiale." (Merleau-Ponty 1988: 319)

12. "Le phénomène ainsi compris aura nécessairement un caractère imparfait et il n'est plus question d'une synthèse idéale où les anticipations et les régressions deviennent difficiles à penser." (Merleau-Ponty 1988: 320)

13. Note that the English translation is not correct, in that it considers "higher orders" as the subject of the sentence, instead of "the advent". "L'avènement des ordres supérieurs, dans la mesure où il s'accomplit, supprime comme autonomes les ordres inférieurs et donne aux démarches qui les constituent une signification nouvelle. [...] Il ne s'agit pas de deux ordres de faits extérieurs l'un à l'autre, mais de deux types de rapports dont le second intègre le premier." (Merleau-Ponty 1990: 195)

14. "Il est un moment où c'est par la médiation de l'image de l'autre que se produit chez l'enfant l'assomption jubilatoire d'une maîtrise qu'il n'a pas encore obtenue. Or cette maîtrise, le sujet se montre tout à fait capable de l'assumer à l'intérieur." (Lacan 1975: 192)

15. Cf. *the theory of complexly organized dynamical systems* (Collier & Hooker 1999; Christensen & Hooker 2000), also called *dynamic structuralism* (Van de Vijver 2000) *or interactivism (Bickhard 2000)*.

16. This is, in more philosophical terms, what intentionality is about. Intentional behavior – the intentional directedness towards something – is constructed in a developmental context as the active, interpretive impact of global structures. It is embedded in multi-layered systems, not restricted to consciousness, and is grounded in evolutionary intentionality, i.e. the anticipative power inherent in all living systems (Hoffmeyer 1996: 47).

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Looking at the mirror image

The stare and the glance

Guy Le Gaufey

1. Introduction

Freudian scholars know that the *Project for a scientific psychology* (1950a [1895]), the hundred pages Freud sent to his friend Wilhelm Fliess at the end of the summer of 1895, is a master piece. It contains the schema of the psychic apparatus that proved to be of central importance for all Freud's further theoretical elaborations. The same value can be given to Lacan's invention of the mirror stage. The lecture he gave on this topic at the annual congress of the IPA in Marienbad in 1936 has all the spell of a myth: its transcription has simply disappeared. Nobody has been able to publish it to this very day. It has only been registered as the intervention given on the 3rd of august 1936, at 3.40 pm, under the title: *The Looking-glass Phase*. Luckily there are some other texts that inform us about the steps that led Lacan to his invention of the mirror stage. The most important reference work nevertheless remains his text of 1949 *Le stade du miroir comme formateur de la fonction du je telle qu'elle nous est révélée dans l'expérience psychanalytique* (Lacan 1966: 93).

I will not comment extensively on this text, because I seek to come to a point Lacan elaborated twelve years later. I just want to emphasize one single feature of the mirror stage in its 1949 version. In complete contrast with Wallon's view – who was the first to describe this complicated movement in the child's development between six months and three years – Lacan considers what occurs between the child and its mirror image as something almost instantaneous. For Wallon, what is at stake is a long and intricate integration between what is seen by the child in the mirror on the one hand and its nervous system on the other hand. For Lacan, the "identification" needs no time to be effective, and the recognition by the infant of the mirror image as his own is correlated to "an act of intelligence". This reduction of the mirror stage to a very brief period of time in relation to a sheer element of understanding on the side of the child is emphasized even more by Lacan with his allusion to the "illuminative mimicry of the *Aha-Erlebnis*".

2. In the mirror/in front of the mirror

We now have to develop the conditions under which such an identification can occur since it would be a big mistake to consider the two different poles involved in this identification – the visible thing called "infant", "child", "subject", "I" on the one hand (in his text of nine pages, Lacan uses seven different names to point at what stands in front of the mirror) and the visible image in the mirror on the other – as pregiven entities. Maybe each one of these two components would be perfectly visible and recognizable for any scientific, and thus external, observer; but, according to Lacan, we must abandon this third place, the one of the scientific observer. *Unity and the status of what is in front of the mirror are no given for nobody before the identification is accomplished.*

If the lacanian mirror stage has any interest, it consists in creating a unity that was lacking before. In order to understand this we must locate ourselves in front of the mirror without any previous knowledge or sense of unity. With the image in the mirror, we are, as the infant is, in front of something we don't know at first sight, something we don't recognize straightaway as our own image insofar as we are strictly incapable of comparing our face with this face in the mirror and the body that comes with it. We must first have a long stare at that image as a profound mystery as far as this thing seems to respond instantaneously to each move one makes. But when I treat what stands in front of the mirror as an entity (therefore as something which has some identity), I strongly anticipate what I am able to say because this "entity" has to be thought of as a mere consequence of the mirror stage. It would thus be a serious logical mistake to put it implicitly at the beginning of the operation whereas it is its result.

The exchange between the two places – in the mirror/in front of the mirror – is so intricate that the twist Lacan added in the following passage has taken in the translator of this text in English. The French text reads:

> [cette *Gestalt* dans le miroir] lui apparaît ["au sujet"] dans un relief de stature qui la fige et sous une symétrie qui l'inverse, en opposition à la turbulence de mouvements dont il s'éprouve l'animer. (Lacan 1966: 95)

There is no doubt for the French reader: the "s' " is reflexive and points to the subject, whereas the "l' " points to the image in the mirror. But the English version reads:

> [...] it appears to him above all in a contrasting size that fixes it and in a symmetry that inverts it, in contrast with the turbulent movements that the subject feels are animating him. (Lacan 1977: 2)

The translation thus completely misses the point. The movements are precisely animating "it" as well as "him", and that is why what is called here by anticipation "the subject" is located in two different places at the same time, as the word "identification" clearly points to. And the result of the mirror stage comes forth from the fact that the apparent identity of the image in the mirror literally falls on that which, just the instant before, did not have the feeling of identity, did not know that it possessed such a unity, and therefore did not possess this unity which keeps standing far beyond the means of the present nervous system which receives such an information.

In this way, Lacan encountered a strong backing in a hypothesis from Bolk according to which the infant is deeply premature and has to anticipate who and what it is many times all along its first steps into life. The lacanian mirror stage is one of these anticipations. Therefore, it is no longer a matter of a long and complex development, and as far as it is immediately linked by Lacan to Freudian narcissism, this mirror stage behaves as a sort of metaphysical moment, introducing something absolutely new: an ego that is not a real thing in a scientific sense, but only the *very reflection of a reflection*. That is what the lacanian ego is, which directly leads to one of its main features: misunderstanding – *méconnaissance*.

As a reflection of a reflection, this ego is almost by nature narcissistic; but it is in complete disagreement with the Freudian ego as a perception-consciousness agency, capable of acting as an agent (repressing, inhibiting, etc.). Incidentally, this discrepancy between Freudian and Lacanian egos must have led the strange monster named freudolacanianism to its more serious roamings.

3. The imaginary, the symbolic and the real

But the face-to-face situation as described in the mirror stage until 1949 was, in fact, extremely unsteady because three very different entities stood in front of the mirror at the same time: (a) the *nervous system* with all its *Bildenbewe-*

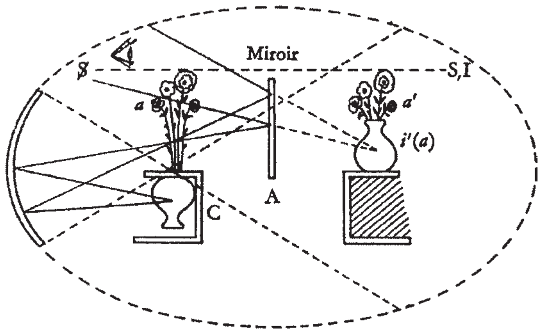

Figure 1. (Lacan 1966: 674)

gungen, its "images of movement" as Freud called them in his *Project* (1950a [1895]), (b) the fundamental *eye* through which the operation was effectuated, and (c) maybe the *face* itself with this special value that it is something the eyes can not get a direct perception of (this in contrast with the rest of the body).

When Lacan started his teaching in 1953, he immediately sought to inscribe his mirror stage in the three new dimensions he was promoting then: the imaginary, the symbolic and the real. What could be the part of each one of these dimensions in the operation of the mirror stage? Would it be possible to reach something steadier with these three orders?

By chance, Lacan encountered what he then called "a funny experiment": by means of a concave mirror, it is possible to get a real image, a sort of hologram, of something hidden. The real image could easily be completed with an object. For instance, if the real image, in three dimensions, is the one of a flower vase, you can manage things in such a way that some real flowers appear as if they were located in the vase, although they are only in the real image of it. Then, put a plane mirror in front of this and you will get a regular image of the composition provided that you respect a new constraint (cf. Figure 1).

To focus the real image, your eye must be located inside a cone determined by the concave mirror. If the eye is outside this cone, it will not see the real image of the vase and the only image in the mirror will be the one of the flowers. On the contrary, if the eye is correctly located, it will get a plane image of the arrangement, vase plus flowers, which, in its metaphoric value, means "body" plus these flowers Lacan points to as "desires, instincts, objects of desire", all what will fall later on the side of the real.

This new constraint about the place of the eye is extremely valuable for Lacan because it means that the sheer existence of the complete image of the body in the mirror is dependant on the posture of what is then called “the subject”. The eye is now the subject. It comes into play as the symbolic element that is linked to the introduction of the child into speech acts, and it will depend on the location of this eye whether the subject encounters his own image, or not. Thus the symbolic takes precedence on the imaginary. It is now isolated in the form of an eye as *the point from which the body is seen as a compound of something obvious and something hidden, the whole in the form of a circumscribed and lovable image into which narcissistic libido can be strongly cathected.*

This arrangement is much more precise than the first version of the mirror stage, which mixed up through several different names the body in front of the mirror image, the image in the mirror as a genuine reflection, and the eye located at the same place as the body. With these three partners – I mean the eye, the image-in-the-mirror, and what-stands-in-front-of-the-mirror – finally distinguished through their different functions and locations thanks to the so-called “funny experiment”, a new question, so far curiously ignored, could arise.

4. A fleeting glance

The question occurred during the final stretch of the construction of this optic schema, at a time Lacan was correcting the proofs of his paper *Remarque sur le rapport de Daniel Lagache* (Lacan 1966: 647). During a session of his seminar of that time, taking up again what he then called “my old thematic of the mirror stage...”, he adds a little detail he did not mention even once during twenty five years: at some point, when the child has more or less already realized that the image in the mirror is his, he turns round towards the adult next to him and casts a fleeting glance at his eyes. The fact itself is more or less well known, as Lacan comments on it immediately; but if so, why did it take so long for him to value it so highly?

What the heck is the child looking for in such a turning round and such a glance? Lacan’s first answer is very cautious: “... est-ce de l’ordre d’un accord, d’un témoignage ? ” *[Is it a question of agreement, of collecting an evidence?].* But when the point comes to what could come from the adult, Lacan’s answer is much clearer:

> Ce regard de l’Autre, nous devons le concevoir comme s’intériorisant par un signe. Ça suffit. *Ein einziger Zug.* Il n’y a pas besoin de tout un champ d’organisation et d’une introjection massive. Ce point grand I du trait unique,

> ce signe de l'assentiment de l'Autre du choix d'amour sur lequel le sujet peut opérer, est là quelque part, et se règle dans la suite du jeu du miroir. Il suffit que le sujet aille y coincider dans son rapport à l'Autre pour que ce petit signe, cet einziger Zug, soit à sa disposition.
>
> (Lacan 2001 [1960–61]: 418, lesson of 07.06.'61)

> This gaze of the Other, should be considered by us as being interiorised through a sign, that is enough, e*in einziger Zug.* There is no need of a whole field of organisation, for a massive introjection. The point I of the single trait is a sign of the Other's *assent*, of the love-choice upon which the subject precisely can adjust his setting in the subsequent operation of the mirror, it is there somewhere, it is sufficient that the subject should coincide there in this relationship with the Other in order to that this little sign, this *einziger Zug*, should be at his disposition."
>
> (Lacan 1960–61, translation: C. Gallagher, unpublished)

I want to stress a lot this word of "assent", not because of its possible whiffs of profound humanity, but for very formal reasons which could not be at stake sooner. I am led to this by Lacan himself who used this same word in his speech *La science et la vérité* (delivered on the 1rst of December 1965, four years later, Lacan, 1966: 862) referring then directly to Cardinal Newman's book: *An Essay of a Grammar of Assent* (Newman 1975). In this passage, Lacan talks about Lévi-Strauss and the fact that he has to put aside, "rejeter hors du champ de la structure", what would be named, in another grammar, the "assent" of the one who, in this case, uses the myths Lévi-Straus is then collecting. This assent coming from Newman is thus considered by Lacan as "something out of the structure".

But what is an assent? According to Cardinal Newman it is a way of agreement, a way of telling "yes" but in such a manner that the sign given to mean it cannot be partitioned. You cannot take half, or third of an assent. You take it, you receive it in its entirety, or not at all. This very special sign is irresolvable. That is why it is so commonly conceived of as a movement from the heart, and the sign which is used to act it out must be absolutely minimal. The English verb "to nod", which is so sorely lacking into French language, is perfect for the job: hardly one syllable, barely more than a silent wink, and... it's done! The perfect assent is as thin as a hair's breadth, as silent as a short breath, as discreet as a nod addressed to one in a million. If it comes, it is addressed to you, you know it because you were expecting that sign and nothing else, so that it reaches you in such a manner that it leaves no room for the slightest doubt.

Assent is something "simple" in a theological meaning: God is eminently simple, despite the fact of the three different persons. The comparison does not go further, but we must consider now that this kind of property is nothing we could encounter as a fact of experience. On the contrary, it is something which occurs only as the result of a huge construction, as the kind of physical particles that need very high levels of energy and expansive scientific means to be spotted.

Lacan himself had the opportunity to secure it with the Freudian term of "ego ideal" ("*Ichideal*", l'idéal du Moi) Freud had put forward in the context of his invention of the superego when he introduced narcissism. This couple of terms – "*Ichideal*" "*IdealIch*" – had not yet been taken up, and at the end of the complex development of his mirror stage, Lacan gave these two words the value of the two fundamental types of unity. The ideal ego is the one that circumscribes, it therefore has parts and can be articulated by the inside – this is the unity in the mirror. The ego ideal is the one that is so simple that it cannot be partitioned in any way – this is the unity which would come with the assent from the adult, as the keystone of this construction. The readers who are at ease with the lacanian terminology know that I am speaking about *l'un "unien" and l'un "unaire"*.

5. An element and its unitary class

The problem Lacan is confronted with here can be encountered in logic itself, when the crucial difference between an element, out of any class, and the unitary class, the one formed with this sole element, has to be established. This point is essential in the very first steps of logical calculus as far as the apprentice in logic must have confidence in the difference between *membership* and *inclusion*. An element can be a *member* of a set, and a set can be *included* into another set. This is basics, because it is strictly forbidden (it would be a perfect nonsense) to break off a class holding a single element to seize it as such. You can always break off any class into its sub-classes, but when you reach the level of the unitary classes – the singletons as they are called too – you must stop; you have no right to put the element present in its unitary class on one side, and the null class next to it. You have no right to put in the open the obscure relationship named "membership" that glues both of them together, hiding in this way the fact that the element is not capable of sustaining its unity by itself. On the one side, the unitary class – I mean the element encapsulated in a vague circle, as we commonly represent it onto a blackboard – is no mystery at all: you can compound it with as many classes as you want; but on the other side this very strange relation named «membership» which sticks the element with its unitary class can not be touched.

In my opinion, the relation between an element and its unitary class presents the same inscrutability as the movement of identification that leads an infant in front of his image in the mirror to recognize it as *him* or *her*. In a book I published some years ago, I named the tension between these two kinds of unities the "specular lasso" (Le Gaufey 1997), borrowing the term "lasso" from Davis Lewis who used it in his book *Parts of Classes* (Lewis 1991). In the first part of this work, he tries to cast some light on the logical mystery of what "membership" could be – if at least the verb "to be" has any relevance in this area.

In both cases, the supposed unity of what is called «element» in logic, or what stands in front of the mirror in Lacan's theory, is much trickier than the other unity, the one of the set or the one of the image in the mirror. To give another example of this lack of symmetry between these two kinds of unity, I would just mention the great book of Alain Badiou, *L'être et l'événement* (1988), into which he chose to name this element out of its unitary class "a multiplicity of multiplicity", pointing directly to the fact that we cannot secure with a sole word, a unique letter, or a simple cross on the blackboard, this type of unity that we nevertheless need so much.

6. Conclusion

I will conclude on a sort of warning: the body image can be considered as a thing, therefore as something which can be located (in the brain), which has properties we have to discover and study carefully, but at the same time the power of this image is also linked with this assent the infant is forced to look for outside of the mirror, outside of the image itself. And this assent shows us that the kind of unity we can describe needs a point from which the image itself can be considered as something paramount in human life. There is not much to say about this point Lacan named *Idéal du moi* – ego ideal, indicated as 'I' in Lacan's optical schema – it has nothing to do with the image itself, it has no figure, no shape at all. It is nothing you can circumscribe, and by this way describe. That is why the only thing (albeit not exactly a thing) it can be reduced to is a signifier – a sign whose signified is profoundly enigmatic.

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Anorectics and the mirror

Veroniek Knockaert and Katrien Steenhoudt

1. Introduction

How do anorectics feel about their bodies? What do they perceive, feel and think when they see its reflection in the mirror? The following utterances from anorectic patients presented in Gabriella Ripa di Meana's book *Figures of lightness* (1999), give us a taste of the problematical relationship of the anorectic subject to her body.

> I'd rather die than have people tell me, 'you're pretty, you're better now, you've finally put on a little weight…' If anyone tells me that, it's a catastrophe. I immediately become obsessed: I have to assure myself that nothing has really changed, that I haven't put on even one gram, otherwise … I'd rather die!
> If I eat without vomiting, I look at myself in the mirror, and I seem fat, disgusting deformed ridiculous.
> I look at myself for hours in front of the mirror until I find that point, that one point where I can see my hip bone sticking out without any fat on it … then I can calm down a little.
> I'm going to become so thin that no one will be able tot say anything.
> I feel fat, I'm full of anxiety. I'm ashamed of myself! I feel full and bloated. (…) I feel huge. Sometimes I'm disgusted with myself, I'm revolting, I hate myself. I'm angry with myself, because I feel swollen. Maybe this isn't really the truth, but it's the way I see things. (Ripa Di Meana 1999: 45–46)

On the one hand, these short clinical vignettes articulate the fear and horror of the anorectic subject for the comments of others. Why are these comments so unbearable? Why do they drive the anorectic to starve herself? Why do they make her strive for a thinness that will make the other mute, speechless? On the other hand, these utterances reveal the paradoxical perception the anorectic has of her body. Although she is skin and bones, she feels and perceives herself as fat. She may know that this is not really true but nevertheless feel huge and heavy. What is it that weighs on her and that makes her feel like this? What makes her search for that one piece of hipbone sticking out? What makes her hate and despise the appearance or the image of her own body?

It is without any doubt a cliché, a commonplace to state that anorectics have a distorted body image. But why is the relationship of anorectics to their bodies so problematic? In what way is this problematical relationship related to their fear and horror of the comments of others? We will try to shed some light on these questions from a freudo-lacanian perspective. In a first step, this will lead us to a rearticulation of anorexia as a search for desire, for subjectivity. In a second step, we will situate this search, with its own singular obstacles, within Lacan's conceptualisation of the mirror stage, as the stage wherein a subject constructs its body image. In a third step, we address the paradoxical attitude of the anorectic subject to life and death. Here we elaborate on the connection between the body of the anorectic as one that represents death and the psychoanalytic notion of the death drive.

2. Need, demand, desire

In Freudo-Lacanian literature anorexia is consistently considered within the context of a singular dialectic between a subject and an Other, a dialectic that is articulated in terms of need, demand and desire. More precisely, it is described as a refusal to enter the circuit of need. With this refusal, the anorectic hopes to obtain something different from nourishment and as such it can be read as a cry: "the cry of a desire which is in danger of never arising because of the insatiable demands of the Other" (Freymann, in: Ripa di Meana 1999: 33).

In what way can we understand such a description? What do the terms need, demand and desire stand for here? Lacan developed these three concepts throughout his entire oeuvre. Nevertheless, he focussed on them particularly in the 60's, more specifically in his fifth seminar *The Formations of the Unconscious* (1998 [1957–1958]) and in his text "The Subversion of the Subject and the Dialectics of Desire in the Freudian Unconscious" (1977 [1960]). Need, demand and desire can be considered as three different motives that drive the interaction between a subject and the Other, an interaction wherein the subject comes into being. The starting point for thinking this interaction is a sort of mythical pre-subject that has not yet entered language and the social bond, an infant that is living in the immediacy of experiencing itself in relation to the environment without any symbolic mediation (Van Haute 2000: 43). This starting point is inevitably troubled by the rise of needs. In Freudian terms, we can describe this as a situation wherein the infant is confronted with endogenous stimulation, that is, stimuli coming from the interior of the body. This excitation, that represents the need of the infant, can only be removed by a specific action, that is an alteration in the external world (Freud 1950a: 318). The infant is initially not able to perform this action and as a consequence a state of life need or urgency arises that can only be resolved by extraneous help. Another human being, an adult must bring about, for the infant, the needed alteration in the outside world. The action of the adult implies that he interprets the need of the infant based on the external manifestations of its state of life need (Freud 1950a: 318). A simple example of these manifestations is the cry of the infant. The adult interprets this cry as a cry for help, he hears it as a communication, as language and thus transforms it into a demand, a symbolic expression.

This primordial interaction has several consequences and implications. Firstly, it implies that the relationship of a subject to its body is an indirect one. The subject gets to know its body through the interpretations of an Other. Since the Other makes these interpretations from a position of exteriority and since the interpretations are symbolic ones, the subject is confronted with a loss. It loses the immediate experience of itself in relation to its environment. This implies that the relationship of the infant to its body is also characterized by a gap, something that demands again and again to be signified (Van de Vijver 1999: 116). On the other hand, the crossing of need with language also introduces something new, it introduces a structure in the perceptions and experiences wherein the need initially expresses itself and will engender a diversification of needs that surpasses any biological functionality (Van Haute 2000: 46). Language thus creates something that cannot be deduced directly from the biological order. From this primordial interaction between subject and Other also ensues a transformation of the subject itself. Through the interpretations of the Other the subject is pulled into language and becomes the subject of a linguistic social bond (Knockaert 2002: 243). From now on, it will have to pass its needs through language to attain the Other it is dependent on. It has to articulate them symbolically, that is, as a demand. The Other, in that sense, is not only the one that satisfies the need of the infant but also the instance that reveals the function of the symbol to it, through his speech and especially through the symbolic action of his appearing and disappearing (Adriaensen 1992: 22). The alternation of his absence and presence acquires a metaphorical dimension, wherein the appearance of the Other expresses something else than what it was initially conditionally coupled with, that is, the satisfaction of a need. The presence of the Other becomes valuable as such, unconditionally.

So, every time the subject addresses a demand to the Other it will be characterized by a fundamental ambiguity. On the one hand, a demand expresses a need, and is in that sense a demand for a concrete object that can satisfy this need. On the other hand, the demand is also a demand for love, for the presence of the Other as such (Porge 2000: 93–94). The dialectic of the demand makes subject and Other bound to each other in a reciprocal relation of dependency. The subject is depending on the Other's gift of satisfaction and love. The Other depends on the subject's acceptance or refusal of his gift.

This relationship of dependency can only be changed by the introduction of desire. The subject can only loosen the absolute grip of the Other on its being through desire. The rise of an unconscious desire has two conditions. The first one is the failure of the Other to satisfy all the needs of the subject, the second one is the absence of the Other. The failure to satisfy the needs of the subject realises a breach between the subject and the Other, it confronts the subject with a lack in the knowledge of the Other with regard to its body and its existence and as such opens up the possibility for the subject to consider itself as different, separated from the Other and as at least partly unknown by him. The absence of the Other as the second condition for the rise of an unconscious desire opens on an obscure, unknown aspect of the Other. Where is the Other when he is absent? What makes him absent? What does he desire besides the subject? This line of questioning constitutes the path that will lead the subject to its own desire.

In a first logical step, a subject confronted with the absence of the Other will engage in a search for the object of desire of the Other. It will try to attain and become this object to assure himself of the Other's love and, in the same movement, of its own existence (Van Haute 2000: 108–113). This attempt will nevertheless prove to be vain. The subject will never obtain a definite answer with regard to the desire of the Other. This desire cannot be exhaustively articulated; the last word that would reveal its meaning can never be said. Therefore, the subject is once again confronted with a lack, this time a symbolic lack.

This lack will change the relations between subject and Other. The confrontation with the lack in the Other will make the question of the subject return to itself in a transformed version: "When this Other refuses to give me the answer, then what does he want from me? What am I for the Other?" (Lacan 1977 [1960]: 312). The questioning of the desire of the Other is thus transformed in a questioning of one's own being in relationship to this Other.

In this way the dynamic of unconscious desire can be characterized as a search for that element in the Other that can signify its being. The problem is that there is no definite answer in the Other to the question "What am I?", there is only a lack. The confrontation with this absence will drive the subject to create a phantasm, an unconscious answer to the question "What am I for the Other?". As such, this phantasm is marked by the impossibility it tries to mask. The being of the subject can't be finally signified, and even in the phantasm it can only be pointed at with the structure of a gap. The phantasm stages the relationship of the subject to the lack in the Other as the cause of desire. This lack is what Lacan calls the object *a*. The object *a* as the cause of desire is as such an unattainable object that ensures the endless renewal or metonymical repetition of the desire of the subject.

3. The cry of a desire in danger of never emerging

Let's now return to our initial description of anorexia. We defined anorexia as the refusal of a subject to enter the circuit of need, a refusal that aims at obtaining something different from nourishment, a refusal that can be read as the cry of a desire in danger of never arising because of the insatiable demands of the Other. What are the reasons for this refusal? What are the characteristics of the dialectic between the anorectic subject and the Other?

We have to see the refusal of the anorectic subject to enter the circuit of need as one that is based on an anterior acceptance of the Other. The anorectic did cry out to the Other and accepted that the Other gave meaning to her body through the interpretation of her needs. Her refusal is not as such directed against the Other, but against the nature of the interpretations. The refusal must thus be situated on the level of the dialectic of the demand and not on that of the need. As we have stated above, the crossing of need with language through the Other transforms the infant into a subject of a linguistic social bond, that inevitably has to pass its needs through language to attain the Other it is dependent on. In other words, it has to articulate its needs as a symbolic demand. This demand has a fundamental ambiguous character in that it is a demand that expresses a need on the one hand, and that it is a demand for love on the other hand.

The refusal of the anorectic is a refusal of the way in which the Other consistently reduces her demand to the need for a concrete object, for example nourishment. In doing so the Other takes the position of an all-knowing, almighty Other that can answer any question the subject might articulate

(Delmeire 1995: 44; Delmeire 1994: 22). In this way the Other refuses to accept its own impotence to completely satisfy the needs of the subject, and persists in offering concrete objects of satisfaction. As a consequence of this the subject is denied the confrontation with the lack in the knowledge of the Other with regard to its body and is not permitted to lack anything itself (Hiel 1984a: 51). This implies that the anorectic can only experience her body as the field of the Other, she cannot see it as separated from this Other, as partly unknown and unknowable to the Other.

Within this context, we can read the refusal of the anorectic as an attempt to break the hold the Other has on her through her body. By refusing the food that the Other provides, by wanting nothing, she forces the Other in a position of impotence. By becoming thin and almost erasing her own body, she tries to erase the traces of the invasive Other. The physical reduction of the anorectic can be seen then as an unconscious strategy to annul the interpretations of the Other by annulling herself (Ripa Di Meana 1999: 85). Or stated differently: the anorectic strives for a thinness that will make the Other mute, speechless. In this way she tries to emancipate herself from the alienating dependency on the Other, from the weight of his knowledge she is suffocated in.

This attempt of the anorectic subject to separate herself is not an absolute one. It is not an attempt to break all ties with the Other. On the contrary, it is her way to articulate her demand for love. As such her refusal tries to open the other dimension of the demand, tries to create room for the demand for love, that which cannot be solved with a concrete object. This is the negative form that the demand for love can take when it is confronted with the absence of a sign of love of the Other, when it is confronted with an Other who doesn't make the gift of his lack.

As we have explained earlier, the demand for love is a demand for the presence of the Other. This presence can only be a sign of love when it appears against the background of an absence, and thus of the desire of the Other for something beyond satisfying the subject. It is only when the Other gives his lack to the subject that the subject can feel being recognized and loved in its difference from the Other. By making the gift of his lack the Other also acknowledges that he is not omnipotent and omniscient in relation to the subject, and this implies that he can be present without trying to erase the demand of the subject with a concrete object of satisfaction.

The refusal of the anorectic subject transforms her body in an instrument for blackmailing the Other for his love. She uses her emaciated body to force the Other to give not what he has, but what he doesn't have, to force him to give her a sign of love (Recalcati 2001: 148). She becomes a skeleton, devotes herself to death in order to make a hole, a lack in the Other.

The way in which the Other deals with the demand of the anorectic subject does not leave much room for the rise of a desire. Instead of being confronted with ignorance and lack the anorectic subject is confronted with omniscience and omnipresence. The answer that the anorectic subject gives to the question "What is it that the Other lacks and thus desires?" is "nothing". It is with this nothing that she will identify herself (Hiel 1984b: 48). She will become the lack of the Other, that which the Other does not want to know about. She will want nothing, and will strive to be nothing. Nothing will be her phantasmatic answer to the question "What am I for the Other?". As such the refusal of the anorectic subject is orchestrated as a desire, it is her paradoxical strategy to constitute her subjective difference (Recalcati 2001: 147). The object *a* as the cause of desire appears here in its naked, most reduced form, namely as nothing. And as such anorexia can be considered as the cry of a desire that is in danger of never truly arising.

4. Bodies and the mirror

How can we now understand the paradoxical relationship of the anorectic subject to her body? On the one hand, the comments we started with confront us with the contradiction between the skinny body the anorectic shows us, and her feelings of being fat and disgusting. On the other hand, they also reveal a search for a skeletal body. Here the deadly dimension of anorexia becomes tangible.

In an attempt to grasp the meaning of these paradoxes we will elaborate on Lacan's conception of the mirror stage as the stage wherein a subject constructs a body image. In his first elaboration of this stage Lacan isolated two important moments. The first one is the moment wherein an infant recognizes its image in the mirror and identifies itself with it. The second one is the moment wherein an infant identifies itself with its equals and engages itself in an imaginary, aggressive struggle for prestige or narcissistic rivalry.

Let us consider the first moment more closely. Lacan articulated the mirror stage initially as a solution for an anterior crisis, the vital crisis installed by the weaning complex (Lacan: 1984 [1938]). When a mother deprives the infant of her breast this provokes a vital crisis, because the infant is left in need in a time where it is not yet capable of feeding itself, of seeing to its own needs (Nobus 1998: 108). The weaning complex thus confronts the infant once again with its own helplessness, the same helplessness that underlies the introduction of the infant in the linguistic social bond. It is this helplessness, this sense of inadequacy that explains the interest of the infant in the image of its body in the mirror. The image reflects a unity, a Gestalt that reflects a perfection and control which the helpless infant can only dream of.

Through identification with its image the infant anticipates on something that is not yet in its reach, hence Lacan's characterisation of the mirror stage as "a drama whose internal thrust is precipitated from insufficiency to anticipation (...) and, lastly, to the assumption of the armour of an alienating identity" (Lacan 1977 [1949]: 4). The identification described here is an imaginary identification. The ego of the infant is projected on the image in the mirror as a whole. The result of this movement is the constitution of an ideal ego. Through identifying with the image the infant assumes an identity that is radically external. On the one hand it provides the infant with a sense of mastery and control, but on the other hand it alienates it from itself: the infant is the other, the image in the mirror. The sense of mastery the image provides is moreover only an illusion that cannot close the gap between the real body and real sensations of the infant on the one hand and the imaginary body image on the other hand.

Several questions remain unanswered here. Firstly, how can a subject grasp the difference between itself and the image? Secondly, how can a subject maintain a distance between itself and its equals so that it doesn't lose itself in its imaginary struggle for prestige? We can only answer these questions if we turn to Lacan's rearticulation of the mirror stage in the 50's and 60's. The most important element in this further elaboration is the introduction of the desire of the Other as a mediating factor. It is now the Other, his speech and the voice wherein his desire resonates, who determines what the infant can see of its image in the mirror or stated differently, it is the Other that determines the level of perfection of the imaginary.

The importance of the Other in the process of acquiring a body image becomes manifest in the interaction between the infant and the Other that holds it before the mirror. After looking in the mirror the infant will turn around and look at the Other, searching for a certain sign in his gaze or his words, a sign of approval (Le Gaufey 1997: 98; Le Gaufey, this volume). The infant thus temporarily breaks the investment of its image and turns to something that is not present in the mirror. This exterior element is important since it marks a distinction between that which is present in the mirror and that which differs from it. As such it assures the infant of the fact that a rest, a part of its body, of its identity is not captured in the mirror.

The child will identify itself with this sign of the Other, this unary trait, by introjecting it. The child thus brings something from the outside to the inside.

This unary trait will then constitute the ego ideal of the subject, or the point from which it would like to see itself (Lorré 1985: 133).

So next to an imaginary identification with the image in the mirror, we now distinguish the identification with a unary trait outside the mirror as a fundamental mechanism in the process wherein the subject constructs its body image. This unary trait is the trait of the desire of the Other. As such this trait realises a distinction between the image and the subject and installs a symbolic reference. The image is now dependent on the subject, but the subject is no longer completely dependent on the image for its sense of identity and unity. The symbolic reference will also determine what the subject sees in the mirror and is in this sense the fundament that underlies the imaginary identification described earlier. It will also mediate the imaginary rivalry between a subject and its equals. In brief, the introjection of the unary trait offers the possibility to break the spell of the narcissistic specular field (Le Gaufey 1997: 100; Le Gaufey, this volume)

5. The cruel dominance of the specular image in anorexia nervosa

Let us now leave the mere abstract and theoretical approach of the interwoven body image, ego and desire, and bring the problem of anorexia nervosa into focus again. How would she, the anorectic woman, answer the question: "*How would you wish me to be as a subject*"?

In the mirror, the anorectic subject seems to search for the image of a body representing death, a body so emaciated that it comes on the verge of life and death. Why is it that she deprives her body of food in this far-reaching way? Is to make her eat experienced as if the other is entering her and robbing her of the thing she is proudest of, her precious hollow image (Ripa Di Meana 1999: 215)? What precisely is she defending with all her strength and what is she undeniably connecting with her body image?

As just pointed out, the body image needs the recognition of the Other, so that it can be assumed as a representation of the subject. This implies that death as embodied in anorexia, is in one way or another related to that Other, to the person whose words and desires constitute the subject. It should be clear that a problematic identification with something of the Other underlies the anorectic's experience and exposure of her body. This "something of the other" turns out to be the above mentioned *unary trait*.

At the same time however a cruel dominance of the specular image, including fantasies of triumphing over life, refers to the narcissistic stage of imaginary identification, in other words of the ideal ego.

These elements will now allow us to argue that a murdering dialectic between the ego ideal and the ideal ego is bringing the anorectic paradoxically to the fatal point she in fact refuses, namely the point of being subjected to the Other, and thus of living like a dead.

Earlier it was stated that the anorectic subject can only experience her body as the field of the Other, and not as a distinguished from the Other one. That might be the reason why she seems to be afraid of her body, and why she experiences food intake as an increase of her body (Chasseguet-Smirgel 1995: 454). Witness utterances refer to a deformed body image: '*If I eat without vomiting, I look at myself in the mirror, and I seem fat, disgusting, deformed, ridiculous*'. "Being a body is tantamount to being a thing, so that the body has become a threatening force that must be held in check" (Chasseguet-Smirgel 1995: 454). So by refusing food she's trying to reduce the Other, perceived as almighty, and to create space for a desire of her own.

The anorectic woman obviously shows a narcissistic preoccupation with her body image. Her body appears as a manifestation of what characterises the ideal ego, since it goes hand in hand with fantasies of omnipotence. She "tries to preserve the illusion that the body can live indefinitely without any contribution from outside. It is a victory of the mind over the body" (Chasseguet-Smirgel 1995: 457).

In the refusal of eating, and in the radical way of exposing her body to the other's gaze, she shows sadistic rivalry and aggression. The aggression is directed against the own body, thus the own life, as well as against the other who can only stand around watching this phenomenon, and offer concern that time after time is refused. The typical drastic aggression seems to demonstrate in particular that the anorectic is out to get the other's desire. Indeed, narcissistic aggression is understood as a trial to create a difference between herself and the other as the same. It is indeed her anxious attempt to avoid being absorbed in the other (Read: in her mother); if there's no difference between herself and the other (the mirror image), psychic death lies in wait.

6. Being complete: The anorectic representation of death

How could we explain the skeletal body being so attractive for the anorectic subject? Why does she feel obliged to reach the point of really disregarding her ailing body?

The most significant answer to these questions seems to be found in the above mentioned connection between death and Other. The Other in question is here the Other in whom the unary trait, the heart of symbolic identification is situated. Death seems to be a *unary trait*, thus the symbolic inscription of the Other constituting the ego ideal.

The exposure of her thin body looks indeed like a cynical exposition of the way the Other's desire is interpreted by her in terms of death, and only death. The perfect image of death, is an image which figures completeness, perfection, in particular searched for by the anorectic woman. "What is perfect, is complete. And to be complete is the conclusion, the end. [...] The unchanging, definitive and conclusive image of death will be considered perfect.[1] Its icon is the skull" (Ripa Di Meana 1999: 84). In the light of the discussed refusal of the intrusive demands of the Other, we can understand the anorectic's ambition toward the absolute: "perfection is reached, not when there is nothing more to add. Death is when there is nothing more to take away" (Ripa Di Meana 1999: 86). Unfortunately the self-starvation is not infrequently at the expense of her biological death.

If a personification of death is searched for in the mirror, in this aggressive-narcissistic way, the two main elements constituting someone's body image are present: on the one hand, the ego ideal (physically symbolising death) and on the other hand, the ideal ego (narcissism/aggression/feelings of omnipotence).

Let us make this clear. Many clinicians testify to an identifying inscription operative in the problem of anorexia nervosa. In several cases the anorectic woman would identify herself with a dead person whom she cannot speak of. For instance, it involves an identification with a dead born child; the parent's mourning of the loss of that child had not been fulfilled, death could not be symbolized, suffering not expressed, so that all those unspoken grieves, hatred, desire, wishes and so on, appear in the intervals of their discourse. It's not rare that on an unconscious level the child, who does live, gets in fact the duty to replace a dead person. The anorectic girl is confronted with the impossibility of pronouncing something repressed, thus with the powerlessness of the fact that words cannot signify a painful secret in family history. If symbolizing painful facts and feelings are forbidden and hence made unexpressable, the repressed returns in other ways, so for example in the speech of the body, related to destructive imaginary constructions.

But let us shade a bit. We do not contend that anorexia nervosa is necessary due to an unsaid, unconscious identification with a *real* dead person. Only do we suppose a particular perception of the Other's desire, an interpretation of what is seen in the Other's gaze, heard in the intervals of speech, picked up from speaking silences. An answer thus to the question: *He is saying this to me, but what does he want?*

Some authors mention an earlier experience of extreme pleasure or pain, where the desire persists to return; a moment where the subject was "living most intensely, on the margin of death, or in the presence of death" (Weatherill 1988: 85).[2] It almost has to be an enjoyment that fits within certain fantasies, and yet, the crucial fantasies are formed on the basis of the discourse of the Other, or rather, maybe of the lacks in it. At this point, we are in front of the repetition of something that cannot be put into words, that gets stuck in silence, beyond human speaking. Experiences of incest, for instance, or other sexual transgressions are often mentioned as an etiological factor in eating disorders. Without wanting to generalize this factor, these transgressions are characterised by the fact that for the subject (undergoing the abuse), every reflexion is excluded, and every symbolic inscription is cancelled (Ripa Di Meana 1999: 91). The same mechanism of excluding symbolic inscriptions seems at work where a family event is hidden for the subject, so that it is conveyed in what is not said, and maybe in the typical way of imposing one's will to the other. Due to the symbolic identification a unary trait can indicate an unconscious heritage which squeezes within the family history. Someone whose desire is cancelled, the anorectic for instance, is then also in the impossibility of posing delicate but most important questions to herself!

If it may be argued that in anorexia the desire of the Other is vehiculating death in the form of a unary trait, the ego ideal seems to circle the point of a shortcut desire, a forbidden own desire and thus a psychic death. A point that seems fixed in the core of the anorectic's fantasies. This then would imply that a third, symbolic point had been reached so that the subject has been able to leave the mere dual relation with her specular image. In other words, the domain of desire has made its introduction in the dynamics of the unconscious, it has provided an ego ideal, inscripted by the discourse of the Other. If an anorectic is responding to the Other's desire by representing for instance a dead person, or by representing in a physical way a psychic dead subject, this reveals that she has assumed a symbolic identification. As posed by Lacan, it is not a "not eating", but rather, eating "nothing" where "nothing" is to be understood in a symbolic way, thus as the signifier "nothing". So eating nothing is not a negation of the activity, but a way of reversing the dependence on the Other: by eating nothing the anorectic makes the Other depend on her (Lacan 1984 [1957–1958]: 185).

7. Conclusion

The paradox the issue of the anorectic is confronting us with, namely the quest for a desire of her own in order to live, and at the same time self-starving as her radical choice of handling this quest, brings us now to our conclusive, and of course tentative hypothesis. What in anorexia is the murdering dialectic between the so-called ideal ego and the ego ideal?

First, we have emphasized the aggressive and narcissistic relation of the anorectic to her body image, related to the ideal ego towards which she feels almighty. Secondly we supposed death as the unary trait being the core of symbolic identification.

In the light of Freud's notion of what he called *Nachträglichkeit*, we can summarize the phenomenon of anorectic craving for self-starvation as follows: the (logically) earlier formed ideal ego is in a retroactive way cathected with the unary trait constituting the ego ideal. As we discussed, the unary trait is necessary for a subject to escape mere imaginary identification and thus absorption in the other, exactly the place where the psychic death is threatening (hence, the aggression). Since now the ego ideal is in a symbolic way inscribing death – the unary trait – in the subject, the ego ideal is as it were nailing down the ideal ego. The apparent paradox seems now translated by the mechanism of identification: it is as if for the anorectic only death can provide psychic life. A pretty disastrous coincidence now is the fact that for the anorectic precisely death has to make the symbolic difference and thus has to guarantee life. This brings us to the question whether the unary trait – supposed to throw the subject away from death – hasn't lost its function here.

By translating at the level of her body her searching for room for desire, the anorectic subject returns to the starting point, namely as being defencelessly at the mercy of the all-knowing Other.

Let us conclude with the remark that the anorectic shows us in a not always subtle way, that "man would risk his biological life to satisfy his *nonbiological* Desire." (Nobus 1998: 111).

Notes

1. "The sensuality of male and female bodies is closely linked to imperfection. While the quest for perfection and for the essence inevitably leads to the airiest of structures and the void, when it is carried to the extreme, to the skeleton which is the body's material limit." (Ripa Di Meana 1999: 86)

2. The search for an ever experienced extreme pleasure is also found in cases of drug addiction. The "orgasm of hunger" can be associated with this search for the absolute point.

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Françoise Dolto's clinical conception of the unconscious body image and the body schema

Filip Geerardyn and Peter Walleghem

1. Introduction

Early on in psychoanalytic literature some attention has been paid to the body image by authors such as Sandor Ferenczi (1913) and Paul Schilder (1935), or, in the Anglo-Saxon tradition, by Phyllis Greenacre (1954). For them, as for psychoanalysts in general, the body is first of all a body governed by the pleasure principle. More precisely, it is a libidinal body with which the infant actively and purposively "grasps" the external world. No wonder then that Ferenczi stressed the importance of early libidinal interactions of the infant's body with the objects of the external world for the differentiation between the "I" and the "not-I". Schilder, who was not a psychoanalyst himself but was well acquainted with Freud's theory, defined the image of the human body as "the picture of our own body which we form in our mind, that is to say the way in which the body appears to ourselves" (1935: 11).

However, in psychoanalytic literature, the notions "body image" and "body schema" have been frequently mixed up with each other as well as with notions such as "body surface", "membrane", "limiting organ", "body wall", "body boundary" etc. In the present paper the viewpoint of the French Lacanian psychoanalyst Françoise Dolto is presented, who, independently from the viewpoints of the authors mentioned above, constructed her notion of the body image on the basis of her clinical work with children. More specifically, we briefly present (i) Dolto's differentiation between the body image and the body schema and (ii) the body image as a clinical instrument for psychoanalytical treatment. Dolto's theoretical conceptualisation is illustrated with some clinical fragments from her psychoanalytic practice (Dolto 1984).

2. Dolto's conception of the unconscious body image

As de Sauverzac (1993: 294) stated in his book *Françoise Dolto, Itinéraire d'une psychanalyste*, it was not Dolto's aim to build a consistent theory of the subject. She rather tried to develop clinical concepts that could serve as instruments to guide her psychoanalytical work with children. One of those instruments is her conception of the unconscious body image.

According to her own saying, Dolto created her concept of the unconscious *body image* out of her associations with the French word "i-ma-ge" (image). Therein the "i" refers to the "identité" (identity) that forms the central idea of her conception of the body image; "ma" refers to "maman" (mother), while the signifier "ge" refers to "the earth, the basis or to the body" as well as to the pronoun "je" (I) (Dolto & Nasio 1992: 13–14, 17).

The unconscious body image is formed from the very start of life, i.e. in the womb (Dolto & Nasio 1992: 33) and later finds expression through the free creations of the child, e.g. in drawing, modelling or playing. Dolto emphasizes, however, that the drawing, the modelling-work or the play cannot be identified with the body image, rather it is an entity that becomes apparent in the speech associations the child provides during or about the former activities. In this way, the body image "speaks" through every free composition of the child and is to be considered as a language that the clinician must decipher. However, it is not the psychoanalyst who possesses the key for the decipherment in advance. The latter is delivered to him/her in the child's speech and as a consequence the drawing, modelling or play of the child can only be interpreted with the help of the child's associations (Dolto 1984: 16–17).

We also have to distinguish the unconscious body image from the mirror image. Dolto's clinical experience with blind born children enabled her to state that although these children didn't have any experiences with their mirror image they were able to develop a complete and rich body image (Dolto 1984: 64). In other words, children have no need for visual experiences to construct a body image. Nevertheless, when a child begins to recognize its own mirror image at the age between six and eighteen months, the body image 'disappears', i.e. it becomes largely unconscious, although it manifests itself in dreams or in psychosomatic phenomena and can easily be detected in psychotic or in comatose patients (Dolto & Nasio 1992: 15–17).

3. Body image and body schema

According to Dolto, the (partly unconscious, pre-conscious and conscious) *body schema* characterizes an individual as a representative of the human species independent of time and space and is in principle more or less identical for every human being (notwithstanding its being structured by learning processes and experiences), whereas the (strictly) unconscious body image is specific for each subject and directly related to its intersubjective history. The latter then must be considered as the living synthesis of our emotional experiences, as the unconscious symbolic incarnation of the desiring subject, the very structure that – supported by the body schema – is formed through communication and that enables us to communicate with others (Dolto & Nasio 1992: 22–23).

As an *anatomical* entity, the body schema contains the source of the drives and is strongly associated with the bodily needs it aims to satisfy. As a *mental* entity, the body image contains the *representations* of the drives and is associated with desire. As such, it is situated in the field of the 'lack of being' ("manque à être") and aims at the filling of that lack (Dolto & Nasio 1992: 37–38).[1]

We also have to differentiate the body image from the body schema in order to grasp the way in which both can interact with each other. Dolto's clinical experience shows how a pathological body image can disturb the functioning or the mental use of a normally developed and intact body schema: an inhibition of the latter can occur (manifesting itself e.g. in tics, motor inhibitions, mutism) or it can become uncontrolled (manifesting itself e.g. in uncontrolled kicks) (Dolto 1984: 17). On the other hand, the body schema can influence the construction of the body image. Early organic/physical damage can produce distortions in the body schema, which in turn can cause a temporary or permanent modification of the body image (cf. also Cole, this volume).

Of capital interest here is Dolto's clinical finding that a damaged body schema can go hand in hand with a normal body image (Dolto 1984: 18). A paralysed child for example can develop a healthy body image when it is allowed to play verbally with its body, when it can talk with its mother about running, jumping and so on, even if it knows that it will never be able to actually perform all these actions. Through this verbal play the child has the opportunity to construct a healthy body image, symbolised by words and graphic representations, in erotic satisfying phantasms. The fact that the child's desires are addressed to a person willing to accept this projecting play enables the child to integrate its desires into language in spite of its disability (Dolto 1984: 19).

4. The threefold composition of the body image

The body image is formed during the development of the child and consists of three parts: the *basic* image, the *functional* image and the *erogenous* image. A fourth *dynamic* image connects and holds together the three former images.

The *basic image* refers to the child's experience of a "narcissistic continuity" in space and time. The basic image is associated with the primordial narcissism (Dolto 1984: 50–51). In every phase of the child's development the representation of this basic image is characteristic. Shortly after birth a respiratory–olfactory–auditory basic image appears that represents vegetative life (Dolto & Nasio 1992: 34–35). Next the oral basic image is added to the first one and is associated with the emptiness or fullness of the stomach. The third image that is added to the two preceding images is the anal basic image, associated with the function of retention or expulsion. This relational architecture only becomes established when the mother addresses her baby during the care of the body.

Whereas the basic image has a rather static dimension, the *functional image* provides a vital image of a subject that is focusing on the satisfaction of its desire. This functional image, operating in the field of the erogenous zones, enriches the relational possibilities of the child with others (Dolto 1984: 55–56).

Associated with a specific functional image of the body, it is in the *erogenous image* that the erogenous pleasure or unpleasure in relation to the other is situated (Dolto 1984: 57).

The body image is the living synthesis of the basic, functional and erogenous images that are connected by the life drives and are actualised for the subject in the *dynamic image*. The latter stands for the desire to exist in the future, a desire that is characterized by a structural lack and which points to the unknown.[2] As such, it has no representation and must be considered as *the tension of an intention*. This desire or dynamic image is directed towards objects. Dolto differentiates between oral, anal and genital dynamic images with the help of the oppositions need/desire and centrifugal/centripetal. For example, the oral dynamic image is centripetal at the level of the need (e.g. incorporation of food) whereas at the level of the desire, it is centripetal and centrifugal (the child can swallow and spit out the food it needs). The anal dynamic image is centrifugal at the level of the need and centrifugal or centripetal at the level of the desire (as is the case in sodomy). The genital dynamic image is centripetal for women in relation to the penis while for men it is centrifugal. In childbirth women form a corresponding expulsive centrifugal dynamic image. If we consider the oral-anal dynamic image, we see a centripetal movement from the mouth to the anus. An inversion of this movement makes a person vomit. This is caused by an anal interpretation of the oral dynamic image (Dolto 1984: 57–59).

5. Clinical fragments

Dolto very gradually developed and refined the above described notion of the unconscious body image, as a clinical instrument, that is, out of her clinical work with children.[3] What then, according to Dolto, appears in those drawings and mouldings of children? A first example illustrates how the body image appears through *speech*, i.e. in the *associations* of the child, and how it reflects the *dynamic of the desire* of the child and of its parents. A second example illustrates how in a drawing the Freudian psychical instances or structures of the Id, Ego and Super-Ego are represented. A third and fourth example illustrate how, more specifically, the representation of a partial libidinal body appears in the creations of infants, i.e. in drawings and mouldings alike.

5.1 The body image appears through speech

Example 1 (Dolto 1984: 8–10). An eleven-year-old boy with a severe nervous tremor draws a horse that does not fit within the frame of his paper, i.e. the horse has no head. On the horse a knight is sitting who fights an enemy that is partly invisible, but one can clearly see a sword coming from the left that threatens the knight. According to the infant, at the bottom right of the paper a poisonous snake wants to bite the horse. During another session the same theme is elaborated in a second drawing of a knight sitting on a horse. But now it is the knight who has no head, while the horse does have a head but lacks a tail. Also, a tiger head that is ready to attack the horse substitutes the snake.

Being questioned, the boy indicates that he identifies with all of the represented figures: for him, the tiger head signifies the danger of being devoured orally; the head of the horse signifies his mastership over his anal musculature, while the head of the knight stands for the mastership of the knight, that is, of the human being. Apparently, these three heads are interchangeable on condition that they do not figure within the frame of one and the same drawing. The knight, i.e. the human being, is always in danger, threatened orally by the tiger, anally by a snake or, in a more general sense, by a superior human being (represented by the sword).

From the boy's associations it appears that all these dangers refer to an actual family drama. Recently, his grandfather had died and the boy's nervous tremor had begun immediately after the burial. After the dead of his grandfather, i.e. of his father's father, there was a severe conflict within the family with respect to the heritage. Moreover, his father had witnessed the murder attempt by his oldest brother against one of his other brothers. The child had heard of this fact, lying in bed and listening to the conversation of his parents. All had mixed up for him: the oral greed with respect to the heritage, the taboo of murder and his astonishment while assisting to the complicity of his own parents. As a matter of fact, he had been the silent witness and therefore the accomplice of the parental conversation having a dehumanising impact with respect to the law. That is, what he had perceived in the conversation of his parents was that their desire equalled his own incestuous desire, i.e. a desire to transgress the law.

This is how Dolto proceeds in her clinical work: she questions the children about their drawings or mouldings and it is in their associations that the unconscious libidinal body, that the unconscious body image can appear. Therefore, fundamentally, the body image is a spoken image.

5.2 The body image represents unconscious structures

Example 2 (Dolto 1984: 10–12). A ten year old boy, very inhibited, with an anxious smile on his face, incapable of expressing himself through words, during several sessions with Dolto, draws nothing but impossible tank battles. In one of these drawings one tank is drawn in full while the other tank is only partly represented. Tanks, in battle, are supposed to fire at each other but in the boy's drawing, that does not happen. The first tank fires in the opposite direction of where the second tank is, and the latter, while aiming at the first tank, does not fire at all. In another series of drawings, two boxing men are represented, always, as it were, in an impossible fight: either they have no head, or they have no feet, or they cannot reach each other because of the distance between them. After several sessions the boy manages to represent the boxing men right in front of one another and one of them is wearing a striped shirt. The boy indicates that if he himself would be in the drawing, he would be the man wearing the striped shirt. He then recalls the story of a classroom mate, a boy wearing a striped shirt that was once punished by his father for having poor school results.

When Dolto questions him about this apparent identification, the boy says that he does not precisely want his own father to punish him, but that his classroom mate's father at least occupies himself with his son. His own father behaves totally indifferent towards him, does not consider his son as someone valuable. “Be quiet!”, “Go away!”, “Don’t trouble me!” is the only way in which the father addresses himself to his son. Therefore the boy can not identify himself with his father. The father is jealous of his son and does not permit his son to construct himself, psychically that is, in reference to him. He cannot support, cannot function as an Ego Ideal for his son because he himself is anxious and feels insecure. The boy, who as a consequence is totally inhibited in his virile libidinal desires, apparently perceives this very well. At the Ego-level, the boy wants to be someone having a strong father that is capable of controlling his inhibition, a father that can support the establishment of a Super-Ego inhibiting his laziness, a father functioning as an Ego Ideal. His desire is to be like his comrade, having a father that is interested in him and having a mother who can love her son without rendering her husband inexistent and anxious – as is apparently the case in the family of his friend.

Again, it is shown here that for Dolto whatever is appearing in a drawing or moulding, whatever is represented, it can only be deciphered, or inferred, starting from what the child itself relates to it. The body image that is revealed in the associations of the child contains the Freudian unconscious structures of the Ego, i.e. Ego Ideal, the Super-Ego and the Id. In his speech the child identifies with what is represented in the drawing, or, as is the case here, the child hints at a lack and reveals his desire for an Ego Ideal.

Also the volumes that figure in the drawings represent the child’s intentionality, or mediate the partial drives of its desire, mediate the libido as expressed through its body.

5.3 Creations represent the libidinal body

Example 3 (Dolto 1984: 12–15). A brilliant but ‘very nervous’ boy of about 14 years old kicks the tables in the classroom violently in a compulsory way. His mother, suffering herself from a disease of the shinbones, tells Dolto during the first session that at home, her son also kicks her shinbones as well as the table-leg and bed-leg at the side where she is sitting at diner or sleeping at night. In this context, it is interesting to know that in French (as is the case in English and Dutch) the common expression ‘to kick someone at the shinbones’ means ‘to hurt someone’s feelings’. During the first session, the boy cannot explain his violent behaviour, nor the reason why it is always directed to his mother rather than to his father. He simply cannot help it; it is an urge that is stronger than him.

As he cannot draw, he chooses to express himself with modelling clay and he moulds a well. Questioned about his creation, the boy indicates that there is water at the bottom of the well and that "it is an ancient well – nowadays there are no more wells like this". During the same session Dolto and her young patient also talk about the "truth" that usually emerges from such ancient wells.

At the end of the session, as Dolto wants to fix a second session, the boy refers her to his mother – "You should ask that to my mother". Subsequently, while Dolto and the boy's mother are fixing the dates for the next sessions, the boy suddenly takes the right hand of his mother in his left hand and caresses the interior of the well with his mother's index. Questioned on this behaviour he is very much surprised – it is as if he had not been aware of his own gesture. "What does this finger of your mother put into the well makes you think of?" And then, hesitatingly, he confesses that his mother does not permit him to go to the toilet at school, because she insists on being able to examine his excrements. The mother, on the other hand, when questioned about this responds that she considers it as her duty as a mother to be concerned about the good functioning of the body of her son. It was the doctor who more than twenty years ago had advised her to massage the anus of her elder son who had suffered from a prolapsus of the rectum when he was about 18 months old. She had continued this anal massage of her other adult son (21 years old) until this very day.

What then was apparently represented in the moulding of the water well? In Dolto's wording and starting from the child's associations, the well was to be considered as the projection of a partial image of the anal body; it represented the rectum of the boy for whom the truth of the feminine sexuality was associated with excremental pleasure. His own anal sexuality remained fixated by the perverted and incestuous desire of his mother towards her sons and was hidden or legitimated by a superfluous medical and educational discourse. In his aggressive and symptomatic behaviour directed towards his mother, in his kicking of her shinbones, the boy not only expressed incestuous desires but also his rivalry with his elder brother who could hardly function for him as an Ego Ideal for him.

Example 4 (Dolto 1984: 15–16). During the session, an eight-year-old infant moulds an armchair. Dolto questions the boy about the armchair: "Where would it be, that armchair of yours?" – "In the attic." – "But the chair looks quit solid; one does not put a good armchair in the attic." – "Yes, that is true." – "Well, who would it be, that chair, in case the chair would be someone?" – "It would be my grandfather... Because they say that he is old and that he does not want to die." – "Well then, does it trouble someone that he does not die?" – "Yes, because there is not much room in the house and we are obliged to sleep in the room of our parents and because grandfather does not want anybody sleeping in his room."

That was the situation: an awkward and paralysed old man, sitting all day in his armchair and whom the parents wanted to put in the attic with other broken objects. The armchair in the boy's drawing represented the awkward body that prevented the family to live comfortably. For the infant, the drawing of the armchair was the only way to tell the story, through the illustration of the anal fixation to a chair. The grandfather apparently represented an anal Super-Ego and the underlying question was how to reject this man and at the same time, how to keep and respect him. No wonder then that the boy suffered from anal retentions and failed at school, i.e. with respect to the corresponding sublimations of the oral and anal drives.

6. Discussion

The body image is not the image that has been drawn or that has been moulded as such – it can only be revealed from the analytical dialogue with the child. More importantly, this body image should never be confused with the body schema. In the above mentioned examples we are dealing with infants that are perfectly healthy on the level of their body schema: there is no question of their body schema being initially hurt or disturbed, there is no question of any organic lesion. It was only the functioning of their body schema that was affected by their pathogenic body images.

In the second example mentioned above the boy exhibited a total ideational and motor inhibition, completed with mutism and a rigid, paralysed smile – here, the body schema apparently is inhibited by the body image. In his drawings and notwithstanding a perfectly healthy body schema, his tanks did not manage to fight. And again, when in his subsequent drawings the boxing men were missing an arm, this was not due to a defective body schema but rather to an invalidating body image. In the third example, the boy suffered from violent motor impulses that he could not control – that is, his body schema was not controlled by his body image. In both instances, an adequate use or functioning of the body schema was annihilated by "the libido attached to an inappropriate, archaic or incestuous body image" (Dolto 1984: 17). Here, the relation between the body schema and the body image appears to be dynamic: the body image can inhibit or facilitate the functioning of the body schema.

On the other hand, an impaired or deficient body schema, e.g. due to polio attained before the age of three, i.e. before the child has sufficiently experienced its own body while marching, does not necessarily imply that it will acquire an impaired body image. A child that is born without arms or legs, surely will have an impaired body schema; still, whether or not it will have an impaired body image as well, will depend on the linguistic exchanges with its environment. With respect to the latter, Dolto stresses the need for procuring the child with "des informations véridiques", i.e. with "true" and very early information, in speech, on its physical condition.

Whereas the *body schema* is in principle (or to a great extent) identical for all the individuals (at a given age, under the same climate) of the human kind, the *body image* on the contrary is particular and is related to the subject and its history. As a consequence, the *body schema* is partly unconscious, partly preconscious and partly conscious, whereas the *body image* is fundamentally unconscious and can only become partially preconscious when it is associated with conscious language. Or again, whereas the *body schema* (1) refers the actual and spatial body to the immediate experience; (2) can be independent from language considered as the relational history of the subject with others, and (3) evolves over time and space, the *body image* refers the subject of desire to its own *jouissance*, mediated by the memorised communication between subjects and formed by the dynamic articulation of a basic image, a functional image and an image of the erogenous zones where the tension of the drives is expressed (Dolto 1984: 23–24).

The following example may clarify the body image defined as the symbolic and unconscious incarnation of the desiring subject (Dolto 1984: 22). During her first session, a little girl makes a beautiful drawing of a vase with blooming flowers, also indicating the water level. Later on and in presence of her mother, the girl draws another vase, this time a very small one without any water and with withered flowers. The unconsciously experienced body image apparently differs depending on whether the mother is present or not. In relation to her mother, the girl experiences herself as very minor and withered, whereas in relation to her analyst she feels as having the right to bloom. It is of course not the case that the *body schema* of the girl is changed by the presence or absence of her mother; rather the latter affects her *body image* and its *projective representation* in the drawings in which the little girl expresses her injured narcissism in her relation to her mother.

7. Conclusion

Dolto's theory is clearly not the result of any inductive reasoning starting from empirical research of the body schema, i.e. that side of the problem that is most apt to scientific research. However, her clinical examples and theoretical elaborations must sound familiar to clinicians, who in their clinical work of course do not operate on the level of the body schema. What is important in Dolto's conception – besides its clinical, therapeutical relevance – is the fact that it stresses the structuring role of the symbolic order, i.e. the way in which the body schema that the human being shares with the animal world, is subverted through language, an operation that gives birth to the strictly human body image. In a broad sense this conception does not contradict the actual neurobiological point of view of Damasio (2004: 19), as reflected in his Spinozian saying "the mind is the idea of the body". In Dolto's words, this would sound like "my body image is the perception I unconsciously have of my body schema, a perception that is influenced by the symbolic interaction with others."

Notes

1. Evans indicates that in Lacan's teaching the term 'lack' is always related to *desire*, for it is a lack which causes desire to arise. "However, the precise nature of what is lacking varies over de course of Lacan's work. When the term first appears, in 1955, lack designates first and foremost a lack of *being*. (...) What is desired is being itself." (Evans 1996: 95)

2. See Footnote 1.

3. Back in 1938, it was Sophie Morgenstern (1875–1940), the first child analyst in France, who suggested to Dolto to start from drawings and mouldings in her clinical work with children.

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On the relation of the body image to sensation and its absence

Jonathan Cole

1. Introduction

An astronaut friend related to me a few years ago about how, despite five missions in the Space Shuttle, she never tired of looking down onto the world. But she said, she was – at first – amazed that no one had painted national boundaries on the Earth. From space countries do not exist. The body image (BI) and body schema (BS) distinction is somewhat similar – it exists because, and only because, it is considered a useful way of looking at the inter-relations between sensory inputs to and movement of the body and perception. And, like boundaries between countries, the boundaries between the body image and body schema can, at times, be contentious.

Within the present volume, there are different interpretations of the body image – body schema distinction. Having co-authored with Shaun Gallagher, (Gallagher & Cole 1995; and see Gallagher 1986), I am content to suggest that the body image is a complex set of intentional states, perceptions, mental representations and beliefs in which the object is one's own body and that this has a reflexive intentionality and includes a perceptual experience of one's own body, a conceptual understanding of it and an emotional attitude towards it. In contrast the body schema is a sub-personal concept governing posture and movement, a set of motor capacities and habits below intentionality. Debate about these definitions will continue elsewhere in this volume, and may, in part, focus on the nature of the motor (or kinesthetic) system and how plastic and dynamic it might be. I would point out that, as in the original accounts of Head (1920), we have always considered the motor processes dynamic; this was highlighted by me in relation to subject Ian Waterman in my biography of him, (see Cole 1995).

In the present chapter I will address two areas of relevance and which might extend the above model. By considering the body schema as being motoric and the body image as complex the importance of direct sensory inputs to both may possibly been downplayed. This is ironic since it was the very absence of sensory inputs in subject IW that allowed Gallagher and Cole (1995) to show how reliant the schema is on sensory information and to suggest that, in a sense, IW used his body image in place of his schema in the control of movements. I will relate neurophysiological evidence for the direct effects of sensory input on perception of the body image.

The body image has also been considered clearly differentiated from its environment. This may be an oversimplification, and I will discuss the experiences of those who live without sensation or movement after spinal cord injury (SCI) at the neck to explore the way in which body image is dependent on the wider environment. Lastly I will consider some of the consequences of the data reviewed.

2. The effects of sensory alterations on one's body image

2.1 Vibration and perception sense

In the early 1970's Goodwin and colleagues showed that vibration of a muscle tendon led to profound alterations in the perceived posture of a limb (Goodwin, Matthews, & McCloskey 1972). Vibration of the biceps tendon for instance, when direct vision of the limb was absent, gave on the illusion that the limb was being extended, since vibration was thought to activate muscle spindles that normally signal stretch. Further, Lackner showed that if one was touching one's nose at the time of vibration one had the impression that one's nose was elongating, so strong was the illusion of arm extension coupled with the continued felt touching of fingers to nose (Lackner 1988). Previous to these experiments there had been debate as to whether sensory input from muscle spindles had access to awareness, yet here spindle input was shown to alter position sense and was immediately, effortlessly and without thought, elaborated into the body image.

2.2 Numb big fingers

If an excess input had such effects so could the loss of sensation. Gandevia et al. (1999) showed that local anaesthesia to a finger led not to the absence of perception of the finger, but to the perception that the numb finger's size had increased, as we all feel our lips to be after a dental anaesthetic. Surprisingly perhaps, Gandevia also found a small effect on the perception of one's lip size too, even though in his experiment only the finger was anaesthetised. Loss of a sensory input even temporarily affects body image in complex ways.

Paqueron and colleagues have investigated these phenomena in more detail recently (Paqueron et al. 2003). They found that a majority of patients have these alterations in body image during regional anaesthesia for surgery, with changes in the perceived size and shape of limbs. Patients reported illusions of size and shape as well as of, in some cases, position. The latter vanished with direct vision but the former did not. Two patients even failed to recognise their limbs as their own, while another had a strong sense of swelling in a limb which was, nevertheless, felt to be missing. These patients were experiencing dissociations between body image and a sense of ownership. By plotting the time course of these perceptions against the peripheral losses of sensation Paqueron et al. were able to show that it was the small peripheral nerve fibres, underpinning pain and temperature perception rather than the large nerve fibres involved in touch and movement/position sense, that were involved in these alterations in body image. It is clear that body image is dynamic and maintained by peripheral sensory input in a strong bottom up way.

2.3 Feeling a phantom

There is also evidence that sensations can be felt in body parts that are absent. This has been known for many years in relation to the experience of phantom limb sensation and phantom limb pain. Ramachandran et al. (1995) exposed patients with phantom limb sensation to a mirror box and found that in 2 out of 8 patients touching the existing limb, when seen in mirror inversion, led to touch sensation on the exact mirror symmetrical location on the phantom limb. Interestingly – and in distinction to the experiments of Paqueron – this was only for touch and not for pain and temperature. Hunter et al. have extended these observations looking at the interactions between tactile and visual inputs in phantom limb awareness (Hunter et al. 2003). They differentiated between phantom limb sensation (PLS), specific feelings in the phantom, and phantom limb awareness (PLA), a general knowledge of the presence and existence of a missing limb as one's own. Though Hunter et al. did not find dual perception of touch in a mirror box they did find that viewing the intact limb in this situation led to a more vivid PLA.

2.4 Visual capture of sensation

The capture of touch sensation from an intact to a missing limb may be rare but there is evidence that one can *feel* touch from a purely visual stimulus. Botvonick and Cohen (1998) hid their subject's hands from view under a table and then showed them rubber hands above their real ones. After 10 minutes or so of stroking the rubber hands subjects felt the stroking over the skin of their own hands. Subjects related, "I felt as though the rubber hand was my hand", "I was feeling the touch where I saw the brush". The authors suggest that we normally distinguish our self from non-self by a form of intermodal perceptual correlation – what we move and see and feel is us. In some circumstances 'visual touch' can be elaborated from a rubber hand into our own felt body image. In fact others have repeated the experiment with a rubber glove with the same result. As long as the object is presented to the subject in a similar position to the real hands realism of the dummy hand does not seem essential (Driver & Spence 2000).

2.5 Visuo-motor capture of the whole body image

The DART robot at the Johnson Space Centre has arms with similar joints to humans and two cameras mounted in its head looking down at its robotic hands. The human operator sits a few metres away and is equipped with position sensors over the hand, arm and head before being given a head mounted display of the robot arms. Then when one moves one's own unseen arms one sees, after a short delay, the robot arms move, a curiously enjoyable thing to do.

After a minute or so most people feel they are "in the robot". When working the robot's arms, I felt that if I had dropped a wrench I was moving from hand to hand, seeing it but not feeling it, then it would drop on my leg. Another person clearly moved his head and body out of the way when a table was moved towards the robot and when he was sitting metres away controlling it (Cole, Sacks, & Waterman 2000). In a short time, and without realising it, we perceived our bodies to be within the robot; what we see and move we become.

One might question why the body image needs to be so malleable in relation to changing sensory input, or whether such phenomena are only revealed in laboratory experiments or extreme neurological disorders. Such plasticity, in fact, seems essential in everyday life. Our bodies change enormously as first we grow and then age; if we sprain an ankle or break a leg then sensory inputs and motor behaviour will be altered immediately. We need a dynamic sense of body image to maintain ownership and an embodied selfhood.

This is perhaps never more stretched than in one of the most extreme of neurological impairments, spinal cord injury, in which the person has no sensation or movement below the neck. What effects does this have on body image? In the second part of this chapter I will consider some effects of severe spinal cord injury (SCI).

3. Conceptual understanding of one's own body: Lessons from Spinal Cord Injury

The consequence of a complete SCI in the cervical region is that the person is without movement or sensation below the neck, leaving them with some movement of the arms and shoulders but often nothing below. Not surprisingly such massive losses can be devastating and take time to come to terms with. Though how this coming to terms is achieved is of importance and fascination, the present concern is with the effects on the body image and body schema of such a loss and considers phenomenological data from the narratives of those with SCI (see Cole 2004).

3.1 The sensation of nothing

Wittgenstein had asked if the absence of a feeling was a feeling, (Wittgenstein 1980: 31e). In talking with people who are tetraplegic it is clear that living without sensation from the body is not quite the same as having nothing. One man told me that,

> Early on there was this sensation of feeling nothing and one felt disembodied, even though you knew you weren't because you could see. But you did feel completely disembodied. That was an odd sensation.

However it seems that even nothing is perceived as something, as a positive rather than a negation. Another person, longer after his injury said,

> I felt like a balloon being wafted around. It is a sensation of nothing. I immediately compared with before. To me it was a sensation; it wasn't numbness. It was nothingness. It was a sensation because you can sense nothing. It was a definite sensation. My head floating... I've never been up in a balloon, but that's how I imagine it would be.

3.2 Visual capture revisited

Though deprived of peripheral sensation several people told me of how they could feel their legs. One woman was convinced she knew where her legs were in space – on her chair or in bed – and was surprised when I suggested that this might have been because she could see them and had a visual capture of a positional sense. Another "felt" touch on her leg when she saw her leg being touched, and only when she saw the touch, a clear visual capture of sensation homologous with the dummy hand experiments referred to above. The desire of the mind, and the body image, for connectedness with its body and for peripheral sensation is clear.

3.3 "*My friend the pain*"

Unfortunately, in a majority of people, numbness after SCI all too soon turns into pain. At its mildest however this is not necessarily unwelcome. Indeed a mild degree of pain is preferable to a complete disconnection, even though this pain only represents a phantom awareness, an illusion of embodied feeling. If worse however, pain can interfere to an enormous extent,

> My physical pain is in the hands and down the legs and in the feet. The pain does not come on; it is there, the whole time, 24 hours per day every day, every day of the year. But when it's angry it gets me so down. It can last twelve hours, or twenty-four or thirty six...
> The feet feel as though someone has a bicycle pump on them, they feel massive as though they are about to explode and then you look down on them and they are normal size, which is odd. They feel at least twice that size. With my buttocks I am sure it is really hot and ulcerated and yet they are not. At the same time I get the feeling that my legs are ice cold and I touch them and they are not, just numb and yet painful. Most of the time I can override it, but I still know it is there.

The cause for this serious central chronic pain is unknown, but it occurs in around 25% of people with spinal cord injury (Rose et al. 1988). At its worse it is far more than an illusion of embodiment. As one lady said to me, "Paralysis does not stop a life but pain can." But despite this there is still the need for some embodied feeling. A man with severe pain said to me, "I cannot do anything myself to get a connection [with my body]. If I pinch my legs it is numb. The pain is the connection – my friend the pain."

His pain was so bad that for days on end he laid in his bed turning his back on the world, and yet, still, pain was accepted as the only language his body had left.

3.4 The new visual image

Without peripheral sensation vision becomes the sole sensory modality with which to judge one's body after SCI. This can be a cruel awakening. Morris (1989) asked a series of women for their experiences.

> Catching a glimpse of myself in a full length mirror… the broken body, slumped in the ugly apparatus which was to be my outer skin for the rest of my life... My self esteem hit rock bottom.
> Many of the painful emotions experienced in the months after injury are related to changed body image. We have to get used to a different body…
> I cried the first time I saw my skinny body…

Another hated her body.

> Muscley arms and broad shoulders, a fat stomach and twig like legs. Yuk!
> I have my tube-shaped muscle-less legs and swollen ankles; my fat abdomen and my tendency to hunch up in the wheelchair...
> YES!! The body beautiful image makes me feel bitter and resentful...

Yet, with time – fortunately – perceptions alter and people can become more accepting, as we will see.

3.5 Body Image and the environment: Lived space and time

Merleau-Ponty wrote,

> Besides the physical and geometrical distance which stands between myself and all things, a "lived" distance binds me to things which count and exist for me… This distance measures the "scope" of my life at every moment. (Merleau-Ponty 1962: 286)

Spinal cord injury has profound effects on the way in which space and distances are viewed. Toombs (1993) discussed how illness changes the character of lived space. A narrow doorway becomes a problem rather than being a simple passage. Just as, normally, movement opens up space and allows free exploration of the world, so illness and disease limits these potentialities.

Limitations in movement may change not only the experience of space and distance, but also time. Whereas we might normally walk from one place to another whilst thinking about the next thing to do, when movement becomes problematic it requires our constant attention and so roots us in the present. Lives may become a succession of difficult presents rather than a mix of past, present and future.

3.6 Body image from agency

A big problem for anyone tetraplegic is the difficulty of making anything happen, of making an action owned and initiated by them and so to escape passivity and dependency. Describing another situation Samuel Beckett wrote that, "You do what you are, you do a fraction of what you are, you suffer a dreary ooze of your being into doing." (Beckett 1938: 37). I discussed this with David, a tetraplegic,

> I think he got it the wrong way round – Yes there are other ways of being than just doing and probably the more creative you are the better. For me, though, I think it helps to explain my self-perception and self-image by saying that the key is doing into being – the opposite of Beckett. Dragging more out of my head into my body, spreading my physicality throughout my body, gives me the possibility of physically doing things. Being into Doing – I don't think that's right. I think the things that I do make me who I am. That need to express myself physically in certain things that lead me from the doing of things into being a person.

Other tetraplegics were well aware of the importance of breaking out from thought and intention to action. One, able to move his arms, said,

> Me is the mental side. I am what I think, rather than I am what I do. I release my thoughts into speech or writing or anything else, rather than into any other movement. It is still doing, but less doing. It is more intellectual, but that is one reason why I enjoy cycling using my arms, because it is a raw physical release. Before I did not realise how badly I needed it.

But, curiously, doing does not have to be performed by the subject himself.

3.7 Doing and being, through a personal assistant

Merleau-Ponty was aware of the importance of action in the world,

> Consciousness projects itself into the physical world and has a body… [It] is in the first place not a matter of 'I think that' but of 'I can…' Consciousness is being-towards-the-thing through the intermediary of the body…
>
> (Merleau-Ponty 1962: 137–139)

> The body is the general medium for having a world …
>
> (Merleau-Ponty 1962: 146)

> [M]y love, hatred and will are not certain as mere thoughts about loving, hating and willing: on the contrary the whole certainty of these thoughts is owed to that of the acts of love, hatred and will of which I am quite sure because I perform them… I make my reality and find myself only in the act…It is not because I think I am, that I am. The whole certainty of love, hatred or will is that I perform them. (Merleau-Ponty 1962: 382–383)

One man with tetraplegia talked of doing the washing up for his wife, even though I knew this was physically impossible. This is where personal assistants are so crucially important. The man did not wash up himself, but by asking his PA to do it he gained a sense of agency and ownership of action for himself of the task. A good PA, by acting and doing when the tetraplegic asks and in a manner satisfactory for them, can relinquish his or her own agency, so allowing the tetraplegic a real sense of acting in, and on, the world. To paraphrase Merleau-Ponty, "Consciousness can be a being-towards-the-thing through the intermediary of my body *and that of my PA*… My body *and that of my PA* are the general media for having a world."

Through a good relationship with a PA a tetraplegic can move from dependency to spontaneity. The relationship between PA and tetraplegic is fascinating, and yet not without its problems too. If going for a meal out does the PA share the meal, so denying you privacy or sit outside reading a book? One gay man complained about his gay PA flirting at a gay bar when he should have been working. What if the tetraplegic contemplates an illegal act, or for instance asks for assistance with suicide, does his PA then concur with his wishes?

3.8 The body image and the environment: The big idea

It should be apparent by now that for a tetraplegic's an ability to act on and in the world is crucial. Someone unable to have a PA and without family may have to live in a home, dependent on a succession of assistants working to their timetable, not his. But those who wish to work and manage independently still have to negotiate an environment that can make or break their lives. Simple things like curb cuts in the street, accessible transport and buildings either allow them to function as others or exclude them – and effectively say that society has excluded them too. Their perceptions of their body image and self-esteem are dependent on physical access as well as on their physical bodies.

Michael Oliver, a tetraplegic and a professor wrote a famous article about his own life from a wheelchair. He suggested that living with SCI is,

> Not about worse, not different – there is a third difference – that SCI makes life better. That is why I wrote the piece in 'The Guardian' about my disability being the best thing that had even happened to me. Because – for me – I think it was. I was a working class yobbo with a failed education, not very good at relationships, in a job that I did not like and I probably would have gone on to drink too much… I was a promising sportsman but had failed in that too, I was a smoker.
>
> Breaking my neck broke that mould and gave me an alternative possibility. It changed the possibility of whom I could become. Forty years later I am a professor of disability studies, I have one marriage behind me and I am happily married again. I have grandchildren and have been all over the world. I have had a good life. I have no complaints. One thing I do know that if I had not broken my neck I would not be a professor in a university. But equally well I do not want me to be positioned as some sort of hero, who struggled against appalling circumstances. I have just taken opportunities as they occurred.
>
> All of us have a relationship between our body and our environment that allows us to do some things and does not allow us to do others. I do not want in some way for disabled people to be considered different because all we are doing is trying to make sense of that experience in the same ways that you do. Where we are different, because I do not want to deny difference either, is that whereas society takes cognisance of your needs in relation with the environment, it does not take cognisance of our needs. You can jump onto a bus or plane easily. I cannot.

In the late 80's and early 90's there emerged the big idea, that disability should be distinguished from neurological impairment. Oliver again,

> The individual model [of disability] sees the problem as stemming from the functional limitations or psychological losses assumed to arise from disability, underpinned by the personal tragedy model of disability, suggesting in turn that disability is some terrible chance event occurring at random to unfortunate individuals. Nothing could be further from the truth.

> The social model suggests it is not the disability, not individual limitations, which are the cause of the problem but society's failure to provide appropriate services and failure to ensure the needs of disabled people are fully taken into account. Hence disability is all the things which impose restrictions on disabled people, from individual prejudice to institutional discrimination, to inaccessible buildings to unusable transport systems.
>
> (Oliver 1990: 33)

This debate between the effects of the neurological impairment and the socially induced disability reveals the way in which for someone with SCI the environment can affect how they see themselves. If employed and engaged with the world their bodies might be less an enduring part of their lives. Their body images, though altered by the SCI, might become lesser a part of what they are.

3.9 New body schema after SCI

We have concentrated on the effects of SCI on the body image, but with the loss of sensation there is the more obvious loss of movement of the limbs and body for posture. This is not really an abolition of movement but rather a change in the needs for movement and its types. Without automaticity of control bladder and bowel care have to be learnt and also, where possible, the person has to learn transfers from chair to bed, and to use a wheelchair. All these are new and difficult movements, partly because they have to be learnt newly as adults, and partly because they have to be learnt with weakened muscles and posture. Though being "paralysed" might appear a passive state, it can actually be very active.

One person described his first time in a wheelchair, something very difficult to learn because of the balance in a chair without postural muscles. The lack of sensation in his body means that he has to look to see where he is. If the light is bad then it is difficult for him to wheel around, since he has less idea where he is. To know quite whether he is upright and stable he has to reference his position from a spot on the wall and work things out from that.

> Because I had no sensation it was like sitting in a wheelchair and floating. I did not feel safe in the chair in the least. This was extraordinary. Initially you could sit in it, but it felt like you were just a head and so felt unstable and convinced you were going to fall out. To understand it intellectually takes months.

Slowly he became more comfortable and was able to start moving round. He had similar problems in self-catherisation of the bladder. The motor tasks involved in this, whilst weak and in a chair, were initially huge.

> I now open the catheter, open a bit of sticky, split the packet, place it on the wall or loo, get a piece of tube, put that in my mouth while I get the catheter, shuffle forward on the chair, undo trousers and get everything out, connect, pass catheter and place over the loo. I do not know whether it [cognitive difficulty] is part of spinal cord injury but it has taken me 6 months to do this simply.

Bowel care was the same, "a voyage of discovery." Those who live with SCI therefore allow us to see some of the problems of losing one motor schema, for walking and instrumental and locomotor action, and having to learn to consciously control what was previously automatic. Those with SCI have to learn a new relation with their bodies.

3.10 Body image from others

Like people who live with facial disfigurement many of the problems for those with SCI come from, and reside in, the attitudes of other people. In discussing the history of surgery to the face, Sander Gilman suggested that many people have surgery not to appear beautiful but simply "to pass", to go unnoticed and so be accepted within a certain peer group. This is not an option for those with spinal cord injury. They know they will always be, "that guy in the chair", to new people they meet. Not only new people either, one woman said to me,

> I used to go out on a Saturday night, but there was never any one interesting to talk with, just drunks I went to school with who would say how sorry they were. Please go away, I'd say, and please move that cigarette away from my shoulder. I don't like making an entrance and an exit. I hate it to have a group of people lined up to say goodbye.

Another, paraplegic, women related that,

> I was still the same person inside, I still thought the same and felt the same... But every one seemed to regard me as a different person. I was an invalid, a stranger. It was as if my accident had erased their memories of me...
>
> (Julie Hill 2000).

In Goodman's biography of Guttmann, the founder of Stoke Mandeville Spinal Centre there is an anecdote about a paraplegic patient, the Rev Albert Bull, injured at the end of World War II (Goodman 1986). He said that at Stoke it was, "the duty of every paraplegic to cheer up his visitors". People with SCI have to reassure others of their continued humanity.

3.11 Being normal

There is a tension within the medical community and society, and those who have SCI, about rehabilitation that aims for as near normal function as possible. A man with SCI railed against his hospital rehabilitation for trying to make him something he could not be, and in doing so, making him doubt what he was.

> The aim of returning the individual to normality is the central foundation stone on which the whole rehabilitation machine is constructed. If, as happened to me following my spinal injury, the disability cannot be cured, normative assumptions are not abandoned. On the contrary, they are reformulated so that they not only dominate the treatment phase searching for a cure, but also totally colour the helper's perception of the rest of that person's life. The rehabilitation aim now becomes to assist the individual to be "as normal as possible".
>
> The result, for me, were endless soul-destroying hours at Stoke Mandeville Hospital trying to approximate to able-bodied standards by "walking" with callipers and crutches... Rehabilitation philosophy emphasises physical normality and, with that, the attainment of skills that allow the individual to approximate as closely as possible to able-bodied behaviour e.g. only using a wheelchair as a last resort, rather than seeing it as a disabled peoples' mobility aid like a pair of shoes is an able-bodied person's mobility aid. (Zola 1982)

To accept those with other body images and body schemas we need a wider acceptance of difference as being other people's normal. This was seen in what a tetraplegic, injured years before, told me as we sat together once. For he had a new, and surprising, normal body image.

> It took weeks and months to feel OK. Now I can almost kid myself that I can feel something when I sit in a chair, even though I know I cannot. It feels exactly the same sitting in a chair now to before I was injured. It can't but it does. My mind tells me so. My mind makes me think I am like you over there. It learns what is the norm for this body. It tells me there is nothing wrong, so I feel comfortable and correct.

4. Conclusions

4.1 Will, ownership and image

The first part of this chapter showed how alterations in the body image can occur in immediate and apparently non-cognitively mediated ways, with little mediation through intentional states or beliefs. The body image, in these cases, changed in direct relation to altered sensory inputs. The examples given were all unusual, but still allow us to raise the question of how much elaboration of our body image is based on our intentions and beliefs and how much on sensory inputs and, indeed, to ask to what extent our intentions and perceptions are consequent on the effects of these inputs. Why, indeed, do we require such an elaboration of sensation into a body image, constantly changing according to intention, belief and emotion?

In his consideration of action Daniel Wegner suggests that conscious will is superimposed on and associated with movement to allow us agency, "Will...happens both in body and mind... [and] makes the action our own far more intensely than could thought alone." (Wegner 2003: 325). Though work in this area and others have been bedevilled by the splitting of motor and sensory systems when they are intimately related, perhaps those parts of our body image concerned with intentionality and belief have evolved, in part, to give saliency to and ownership of our bodies in a way which raw sensory input does not. A subject with an autistic spectrum disorder may have given an insight into life without a body image and its consequences for perception. She described touching her hand against her leg and consciously experiencing for the first time, in her twenties, the two as connected and her body as a whole,

> My hand was placed randomly on my leg. Suddenly I became aware of inner feeling in both my hand and my leg at the same time. "I can feel my leg", I shouted in fear. "I can feel my hand *and* my leg!" ... I moved my hand to my arm and fearfully whispered, "I've got an arm." I felt it not on my hand from the outside, as usual, but from the inside. "Arm" was more than a texture; it was an inner sense. My hands went up to my face. My face was there from the inside. My body was more than just a series of textures that my hands knew, an image my eyes saw... (Williams 1994: 229–230)

Perhaps our body images are manipulated and altered by our thoughts and feelings to give us an enhanced sense of ownership of our bodies. A sense of embodiment entirely dependent on raw sensation would be difficult to imagine. That our body image is so enduring and yet so plastic, changing with injury, growth and age, suggests its importance.

4.2 The social and the imaginative

Some of the ways in which other people affect one's body image were described in relation to tetraplegia, and were also a major consideration of my book on facial visible difference (Cole 1995), for the face should not be omitted in any consideration of the body image. The ways in which the accessibility of the environment affects those with problems with physical mobility problems also point towards the fact that the body image may be affected by factors beyond the body.

Yet some people with SCI carry on much as before, only from a wheelchair, enjoying their lives by altering their work and social lives to take account of their new bodies, skiing in a skid rather than standing for instance. Others do less well and find their new lives an enduring ordeal. Quite why people react so differently may be the result of many factors. Pain, lack of family, of employment, of accessible environments may all play large parts, and in this tetraplegics are like anyone else. Yet there may be people with similar injuries and similar experiences whose view of their lives after injury are very different. One hugely important gift is social skill, so that one is interested in, and so interesting to, others. This skill is much underestimated, especially in the response of those with neurological impairment.

But even beyond these important factors may lie a potential to explore one's new body and one's new life creatively. One person described being tetraplegic as being a new person with new rules, new perceptions and new expectations. Some have an almost given creative, imaginative faculty to do this, with huge plasticity of body image coupled with an ability to let go their previous lives. Others find this impossible (Cole 2004). It remains a task for the future to assess whether and how people may be encouraged to explore and use their imagination in this regard to restore themselves as best they can. It is with an example of this, from John Hockenberry, a paraplegic, that I will close. He was going through downtown Chicago,

> It had been a long day. I was tired and I stopped worrying about speed and pedestrians: a dreamy dissolve... the walking people became moving posts in a slalom course... the territory between the bodies became an ether, a river of space into which I could glide... Gravity pushed the chair ahead, and with the smoothness of curves on a lathe, I carved a trajectory around the pedestrians. The space between pedestrians became my space, and the whole scene unfolded as a postulate: Can this be done? Can the staccato pedestrian rhythms blend with the reedy line of effortless rolling descent? Wheel jazz.
>
> When the fear of collision vanished, I ceased to look like a piano rolling down

> a hill. The chair and legs joined for all to see in an unsolicited statement of grace. (Hockenberry 1995: 213)

On meeting snow he wrote,

> It took years in a wheelchair before I could be truly amazed by what it could do, and what I could do with it. On a winter night in Chicago, after a light snow, I rolled across a clean stretch of pavement and felt the smooth frictionless glide of the icy surface. I made a tight turn and chanced to look around... The streetlight cast soft icicle rainbows... I saw two beautiful lines etched in the snow. They began in parallel and curved, then they crossed in an effortless know at the place where [I] turned to look back. My chair had made those lines... It was the first time I dared to believe that a wheelchair could make something, or even be associated with something, so beautiful. (Hockenberry 1995: 207)

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