

Pre-Reflective Self-Consciousness: On Being Bodily in the World

Dorothee Legrand

CREA—Centre de Recherche en Epistémologie Appliquée

Empirical and experiential investigations allow the distinction between observational and non-observational forms of subjective bodily experiences. From a first-person perspective, the biological body can be (1) an “opaque body” taken as an intentional object of observational consciousness, (2) a “performative body” pre-reflectively experienced as a subject-agent, (3) a “transparent body” pre-reflectively experienced as the bodily mode of givenness of objects in the external world, or (4) an “invisible body” absent from experience. It is proposed that pre-reflective bodily experiences rely on sensori-motor integrative mechanisms that process information on the external world in a self-relative way. These processes are identification-free in that the self is not identified as an object of observation. Moreover, it is defended that observational self-consciousness must be grounded on such identification-free processes and pre-reflective forms of bodily experience.

Acknowledgement to Manos Tsakiris and Rasmus Thybo Jensen, as well as to the participants of the seminar at the Center For Subjectivity Research, Copenhagen, Denmark.

1. Bodily Experiences

There are many circumstances in which your consciousness of your body is an important part of your experience, when you have to pay attention to it, to observe it, visually or proprioceptively. This is so when you need to obtain specific information about your body and/or actions. For example, you need to know how bad your beard looks in order to make the decision to shave or not. But there are also many circumstances where you do not need to be explicitly conscious of such specific information about your body to perform adaptively. Nonetheless, even in the latter case, the body is not totally absent from experience. This is what this paper intends to clarify. To that aim, I will take two complementary perspectives: an empirical perspective (what are the neuro-physiological mechanisms involved during the experience of one's body as one's own?) and an experiential perspective (what are the different kinds of experience of one's body as one's own?).

2. Empirical Investigations of Observational Bodily Experience

A review of numerous empirical investigations suggests that, as far as the “physical self” is concerned, the only domains where the self seems to

involve “special” processes are “the sense of self constituted by body part ownership and action ownership, or agency” (Gillihan and Farah 2005, p.85).¹ The sense of ownership has been defined as “the sense that I am the one who is undergoing an experience. For example, the sense that my body is moving regardless of whether the movement is voluntary or involuntary,” and the sense of agency has been defined as “the sense that I am the one who is causing or generating an action. For example, the sense that I am the one who is causing something to move” (Gallagher 2000). Given the specificity of these experiences, an important question concerns the necessary and sufficient information required for body ownership and agency.

A first hypothesis states that afferent information would play the major role for observational body consciousness. For example, Farrer et al. (2003) asked the deafferented patient GL to perform an action while the experimenter manipulated the visual feedback by introducing angular biases between the movement performed and the movement seen. GL then answered the following question: “Did the movement you saw on the screen exactly correspond to that you have made with your hand?”² To correctly answer the question in these conditions, the subject can rely neither on proprioception (lost due to the pathology) nor on vision alone (experimentally manipulated). The data show that the patient’s performance is impaired, suggesting that proprioception is necessary for the achievement of such a task.

In another experiment, the authors passively moved the hand of normal subjects while they again manipulated the visual feedback (Farrer et al. 2003). In this experiment, proprioception is available (since the participants are normal subjects) but neither vision (experimentally manipulated) nor motor command (absent since the movement is passive) can allow the recognition of the observed movement as one’s own. Nonetheless, the participants correctly report whether the movement they saw was concordant with the movement their hand really made. Explicit recognition of movement direction is not impaired in this condition, suggesting that proprioception is sufficient for the realization of this task.

Taken together, these results suggest that proprioception is both necessary and sufficient for the type of observational bodily experience involved in these experiments. Importantly, the authors also underline the crucial role of the comparison between *predicted* sensory feedback and *actual* proprioceptive and visual afferences (Wolpert et al. 1995). Thereby, they argue that action recognition would rely on the interplay between peripheral and central information, where sensorial cues would play a major role.

The authors also stress the importance of different sensory cues contributing to the sense of oneself. The role of multimodal integration for the sense of body ownership has been further investigated by the so-called “rubber hand illusion” (Bodvinik and Cohen 1998). When subjects see a rubber hand being stroked synchronously with their own unseen hand, they end up attributing the rubber hand to their own body. Specifically, the “rubber hand illusion” consists in the subject locating the stroked body part closer to the rubber hand. This mis-location would result from the “capture” of tactile information by visual information. Importantly, this multimodal integration is specific to the body, exclusively. This suggests the hypothesis of a multi-*sensory* sense of self (Rochat et Striano 2000, Botvinick 2004). The recording of the neuronal correlates of the rubber hand illusion is coherent with this hypothesis (Ehrsson et al. 2004).

Other investigations shed further light on the processes underlying body ownership and suggest that, in addition to multisensory integration, agency plays a crucial role in the coherence of observational bodily experience. This has notably been shown by using a kinaesthetic equivalent of the rubber hand illusion (Tsakiris et al. 2006). In this experiment, the perceived location of one’s moving finger drifts towards the synchronous video image of the hand projected on a screen 15cm aside from the real hand. This effect is found both when the subject’s finger is moved actively by the subject himself or passively by the experimenter. Interestingly though, the “active” condition elicits a more coherent experience than the “passive” condition. As in the original “touch” condition, in the “passive” condition, only the stimulated finger (stroked or passively moved), but not the adjacent fingers, is perceived closer to the rubber hand or to the video-projected hand. The “active” condition does not elicit such a fragmented body ownership: the subject perceives not only the moving little finger but also the still index finger as being closer to the video-projected image of the hand. These data suggest that efferent information, present only in the “active” condition, play an integrative role in the constitution of a *coherent* observational bodily experience, in addition to the multisensory integration whose role in body ownership has been underlined above.

In addition to the integration of afference (actual and anticipated) and efference, it is classical to consider top-down constraints on bodily experience (Varraine et al. 2001, Bonnard et al. 2004). For example, it has been shown that the rubber hand illusion is elicited only with a facsimile of a human congruent hand (relative to the hand laterality) placed in a congru-

ent posture with respect to the subject's own hand. Specifically, the illusion does not occur when the fake hand is placed in an incongruent location or when a wooden stick is used instead of a fake hand (Tsakiris and Haggard 2005). On this basis, the authors argue that "the concurrent visuotactile inputs are integrated within a preexisting representation of one's own body" (p.90). More specifically, they claim that "cognitive representation of the body reflects the interplay between both sensory input and conceptual interpretation" (p.90).

The position I defend in this paper partly coheres with this position and partly differs from it. It coheres with it in that it will underline the insufficiency of a multimodal sensory integration to elicit a bodily sense of self. It differs from it in that it will not focus on top-down "conceptual" influences but on non-observational levels grounding observational bodily experience³.

Before specifying what is meant here by such "non-observational levels", it is important to underline that a common feature underpins all the aforementioned investigations: they all consider exclusively *observational* bodily experience. Indeed, the subjects are asked to pay specific attention to their body or actions, since the instruction they are given is to answer explicit questions about their sense of ownership or agency. For example, in Daprati et al. (1997) subjects were given the following instruction: "You have just seen the image of a moving hand. Was it your own hand? Answer YES if you saw your own hand performing the movement you have been executing. Answer NO in any other case, that is if you doubt that it was your own hand or your own movement" (p.77). Despite the fact that such instructions clearly put the subject in an artificial situation, this way of proceeding presents a clear methodological advantage: what can be easier than asking the subject whether he recognizes his body/action, if one wants to investigate body ownership and agency? However, it would be a mistake to ground any theoretical point on the basis of such a methodological orientation. Rather, the following question deserves close scrutiny: are the observation and recognition of one's own body and actions as one's own the paradigmatic cases of bodily self-consciousness? I will consider this question by now taking an experiential perspective on bodily experience. Specifically, I will first consider whether self-consciousness is adequately restricted to self-observation. I will answer this question negatively and then extend this answer to the specific case of *bodily* self-consciousness.

3. *Pre-reflective forms of consciousness*

Does consciousness of the self necessarily imply an explicit process like observation? Are implicit processes necessarily non-conscious? A positive answer is most often presupposed⁴, but different approaches nonetheless raise doubts. For example, considering the possibility of Zombies, Revonsuo asks: “Are the individuals truly nonconscious when they manifest complex [automatic] behaviours, or only non-reflective or in a confused state of consciousness during the experience, and / or totally amnesic about the experience afterwards?” (2000, p.333). Surely, the attempt to answer this question faces an important methodological problem. As we just saw, the easiest way to figure out about the subject’s experience is simply to ask him about it: “We have no independent means of checking whether or not the person truly was nonconscious during the automatic behaviour. The only criterion we can use is the person’s subjective retrospective report as to his experiences during the episode” (Revonsuo 2000, p.334).

Even though this methodology cannot justify in itself any theoretical position, it is often echoed in the very conception of consciousness and self-consciousness. For example, Revonsuo intends to avoid the reduction of consciousness to explicitness and the reduction of implicitness to unconsciousness, but he nonetheless defines self-awareness exclusively at the reflective level: “By *reflective consciousness* we mean such states in which the subject not only experiences something but, in addition, can take this experience as an object of further thought... Self-awareness, voluntary control and planning require reflective consciousness” (Revonsuo 2000, p.343).

Contrastively, Pinku and Tzelgov (2006) define three forms of consciousness of the self. First, they mention consciousness of the self as object. This corresponds to what I call here observational reflective self-consciousness. The second type of consciousness they describe is consciousness of the self as subject. Here, the self is experienced as the holder of a given attitude, the latter being explicitly experienced. At the third level the authors describe, the experience of the self is embedded within the experience of the environment. Here, neither the self nor the attitude, but only the intentional object is explicitly represented and experienced. Interestingly, neither the second nor the third type of consciousness of the self implies any explicit representation of the self. As such, they correspond to what I call here non-reflective forms of self-consciousness. This is what this paper intends to investigate at the bodily level.

4. *Pre-reflective Consciousness Grounds Reflective Consciousness*

It is important to consider that pre-reflective self-consciousness is not only one possible form of consciousness among others. Rather, it is a foundational state, in the sense that it conditions the very possibility to recognize oneself as such at the observational reflective level (Legrand 2006). To clarify this point let me first note that restricting one's scope to observational self-consciousness would let unexplored the specificity of self-consciousness. As stated by Evans about the investigation of "I-thoughts", "we are not interested in all thoughts which a subject may have 'about himself', for presumably a person may think about someone who is in fact himself without realizing that he is doing so" (1982, p206). This point is adequately illustrated with a simple story often reported by John Perry (1993):

Not long ago, after a trying railway journey by night, when I was very tired, I got into an omnibus, just as another man appeared at the other end. "What a shabby pedagogue that is, that has just entered," thought I. It was myself: opposite me hung a large mirror. (Mach 1914, p.4)

This story underlines the distinction between self-referring content and first-personal content. When Mach recognizes himself in the mirror, he is conscious of himself as himself and entertains a *first-personal content*. Conversely, when Mach does not recognize himself, he observes himself without realizing it, and entertains a *self-referring content*. Specifically, "a belief content is self-referring but not genuinely first-personal when it refers to the believer though the believer is not aware that it does" (Bermudez 1998, p.32). Thus, the interesting question is: what does make the specificity of first-personal content in contrast to self-referring content? In other words, what does make the specificity of consciousness of oneself as oneself in contrast to access to someone who happens to be oneself?

Mach's story already provides a preliminary answer to this question: in itself, the observation of oneself cannot suffice to be conscious of oneself as oneself. Indeed, Mach can observe himself but nonetheless fail to recognize himself as such. Specifically, observation of oneself implies that the same self is both the subject and the object of the observational state, and first-personal content (by contrast with self-referring content) implies to *recognize* that the same self is both the subject and the object of observation. On the other hand, any observational act implies a *dissociation* of the self which is

cut into an observing subject and an observed object. Thus, observation cannot suffice by itself to elicit first-personal content (Shoemaker 1968). In other terms, observation of oneself is not enough for genuine self-consciousness. The latter necessarily needs a non-observational ground, where, specifically, the self is not the *object* of observational consciousness. This non-observational ground is precisely what I call here *pre-reflectivity*, since it is a state of consciousness where the self is not reflected upon.⁵ I now turn to the investigation of non-observational pre-reflective self-consciousness at the bodily level.

5. *Non-Observational Experiences of One's Body*

The necessity of a non-observational ground to observational consciousness is also advocated at the bodily level. If I move my hand around without looking at it, I can locate it in space, and for that I do not need to observe all the movements it made nor to calculate their direction: "As for my body, I do not observe itself: to be able to do so, I would need to use a second body, which would not itself be observable" (Merleau-Ponty 1962, p.91). Of course, one's body parts are observable thanks to other body parts but the experience of the observing parts *as observing* are never reducible to the experience of any observed part: "If I touch with my left hand my right hand while it touches an object, the right hand object is not the right hand touching" (Merleau-Ponty 1962, p.92). Experience of the touched hand corresponds to an observational consciousness: the touched hand is taken as an intentional object of consciousness. Experience of the touching hand is different. It corresponds to what I call here pre-reflective bodily consciousness. At this level, the body is not an object of experience, it is the subject of experience and it is experienced as such. This point is stated clearly as follows:

The sense of ownership... does not require an explicit or observational consciousness of the body, an ideational, third-person stance in which I take my body as an object. Rather it may depend on a non-observational access that I have to my actions, an access that is most commonly associated with a first-person relationship to myself. In non-observational self-awareness I do not require the mediation of a perception or a judgment to recognize myself as myself. I do not need to reflectively ascertain that my body is mine, or that it is *my* body that is in pain or that is experiencing pleasure. (Gallagher 2005b, p.29)

On the basis of this clarification of what pre-reflective bodily experience is not (it is not the experience of the body as an intentional object of consciousness), we now need to detail what it corresponds to. I will do so by first drawing some comparisons between different types of bodily experiences.

6. *The Opaque Body and the Invisible Body*

IW is a patient suffering from deafferentation, that is, he has lost the sense of touch and proprioception below the neck (Cole and Paillard 1995). Thus, he cannot sense his posture, his movements, and the location of his limbs. He nonetheless remains capable of acting, by relying exclusively on visual and cognitive control. This means that he has to see his moving limb and to concentrate fully on his actions in order to be able to perform them at all (and not only in order to be able to perform them efficiently). In darkness or if he has to think about something else, he is unable to control his actions. IW can thus be in two contrastive states. He is sometimes observationally conscious of his body and actions, when he looks at his limbs and attentionally focuses on them. This corresponds to what I call here the “opaque” body. It is “opaque” in the sense that one does not look “through it,” but at it: it is taken as an object of attention. IW can also be non-conscious of his body (e.g. when he closes his eyes). This is what I call here the “invisible” body that is not itself experienced⁶.

The interesting point for the present discussion is that people are normally not in IW’s situation: “I do not move myself, I myself move” (Evans 1982, p.207). This comparison points to the fact that normal bodily experience usually lies between the “opaque body” and the “invisible body”. This space between opacity and invisibility is what I call here bodily pre-reflective self-consciousness. I will now describe two forms of it: the pre-reflective experience of the body (the “performative body”) and the pre-reflective bodily experience of the world (the “transparent body”).

7. *The Performative Body*

The comparison between deafferented patients and normal people leads to the description of three forms of experience: the body is either invisible, or pre-reflective, or opaque. Interestingly, these three forms of experience are also underpinned by people who are among the most concretely concerned with this issue: body-experts dancers.

When a beginner learns to dance or when a dancer learns a new choreography, he often needs to control consciously the position and movements of his body. This attitude implies to take an observational stance on the body. In other words, this involves what has been called above the “opaque body”. The situation is different with an expert dancer who knows his choreography or who improvises a skillful dance. In these cases, the expert dancer embodies the dance. Observational consciousness is not necessary to control actions and would even be counterproductive. This skillful and fully embodied dance involves what is called here a pre-reflective experience of the body. This form of experience has been adequately named “performative awareness” (Gallagher 2005b, p.74). I will thus follow this terminology and use the notion of “performative body” to refer to the level of pre-reflective experience under investigation here.

Interestingly, this state is clearly differentiated from a situation where the body gets lost in its dance. The dancers themselves provide a relevant voice to describe these specific bodily states:

There is a big difference between the dancer who is lost in its movements and the dancer who's following its bodily logic... In the first case I would say that the body has no clue where it is going, where it is coming from and where it is at this particular moment. [The second case is characterized by] ... the possibility to attune to your own bodily sensations ... A dancer as well as an observer can sense the difference. You can see/feel when the dancer thinks his movements or when the dancer just moves and lets his body intuitively (re)act on the moment. However, you can also sense the difference between the dancer who is lost in his movements and the dancer who moves from a sharp and very present physical state. (Hermans 2003)

Bodily experience in dance provides a clear example of pre-reflective experience of the body. However, it might be underlined that, just as we do not share IW's experience, we do not share dancers' experience. An objector could then argue that body-expertise generates not only new motor abilities but together with them a new form of bodily experience, described here as pre-reflective. The latter would be absent in normal non-expert subjects. However, the comparison with the situation of IW described above shows that this interpretation is not correct. We surely do not ordinarily share the

quality of dancers' pre-reflective bodily experience, but we do not lack it altogether either, since we also differ from IW.

The specificity of dance is that "subtle dynamic shadings, tensions and releases, rhythmic patterns and counterpoints are the stuff of which dance phrases, motifs, themes and variations are constructed" (McKechnie 2002, p.158). In dance, goal and means collapse to some extent, and the experience of the body and its morphocinetic actions come "at the font". Contrastively, most of everyday life actions are topocinetic goal-directed actions. We project ourselves into the world, through our body and actions, and we are mostly conscious of our goals rather than of the means to achieve them. Explicit consciousness of and attention to the outside world would hide the pre-reflective experience of the "performative body" but the latter is nonetheless present (contrary to IW's case). We thus end up here with the description of a place for normal bodily experience in between "body invisibility" and "body opacity", characterized by a pre-reflective experience of the "performative body".

8. *Bodily presence to the world*

Crucially, consciousness of the outside world conveys an additional form of pre-reflective bodily experience. To describe it, I will first draw a comparison between normal everyday life experience and what is called "presence" in virtual reality. In this context, "presence" is defined as the sense of being in the virtual environment, by contrast with the place where one's body is physically. Presence is measured both subjectively (rating-scale questionnaires, for example "To what extent did you have a sense of being in place X") and objectively (the experimenter checks whether the participant behaves as if he really is in the virtual environment). Virtual reality is interesting in the current context in that it provides a tool to manipulate different factors allowing the investigation of the sources and conditions of presence.

A crucial thing that virtual reality allows to manipulate in a way that is impossible in everyday life is *presence* itself. Thereby, it underlines a state that is so constant in everyday life that it often remains unnoticed: we go through our everyday life by being "present" to it and to ourselves in it. In other words, there is a sense of being in the world that is so important that lacking it would amount to losing the experience of the world as being real

and the experience of ourselves as really being in it. “Presence” is not thematized, it is not and cannot be taken as an intentional object of consciousness. Rather, it is experienced at the pre-reflective level.

Given this, it seems relevant to exploit the framework offered by virtual reality to further investigate what elicits the subjective experience of presence. Some types of information are more relevant than others. Interestingly, visual realism does not contribute importantly to presence. Rather, “of particular importance is the degree to which simulated sensory data matches proprioception—for example, as the participant’s head turns, how fast and how accurately does the system portray the relevant visual and auditory effects” (Sanchez-Vivez and Slater 2005, p.333). This suggests that experiencing presence does not merely depend on appearances but is rather a function of the interaction between the subject and the environment. Concordant with this interpretation is the role of the subject’s own body in eliciting presence. Indeed, it has been shown that even though the participants are not considering explicitly their own body in the virtual environment, they can be “shocked” if it is totally occluded from view and not reproduced virtually. However, what is important is not merely the visual reference the body would provide. Rather, what counts is the dynamic of the interactions between the body and the world: if “all real-world visual input is removed, it is important that the participants see, from an egocentric viewpoint, their virtual body, *movement of which correlates with the proprioceptive model of the motor actions of that body*” (Sanchez-Vivez and Slater 2005, p.333, my emphasis). This suggests that the subject is *bodily* present in the environment, and more specifically, present as a bodily agent.

This view is also supported by the results of an experiment where participants control a robot’s arm thanks to the movements of their own arm, while only the robot’s arm is seen, and only the real arm is felt proprioceptively (Cole et al. 2000). The participants describe their experience as follows: “In a short time, and without realising it, we perceive our bodies to be within the robot; what we see and move we become” (Cole 2005, p.314). In the same line of thought, the Heideggerian/Gibsonian approach underlines the importance of “concernful action” to elicit presence (Zahorik and Jenison 1998). “Concernful action” in this context is defined relative to a perception/action coupling. The role of such a sensori-motor integration will be developed below. The important point at stake for now is that pre-reflective “presence” is a crucial aspect of our experience and it is bodily.

9. *The Transparent Body*

On the basis provided by the investigation of body-privation in deaf-ferentation, body-expertise in dance and bodily-presence in virtual reality, we can now turn to the description of pre-reflective consciousness of being bodily in the world in normal people and normal environment. At a pre-reflective level, the body is not invisible; it is experienced. However, it is not opaque either, in the sense that it is not taken as an intentional object of consciousness. Rather, it is pre-reflectively experienced in two complementary ways: the “performative body” described above and the “transparent body” that I will describe now. The body is *transparent* in the sense that one looks *through* it *to the world*. At this level, pre-reflective bodily experience is precisely the experience of the world as given through the “transparent body”. The latter is not perceived as an object but experienced specifically as a subject perceiving and acting, that is, as in-the-world. I take this claim to be a phenomenal “evidence” in the simple sense that one can hardly argue for or against it.⁷ Rather, one can point to it more or less clearly and specifically. The following quotes describe the form of pre-reflective self-consciousness specifically under consideration here.

...we are able to know our position, orientation, and relation to other objects in the world upon the basis of our perceptions of the world. Included here are such things as: knowing that one is in one’s bedroom by perceiving and recognizing the room and its content; knowing that one is moving in a train by seeing the world slide by; knowing that there is a tree in front of one, or to the right or left, by seeing it; and so on. (Evans 1982, p.222)⁸

Each thing that appears has *eo ipso* an orienting relation to the Body, and this refers not only to what actually appears but to each thing that is supposed to be able to appear. If I am imagining a centaur I cannot help but imagine it as in a certain orientation and in a particular relation to my sense organs: it is “to the right” of me; it is “approaching” me or “moving away;” it is “revolving,” turning toward or away from “me” – from me, i.e. from my Body, from my eye, which is directed at it. (Husserl, *Ideen II*, §18a)

In short, pre-reflective bodily self-consciousness corresponds to the bodily mode of givenness of intentional objects of consciousness: “Consciousness is being-towards-the-thing through the intermediary of the body...” (Merleau-Ponty 1962, p.139). At the pre-reflective level, the body is lived insofar as it projects itself on the world (Depraz 2001).

The major reason why pre-reflective self-consciousness is hard to pin down is precisely because it does not correspond to an explicit experience of the body itself but rather to the bodily “thickness” of the experience of the world. In normal circumstances, rather than being explicitly conscious of this aspect of our being-in-the-world, we project ourselves to the world: “We do not begin by knowing the perspective aspects of the thing...we go straight to it; and it is only in a secondary way that we become aware of the limits of our knowledge and of ourselves as knowing” (Merleau-Ponty 1962, p.172). Note that Merleau-Ponty argues that “through a final *reduction*, I arrive ultimately at the sensation which is no longer a property of the thing, or even of the perspective aspect, but a modification of my body” (Merleau-Ponty 1962, pp.172-3, my emphasis). Here, I argue that the experience of the thing already corresponds to a bodily experience at the pre-reflective level, but it remains the case that thematizing it implies the reduction Merleau-Ponty describes. This articulation of the pre-reflective and reflective levels coheres with Merleau-Ponty claims that “when I perceive a pebble, I am not *expressly* conscious of knowing it only through my eyes, of enjoying only certain perspective aspects of it, and yet an analysis in these terms, if I undertake it, does not surprise me. Beforehand, I knew *obscurely* that my gaze was the medium and instrument of comprehensive perception...” (Merleau-Ponty 1962, p.173, my emphasis). The comparisons drawn above intended to clarify this “obscurity”. Now, on the basis of the description just given of pre-reflective bodily experience in normal circumstances, it is worth coming back to the experience of body-experts dancers and body-deprived patients.

10. *Dancing in the world*

As noted above, body expertise like dance is associated with a particularly sharp pre-reflective experience of the “performative body”. Normal non-body expert people do not lack it all together but there is a noticeable difference between dancers’ experience and normal people’s experience: bodily pre-reflective experience is “at the front” of dancers’ experience,

whereas it is mostly “in the world” in normal everyday life. Specifically, dancers mostly experience their *body* pre-reflectively, whereas normal people in normal circumstances mostly experience the world in a *bodily* way. The common point between these two forms of experience is that they are both pre-reflective in the sense that they both imply a specific form of experience where the body is not taken as an object of identification (Legrand 2006). It is also important to underline that these two forms of bodily pre-reflective experience are not incompatible with each other, since the dancer experiences both. Again borrowing dancers’ words:

[When dancing, you] ... attune to all the sensory information (vision, touch, sound especially) which derives from outside the body... the body can still take in all the sensory information from the direct environment. [On the contrary] when I am lost in my movements, I believe that my body is no longer capable of attuning properly to all the incoming sensory information. The body is locked up inside: it is no longer communicating with the outside world. (Hermans 2003)

To say that I am improvising, I am in the process of creating a dance out of the possibilities that are mine at any moment of the dance is to say that I am exploring the world in movement....the global dynamic world I am perceiving, including the ongoing kinaesthetically felt world of my own movement, is inseparable from the kinetic world in which I am moving. (Sheets-Johnstone 1999, pp.486-7)

Dancers as well as non-dancers thus entertain two complementary bodily pre-reflective experiences: the “performative body” itself is experienced pre-reflectively as a subject-agent, and the surrounding world is experienced through the pre-reflective “transparent body.”

11. Deafferented in the world

Now considering body-privation, should we say that deafferented patients are non-bodily in the world, since they lack the proprioceptive sense that plays a crucial role in bodily experience? To consider this question, it is important to keep in mind the distinction between the pre-reflective sense of one’s body (the “performative body”), and the pre-reflective bodily experience of the world (the “transparent body”). Deafferented patients lack

the former, but not the latter. IW does not have and cannot have the form of bodily experience dancers enjoy (he does not pre-reflectively experience his body *itself*). Nonetheless, he remains bodily in the world, even though he lacks proprioception. Indeed, proprioception is not the *pre-reflective* sense of the body *par excellence*. Crucially, other afferent information as well as efferent information are important for the sense of one's own body at a pre-reflective level, since the latter corresponds to the bodily mode of givenness of the world. Thus, IW still has different sources allowing him to entertain a form of bodily pre-reflective experience. A clear evidence of this is his experience of presence (as defined in virtual reality). Being able to control the arm of a robot by moving his own arm, he quickly "became at ease with the feeling of being 'in' the robot. Making a movement and seeing it effected successfully led to a strong sense of embodiment within the robot arms and body..." (Cole et al. 2000). I would like to hypothesize here that this remaining pre-reflective bodily consciousness is precisely what provides IW the necessary basis on which he learned to compensate for his loss of proprioception in order to act adaptively: deafferented patients would be able to compensate their deficit not only by relying on their body image but also thanks to the fundamental experience we all have of being bodily in the world.

12. *The Biological Lived Body*

To summarize, consciousness is not adequately limited to explicitness, and there exists forms of self-consciousness where the self is not taken as an object of experience. This is what is called here pre-reflective self-consciousness. The latter grounds the very possibility of observational reflective consciousness of the self. At the bodily level, pre-reflective self-consciousness lies between the "invisible body", absent from experience, and the "opaque body", taken as an intentional object of experience. It corresponds to both the "performative body" characterized by pre-reflective experience of the body itself and the "transparent body" characterized by the bodily experience of the world.¹⁰

Given this, the investigation of self-consciousness has to include an account of non-observational pre-reflective self-consciousness where the self is not taken as an intentional object of consciousness. But one might want to do so without succumbing to an idealist conception of the self, where the self-as-*subject* would be considered as being distinct from any *object* of

the physical world. Specifically at the bodily level, favouring a naturalistic perspective implies to consider how the phenomenal body (*Leib*) corresponds to the biological body (*Körper*), described from a first- and third-person perspective, respectively. Given the distinction between intentional object of consciousness and physical object of the external world, there is no contradiction to propose that the self can be an object of the physical external world without being an intentional object of consciousness. Here, I underline two points that cohere this position. First, the self experiences itself as a *physical* subject in the world. This is the experiential level of investigation we just went through. Second, the self as subject is a physical object of the external world, the biological body. This second aspect now leads me to take an empirical perspective on pre-reflective bodily experience.

13. Body Schema and Pre-Reflective Bodily Experience

We saw above that cognitive neurosciences have developed the techniques and methodology to investigate *observational* bodily self-consciousness in a naturalistic perspective. Now, we need to see if the equivalent can be done concerning *non-observational* bodily self-consciousness. To check that, it is relevant to consider whether the distinction between observational and non-observational self-consciousness can be described not only from a first-person perspective as we've seen above, but also from a third-person perspective.

An important distinction in both the neurophysiological and philosophical literature is the distinction between the body image and the body schema. Gallagher (2005a) clarifies this conceptual distinction as follows. The body image is “a system of (sometimes conscious) perceptions, attitudes, and beliefs pertaining to one’s own body” (p.234). The body schema is “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” (p.234). *Defined as such*, this distinction does *not* correspond to the distinction between observational consciousness of the body and pre-reflective bodily experience. Indeed, the former corresponds to the body image, but the latter does not correspond to the body schema defined as unconscious. However, I would like to argue that the notion of pre-reflective bodily experience as described here allows a reconsideration of the notion of body schema. Specifically, the proposal here is to define body image and body

schema independently of the conscious/unconscious divide, but rather relatively to the *type* of access one can have to one's body. As stated by Gallagher, the body image is "sometimes conscious", which of course implies that it is sometimes unconscious. I propose here that, as well, the body schema is sometimes conscious. Specifically, the body schema would *sometimes* involve a pre-reflective experience, while the body image would sometimes involve observational consciousness of the body. I will not consider the body image more in detail here, since I've described observational bodily consciousness above (opaque body). I thus now turn to the body schema.

The latter is adequately defined as "the *implicit* processing of somatosensory information that can be used for sensory-motor interactions" (Rossetti et al. 2005, my emphasis). The question here is the following: are these implicit processes necessarily non-conscious? This question is legitimate since, as we already saw above, self-consciousness is not limited to explicit reportable reflective states. Here, we can apply this position to the particular case of the body schema: the sensory-motor processes involved by the body schema are implicit but this is not incompatible with a pre-reflective form of consciousness. Hence, the question is whether there is any pre-reflective experience of the body matching processes at the level of the body schema.

Gallagher states that "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" (2005a, p.234). In other words, the body schema is related to the functional body by contrast with the perception of the body-as-object (opaque body). Surely, as we have seen above, moving one's body does not normally imply to take one's body as an object of perception. However, moving is clearly not unconscious either. Specifically, "When I am moving I am non-reflectively aware that I am moving, and this nonreflective awareness is not equivalent to a perception of the body as an object in the peripheral field" (Gallagher 2003, p.60). As the expert dancers report, action can even be associated with a clear experience of the body as subject-agent. In this particular case, an enhanced body-schema is associated with enhanced pre-reflective body experience. On the other way around, the loss of the body schema as in deafferentation leads, by the same token, to lose both the ability to move without relying on the body image and the felt sense of the body posture.¹¹

As above, the comparisons between body-experts, body-deprived, and normal people prove to be relevant and suggest that the notion of body

schema adequately articulates the experiential description of pre-reflective bodily experience on the one hand, and the third-person perspective on the physiological mechanisms underlining it, on the other. As clarified by Gallagher, “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” (Gallagher 2005a, p.239, my emphasis). If this is correct, describing the body schema in physiological terms will move us closer to a better understanding of the neurophysiological anchoring of bodily pre-reflective self-consciousness.¹²

14. Experientially and Functionally Being in the World

The body schema is “a combined standard against which all subsequent changes of posture are measured...” (Head & Holmes, 1911-1912). It corresponds to the body as an egocentric reference that is itself located geocentrically. It is related to the postural reference frame that allows the location of the body in space and the location of body parts relative to the head and to gravity. This geocentric reference frame allows the location of the body relative to the external environment. Conversely, an egocentric reference frame allows the location of exteroceptive signals relative to the body referred in space. The articulation of these geo- and egocentric frames of reference constitutes the body schema which thus integrates information on the target of the action and the surrounding space, on the one hand, and proprioceptive, vestibular, visual information on the body, on the other hand. This is what Paillard describes in the following way: “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 on a geotropically oriented postural frame, which constitutes the *body schema*” (Paillard 2005, p.99). Thus, the body schema is what indexes sensorial information relative to the body posture in a way that allows the initiation and control of actions (Paillard 1973).

This description of the body schema from a neuro-physiological perspective is particularly relevant in the present context, if we compare it with the description of pre-reflective bodily consciousness. Coherently, the latter necessarily involves the integration of experiences of the world and of one’s own body¹³, and what the body schema provides is precisely an in-

tegration of world-related and body-related information and processes. We saw above that the body schema is associated with a pre-reflective form of bodily consciousness. In addition, we now see that this form of experience and the body schema as described physiologically share the same structure: they provide two complementary descriptions (experiential and functional) of how the body is in the world.

15. Not Merely Peripheral But Specifically Pre-Reflective

Two additional points are worth considering here. First, the body schema can function even though the body image is defective. In other words, high level representations of the body do not dominate lower level body schematic processes. Second, the body schema does not merely correspond to an implicit body image but to a specific mechanism.

These two points are notably suggested by cases of dissociation between an absent or perturbed body image and a (relatively) preserved body schema. This has notably been tested in a patient JA, who suffers from a complete sensory loss of the right hemibody: he does not feel touch, proprioception, pain, temperature, vibration, deep pressure, and passive movement. As IW described above, JA can move his right hand under visual control, but not without visual feedback. Despite this lack of sensation, he is able to perform correctly in a localization task: the experimenter touches the deafferented right arm of the patient and the latter is able to point to this target with his intact left arm, without visual feedback. JA can thus process, at the level of the body schema, a sensory stimulation on his right hemibody. Interestingly, his motor responses (pointing movement of the left hand to the stimulated right hand) are well above chance level, whereas his verbal performance (verbal forced-choice paradigm) is never significantly different from chance. Moreover, his performance also drops to chance level when a delay is inserted between the stimulation and the pointing. These last points suggest that JA's performance "could not be simply explained by a conscious-unconscious dissociation" (Rossetti et al. 2001, p.272), but rather by a specific process for motor interaction with the stimulus, which would remain unavailable for verbalization, as well as for objective identification. These tasks have been replicated with proprioception, and comparable results are obtained. What is mostly interesting in the present context is that the "sensory information (tactile, proprioceptive) may be processed not only implicitly but specifically for motor purposes" (Rossetti et al. 2001, p.282; Rossetti et al. 2005).

This behavior has been identified as a “blind-touch” (Paillard 1983).¹⁴ By analogy with the phenomenon of “blindsight” and with the distinction of two visual systems (“what” and “where”), it is argued that the location of body parts in the body schema (a “where” problem in the body space, here preserved) would involve neuro-physiological processes different from the one involved in the perceptual identification of the body features in the body image (a “what” problem, here perturbed) (Paillard 1999).¹⁵

It is important to consider how these empirical considerations shed light on the experiential level of description. Indeed, when considered at all, pre-reflective self-consciousness is considered as *peripheral*. For example, a characteristic description is the following:

Conscious experiences exhibit a subjective character in virtue of the fact that whenever we have a conscious experience, we are peripherally aware of having it. Thus, if my visual perception of the laptop is a conscious one, then in having it I am peripherally aware not only of the stack of books on the left and the bonsai on the right, but also of the fact that I am having that very experience. (Kriegel 2005, p.4)

Such a description of the phenomena can be questioned: “Are the fingers, as they function in haptic exploration, analogous to objects in peripheral vision, or to the way that the eyes function in vision?” (Gallagher 2003, p.60). In fact, the analogy with peripheral vision is importantly misleading since it suggests that the self-as-subject is just a peripheral self-as-object. However, this is simply not the case (Zahavi, 2005; Legrand, 2007b).

First, the self-as-subject (or the subjective character of experience) is not necessarily peripheral, or marginal. Expertise (with one’s body as in dance, or with one’s mind as in some meditative states) can overcome this “self-forgetfulness” (as Husserl would put it) and put this subjective character of experience “at the front” of one’s experience without turning it into a mere intentional object.

Second, attending to something that would have been peripheral, thus making it central would only allow the focus on the self-as-object, and not on the self-as-subject, thereby missing the point. This is so because pre-reflective self-consciousness involves specific processes, rather than merely a representation of the self simply put in the margin. On this point, the phenomenal evidence coheres with the physiological properties of the body schema as just described: the body schema involves specific processes of

sensori-motor integration that are not adequately described as merely the implicit and unconscious equivalent of the processes underlying conscious and explicitly reportable states. As well, pre-reflective bodily self-consciousness does not correspond to a representation of one's body put in the margin of one's experience.

16. *Sensori-Motor Coherence*

Experiential and empirical perspectives converge on the idea that pre-reflective bodily self-consciousness corresponds to being functionally and experientially bodily-in-the-world. The latter specifically implies identification-free processes, i.e. processes that do not involve the identification of the self as such (Legrand 2006). Indeed, the latter can only underlie observational forms of consciousness which is not what is at stake at the pre-reflective level. Given the preceding considerations, it is coherent to hypothesize that integrative sensori-motor processes, among which the body schema, underlie such identification-free processes.

The detailed description of these processes would go beyond the scope of this article but already as such this position differs from a number of other hypotheses. First, it differs from the conception of the most primitive level of self-consciousness as implying the processing of self-*specific* information articulated to the processing of information on the world (Bermudez 1998). In such a framework, the self is still thought of as represented *as such*. Therefore, this cannot account for the consciousness of the self-as-subject at the pre-reflective level (see also Gallagher 2003, Legrand 2006). Rather, the proposal defended here is that pre-reflective self-consciousness relies on *self-relative* information rather than on self-specific information (Ruby & Legrand 2007). Self-relative information is not information about the self, but *information about the world relative to the self*. At the sensori-motor level, this self-relativity is given by the reciprocal modulation of perceptual afference and motor efference. This provides the basis for the functioning of the body schema, and, this is the proposal here, for pre-reflective bodily consciousness.

Mostly for the same reason, the position proposed here also differs importantly from any proposal which would try to conceive of the "sense of self *par excellence*" as mostly afferent or mostly efferent. Beyond their dispute, these two positions share the same conception of bodily self-consciousness in that they both tackle exclusively *observational* self-conscious-

ness: they investigate only self-specific information, that is, information about the self (here the body). This might appear as conceptually obvious and methodologically the easiest way to follow when one wants to tackle self-consciousness. However, the fundamental form of self-consciousness, pre-reflective self-consciousness, cannot rely on self-specific information. It rather relies on *self-relative* information, information about the world that is relative to the self/body. The present proposal is thus that a foundational bodily experience is pre-reflective and rooted in sensori-motor integration,¹⁶ rather than primarily on afference or primarily on efference. Importantly, the reason why it is so is not contingent. Rather, it coheres with a crucial claim that remains mostly misunderstood but that this paper intended to clarify: “it seems not to be necessary, if a subject is to think about himself self-consciously, that he actually have any information about himself” (Evans 1982, p.215). This coheres with the view that pre-reflective self-consciousness is grounded on self-relative information processing.

Last, the position defended here differs fundamentally from the conception of the body schema as anonymous¹⁷ and of action representations as neutral (Jeannerod and Pacherie 2004). Rather, the present proposal is that integrative sensori-motor processes constituting the functional body anchor a form of bodily pre-reflective *self-consciousness* (Legrand, 2007a). The latter lies between the “invisible body” (absent from the experience) and the “opaque body” (taken as an intentional object of consciousness) and has been described here as both the “performative body” (the pre-reflective experience of the body itself) and the “transparent body” (the pre-reflective bodily experience of the world).

References

- Bermudez, J.L. (1998). *The paradox of self-consciousness*. The MIT Press.
- Bonnard, M., de Graaf, J. & Pailhous, J. (2004). Interaction between cognitive and sensorimotor functions in the motor cortex: evidence from the preparatory motor sets anticipating a perturbation. *Reviews in the Neurosciences*, 15, 371-382.
- Botvinick, M. (2004). Probing the neural basis of body ownership. *Science*, 305, 782-783.
- Botvinick, M., & Cohen, J. (1998). Rubber hands ‘feel’ touch that eyes see. *Nature*, 391, 756.
- Calvo-Merino, B., Glaser, D.E., Grezes, J., Passingham R.E. & Haggard, P. (Epub 2004). Action observation and acquired motor skills: an fMRI study with expert dancers. *Cerebral Cortex*.
- Cole, J. (2005). On the relation of the body image to sensation and its absence. In H. De Preester and V. Knockaert (Eds.) *Body Image and Body Schema. Interdisciplinary per-*

spectives on the body. John Benjamins Publishing Co. Advances in Consciousness Research, 62, 311-327.

Cole, J. & Paillard, J. (1995). Living without touch and information about body position and movement. Studies on deafferented subjects. In J. Bermudez, A. Marcel and N. Eilan (Eds.), *The body and the self*. The MIT Press, pp. 245-266.

Cole, J., Sacks, O. & Waterman, I. (2000). On the immunity principle: a view from a robot. *Trends in Cognitive Sciences*, 4, 5, 167.

Daprati, E., Franck, N., Georgieff, N., Proust, J., Pacherie, E., Dalery, J. & Jeannerod, M. (1997). Looking for the agent: an investigation into consciousness of action and self-consciousness in schizophrenic patients. *Cognition*, 65, 71-86.

Depraz, N. (2001). *Lucidité du corps. De l'empirisme transcendantal en phénoménologie*. La Haye, M. Nijhoff, Phaenomenologica, 160.

Ehrsson, H.H., Spence, C. & Passingham, R.E. (2004). That's my hand! Activity in premotor cortex reflects feeling of ownership of a Limb. *Science*, 305, 875-877.

Eilan, N., Marcel, A., & Bermudez, J.L. (1995). Self-consciousness and the body: an interdisciplinary introduction. In J.L. Bermudez, A. Marcel and N. Eilan (Eds.), *The body and the self*. The MIT Press. pp.1-28.

Evans G. (1982). *The varieties of reference*. Oxford: Oxford University Press.

Farrer, C., Franck, N., Paillard, J. & Jeannerod, M. (2003). The role of proprioception in action recognition. *Consciousness and Cognition*, 12, 609-619.

Gallagher, S. (2000). Philosophical conceptions of the self: Implications for cognitive sciences. *Trends in Cognitive Sciences*, 4, 1, 14-21.

Gallagher, S. (2003). Bodily self-awareness and object-perception. *Theoria et Historia Scientiarum: International Journal for Interdisciplinary Studies (Poland)*, 7(1): 53-68.

Gallagher, S. (2005a). Dynamic models of body schematic processes. In H. De Preester & V. Knockaert (Eds.), *Body image and body schema*. (pp. 233-250). John Benjamins Publishing Co.

Gallagher, S. (2005b). *How the body shapes the mind*. Oxford: Oxford University Press.

Gawronski, B., Hofmann, W. & Wilbur, C.J. (2006). Are "implicit" attitudes unconscious? *Consciousness and Cognition*, 15, 485-499.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston, MA: Houghton Mifflin.

Gillihan, S.J. & Farah, M.J. (2005). Is self special? A critical review of evidence from experimental psychology and cognitive neuroscience. *Psychological Bulletin*, 131(1), 76-97.

Head, H. & Holmes, G. (1911-1912). Sensory disturbances from cerebral lesions. *Brain*, 34, 102-245.

Hermans, C. (2003). When the body takes over. <http://www.du.ahk.nl/mijnsite/papers/impro.htm>.

Husserl, E. (1989). *Ideas pertaining to a pure phenomenology and to a phenomenological philosophy, Book 2: Studies in the phenomenology of constitution*. (R. Rojcewicz & A. Schuwer, Trans.). Collected Works, vol. 3. Dordrecht: Kluwer.

Jeannerod, M. & Pacherie, E. (2004). Agency, simulation and self-identification. *Mind and Language*, 19(2), 113-146.

Kriegel, U. (2005). Naturalizing subjective character. *Philosophy and Phenomenological Research*, 71, 23-57.

Legrand, D. (2006). The bodily self: The sensori-motor roots of pre-reflexive self-consciousness. *Phenomenology and the Cognitive Sciences*, 5, 89-118.

Legrand, D. (2007a). Naturalizing the acting self: Subjective vs. anonymous agency. *Philosophical Psychology*. In Press.

Legrand, D. (2007b). Pre-reflective self-as-subject from experiential and empirical perspectives. *Consciousness and Cognition*. In Press.

Mach, E. (1914). *The analysis of sensations*. (C.M. Williams & S. Waterlow, trans.). Chicago & London: Open Court.

McKechnie, S. (2002). Movement as metaphor: The construction of meaning in the choreographic art. In C. Stevens, D. Burnham, G. McPherson, E. Schubert, & J. Renwick (Eds.), *Proceedings of the 7th International Conference on Music Perception and Cognition* (pp. 157-160). Adelaide: Causal Productions.

Merleau-Ponty, M. (1962). *Phenomenology of perception* (C. Smith, Trans.). London, New York: Routledge.

Paillard J. (1999). Body schema and body image—a double dissociation in deafferented patients. In G.N. Gantchev, S. Mori & J. Massion (Eds.) *Motor Control, Today and Tomorrow* (pp. 197-214).

Paillard, J. (1973). Discussion du rapport de R. Angelergue sur “Reflexions sur la notion de schéma corporel.” In Symposium de l’APSLF (Paris, 1973) “*Psychologie de la conscience de soi*”. Presses Universitaires de France. Paris, 143-148.

Paillard, J. (1980) Le corps situé et le corps identifié. Une approche psychophysique de la notion de schéma corporel. *Rev. Méd. Suisse Romande*, 100, 129-141.

Paillard, J. (2005) Vectorial versus configural encoding of Body Space: A neural basis for a distinction between Body schema and Body image. In H. De Preester & V. Knockaert (Eds.) *Body Image and Body Schema. Interdisciplinary perspectives on the body*. John Benjamins Publishing Co.

Paillard, J., Michel, F. and Stelmach, G. (1983) Localization without content. A tactile analogue of ‘blind sight’. *Arch Neurol*, 40, 548-51.

Perry, J. (1993). *The problem of the essential indexical and other essays*. New York: Oxford University Press.

Pinku, G. & Tzelgov, J. (2006) Consciousness of the self (COS) and explicit knowledge. *Consciousness and Cognition*, 15(4), 654-661.

Revonsuo, A., Johanson, M., Wedlund, J-E., & Chaplin, J. (2000) The zombies among us: Consciousness and automatic behaviour. In Y. Rossetti and A. Revonsuo (Eds), *Beyond Dissociation. Interaction between dissociated implicit and explicit processing* (pp. 331-352). John Benjamins Publishing Co.

Rizzolatti, G. & Craighero, L. (2004). The mirror neuron system. *Annual Review of Neuroscience*, 27, 169-192.

Rochat, P. & Striano, T. (2000). Perceived self in infancy. *Infant Behavior and Development*, 23, 513-530.

Rosenthal, D. M. (2005) *Consciousness and Mind*. Oxford UP.

Rossetti Y., Rode G., & Boisson D. (2001) Numbsense : a case study and implications. In De Gelder B., De Haan E., & Heywood C. (Eds) *Out of mind: Varieties of unconscious processing* (pp. 265-292). Oxford University Press.

Rossetti, Y., Rode, G., Farnè, A. & Rossetti, A. (2005). Implicit body representations in action. In H. De Preester & V. Knockaert (Eds.), *Body image and body schema. Interdisciplinary perspectives on the body* (pp. 111-125). John Benjamins Publishing Co..

Ruby, P. & Legrand, D. (2007). Neuroimaging the self? In Y. Rossetti, P. Haggard & M. Kawato (Eds.). *Sensorimotor foundations of higher cognition* (22nd Attention & Performance Meeting). Oxford University Press. In Press.

Sanchez-Vives, M. V. & Slater, M. (2005) From presence to consciousness through virtual reality. *Nature Reviews Neuroscience*, 6, 332-339.

Sheets-Johnstone, M. (1999). *The primacy of movement*. John Benjamins Publishing Co.

Shoemaker, S. (1968). Self-reference and self-awareness. *Journal of philosophy*, 65, 555-567.

Tsakiris, M., & Haggard, P. (2005). The rubber hand illusion revisited: Visuotactile integration and self-attribution. *Journal of Experimental Psychology: Human Perception and Performance*, 39(1), 80–91.

Tsakiris, M., Prabhu, G. & Haggard, P. (2006). Having a body versus moving your body: How agency structures body-ownership. *Consciousness and Cognition*, 15(2): 423-32.

Varraine, E., Bonnard, M. & Pailhous, J. (2002). The top down and bottom up mechanisms involved in the sudden awareness of low level sensorimotor behavior. *Cognitive Brain Research*, 13, 357-361.

Wolpert D.M., Ghahramani Z. & Jordan M.I. (1995). An internal model for sensorimotor integration. *Science*, 269, 1880–1882.

Zahavi, D. (2005). *Subjectivity and selfhood: Investigating the first-person perspective*. Cambridge, MA: Bradford Books, The MIT Press.

Zahorik, P. & Jenison, R. L. (1998). Presence as being-in-the-world. *Presence-Teleoper. Virtual Environ.* 7, 78–89.

Notes

¹ This position is not incompatible but contrasts with the view claiming that the self, far from being special at this level, would rather share neutral representations of its actions and intention with other agents (Rizzolatti and Craighero 2004; Jeannerod and Pacherie 2004).

² Note that this instruction lets open the question of whether the subject is performing a task involving merely the recognition of the angular discrepancy between movement seen and movement done, or the sense of ownership of the movement (“this movement is mine” or “this moving hand is mine”), or the specific sense of agency (“I am the one performing and controlling this action”). Of course, it would beg the question to assimilate these three tasks.

³ Note that these influences, non-observational, on the one hand, and conceptual, on the other, are by no means incompatible with each other. Rather, the former would ground the latter.

⁴ “It is often argued that self-reported (explicit) evaluations reflect conscious attitudes, whereas indirectly assessed (implicit) evaluations reflect unconscious attitudes. This notion is widely shared now, such that it is rarely subjected to empirical scrutiny” (Gawronski et al. 2006, p.2)

⁵ Debates about this issue are vivid (Kriegel 2006). This non-observational pre-reflective state can be thought of in relational and representational terms (a second act of conscious-

ness takes the first one as its object, Rosenthal 2005) or as a one-level process (a single act of consciousness is both intentional and subjective, Zahavi 2005).

⁶ As will be detailed below, the “invisible body” as understood here (not “opaque” and not “performative”) is compatible with another form of pre-reflective bodily experience (the transparent body) which corresponds to the bodily experience of the world.

⁷ “Our objector may insist, however, that she finds no such awareness in her phenomenology. Unfortunately, I cannot offer here a positive demonstration of the existence of such awareness, and hence of subjective character. Arguably, such a demonstration is simply unavailable” (Kriegel 2006, p.4, note 11).

⁸ Evans continues as following: “Once again, none of the following utterances appears to make sense when the first component expresses knowledge gained in this way: ‘Someone is moving, but is it I?’; ‘Someone is standing in front of a tree, but is it I?’” Thereby, he relates this point to the principle of «immunity to errors through misidentification of the first person». For a discussion of this characteristic of self-consciousness at the bodily level, see Legrand 2005.

⁹ Coherently with this view, it has been shown that the perception of actions by expert dancers *at rest* is specifically modulated according to their area of expertise (Calvo-Merino et al. 2004). The authors compare brain activation during the perception of movements representative of the dance one usually performs to brain activation during the perception of movements the perceiver does not usually perform himself. The former situation activates more importantly “mirror brain areas”, generally found to be activated both when one executes an action and when one observes an action. This result suggests that one’s own motor expertise modulates one’s perception and specifically one’s perception of others’ movements.

¹⁰ The “transparent body” and the “performative body” are closely intermixed. In what follows, they will be considered jointly as complementary pre-reflective forms of bodily experience.

¹¹ The loss of the body schema due to deafferentation leads to a loss of the «performative body» but not of the “transparent body.” Further investigations are needed to clarify the link between these two forms of pre-reflective bodily experience and body schematic sensori-motor processes.

¹² At this point, there are two ways to proceed. The first involves a purely third-personal perspective leading to a detailed description of the neuro-physiological processes underlying the body schema. This approach implies to conceive of the naturalistic enterprise as a correlation between first-person evidence and third-person data, each being described independently. The second approach is necessarily non-reductionist as it involves the integration of the first- and the third-person perspectives right at the beginning and all the way through. Here, I will favour this second approach. Thus, my question is not merely “What is the body schema from a neuro-physiological perspective?” but more specifically “What can we learn on pre-reflective bodily consciousness from the neuro-physiological investigation of the body

schema and implicit sensori-motor processes?”

¹³ Again, information on the body does not have to be proprioceptive. It includes others afferent information as well as efferent information.

¹⁴ Interestingly, Rossetti et al. (2001) have preferred the term “numbsense” to describe this phenomenon, while Paillard (1983) named it “blindtouch.” Whatever their initial motivation, this terminological choice is interesting because it suggests that a form of “thin” consciousness of the body is associated with the processing of sensori-motor information at the level of the body schema. JA’s subjective reports during the experiment are interesting to consider in this respect: “I don’t feel it, but it is stronger in the palm”; “I have got a kind of feeling in my hand”; “I almost felt something entering my arm. But where? I had to guess”; “I have got the idea that I feel something strange. It is like I heard something, but almost nothing” (Rossetti et al. 2001, p.270). Of course, it would be particularly interesting to investigate more in detail this subjective bodily experience, but already as such it points to the fact that the specific body-schematic processes are associated with a subjective experience laying between observational consciousness (the “opaque body”) and non consciousness (the “invisible body”).

¹⁵ This distinction between a situated body and an identified body (Paillard 1980) is confirmed by the performance of the peripherally deafferented patient GL who shows the converse dissociation: a capacity to identify perceptually the location of a stimulated part of her body but an inability to reach the stimulated site when her vision is blocked (Paillard 1999).

¹⁶ This is coherent with (even though different from) Evans’ view that the necessary ingredients for I-thoughts include an information component and an action component (1982, p.208), that is, an element involving sensitivity of thoughts to certain information, and an element involving the way in which thoughts are manifested in action (p.207). This is why self-conscious thoughts are irreducible to thoughts involving definite descriptions: the latter involves no special disposition to act towards oneself. Of course, this remark should not lead one to iron out the important differences between Evans’ view and the one defended here. Notably, for Evans “I’-thoughts are not, as it is sometimes suggested, restricted to thoughts about states of affairs ‘from the point of view of the subject’” (p.210). Rather, he is interested in I-thoughts which satisfy the generality constraints (p.209), i.e. that are conceptual. What he wants to explain is how “I can make sense of identifying a person, conceived from the standpoint of an objective view of the world, as myself” (p.210). Pre-reflective self-consciousness as defined here is not incompatible with position, but is rather foundational.

¹⁷ “Body schematic processes operate anonymously and pre-personally” (Gallagher 2005a, p.240).

Author’s note: Correspondence concerning this article should be addressed to Dorothee Legrand at CREA—Centre de Recherche en Epistémologie Appliquée. Email: legrand@shs.polytechnique.fr.