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The deep bodily origins of the subjective perspective: Models and their problems

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Abstract

The naturalization of consciousness and the way a subjective perspective arises are hotly debated both in the cognitive sciences and in more strictly philosophical contexts. A number of these debates, mainly inspired by neuroscientific findings, focus on the 'visceral' dimension of the body in order to formulate a hypothesis for the coming about of consciousness. This focus on what might be called the 'in-depth body' (which is usually not governed by the intentions of the subject) shows that consciousness or the subjective perspective is intimately linked with vital and visceral regulatory processes.

I join the debate by arguing that representationalist accounts of the origin of consciousness in the in-depth body exhibit a number of flaws hitherto mainly unnoticed. Furthermore, some aspects of neuroscientific theories are explored as possible validations of a *nonrepresentationalist* model of consciousness and the subjective perspective. Inspired by phenomenological (more specifically Husserlian) philosophy, I present a hypothesis in which the subjective perspective constitutes *itself* (in a process of auto-constitution) and in which the 'in-depth' body is not the *object* of representations in the brain. Rather, the 'in-depth body' is in a non-objectified way built-in in the subjective perspective itself. In this account, therefore, the subjective perspective looses its transparency and gains 'interoceptive thickness'.
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1. Introduction: a stratified account of the body

A number of neuroscientific studies argue that our subjective, conscious perspective is rooted in what can be called the 'in-depth body'. The living body can indeed be approached as a *stratified* system, i.e. a structured system with several organizational layers. There are sufficient physiological, clinical and conceptual arguments for a stratification of the body into *body image* and *body schema* (for an interdisciplinary approach of body image and body schema, cf. De Preester & Knockaert, 2005). Yet, the deeper or more inner strata of the body, i.e. those bodily structures and processes *underneath* body image and body schema, are much less considered both in the cognitive, philosophical, and neurophysiologic field (cf. Leder, 1990a, 1990b, for the philosophical

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neglect, cf. Cameron, 2002, for the history of the physiological study of interoceptive processes). More recently, however, in 'visceral' sensory neuroscience (or, more accurately, in interoceptive neuroscience) interoceptive processes are considered as a necessary source for the coming about of subjectivity (cf. Craig, 2002, 2003; Damasio, 1994, 1999, see also Cameron, 2002).

Although it is not evident to give a clear-cut outlining of one particular layer in distinction with other bodily layers, for the sake of conceptual clarity, I introduce here the term 'in-depth body' in contradistinction to body image and body schema. The introduction of this concept, however, does not involve an isolated or autonomous functioning of the in-depth body in the whole of a living system. Not only do the layers interact in complex and dynamical ways, several authors disagree moreover about what is to be considered as belonging to a particular bodily layer (or how to term this layer).

Therefore, I first turn to a definition of body image and body schema in the standard literature, in order to then characterize what is particular about the in-depth body (cf. De Preester, in press, for a more elaborate account). Let us start with a definition of *body schema*: "Body schema can be defined as a system of preconscious, subpersonal processes that play a dynamic role in governing posture and movement." (Gallagher & Cole, 1995, p. 370, cf. also Gallagher & Cole, 1998 and Gallagher, et al., 1998). The function of the body schema is to maintain posture and to move without *consciously* monitoring motor activity. This aspect and the *subpersonal* aspect differ from the characterization of *body image*: "(...) most often defined as a conscious idea or mental representation that one has of one's own body." (ibid, p. 370). The body image is *conscious* and *personal.* The conceptual distinction, however, does not hinder the fact that body image and body schema are functionally interrelated at the level of behavior (cf. also Rossetti, Rode, & Farnè, 2005).

A second way of conceptualizing the difference between body image and body schema happens in terms of *intentional subject* and *intentional object*.[1] "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, p. 371). One's own body appears as the intentional*object* of a set of states directed toward the own body. The intentional subject takes herself—or at least her own body—in an act of reflective intentionality as the intentional object of her act.[2]

Now let us look again at the body schema: "In contrast to the reflective intentionality of the body image, a *body schema* involves a system of motor capacities, abilities, and habits that enable movement and the maintenance of posture. The body schema is not a perception, a belief, or an attitude. Rather, it is a system of motor and postural functions that operate below the level of self-referential intentionality, although such functions can enter into and support intentional activity." (ibid, p. 371). The body schema does not have the status of a conscious representation or a belief. It is a preconscious, subpersonal system that enables and supports intentional motor activity. The *body schema* is found at the side of the intentional subject, and not at the side of the intentional object.

A third aspect concerns the degree of representation of the body in the body image. It is stated that: "(...) 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 the time." (ibid, p. 373) The body schema, in contrast, functions in a more integrated and holistic way. "A slight change in posture, for example, involves a global adjustment across a large number of muscle systems. Proprioceptive information, originating in different parts of the body, does not function in an isolated or disintegrated manner but adds together to modulate postural control (Roll and Roll, 1988)." (ibid, p. 374). The body image appears to be an intentional act directed to a *part* of the body, while the body schema concerns the (musculoskeletal) body *as a whole.*

[1] The terminology related to intentionality comes from the phenomenological tradition. 'Intentionality' or 'intentional' is not to be confused with 'deliberate' or 'purposive', but refers to the description of states of consciousness as *directed to an object.* In phenomenology, a subject is intentional because it is directed to objects, and an object is intentional because it is taken (by the subject) *as an object* in an act of consciousness.

[2] In the literature, three modalities of the body image are distinguished: (1) a perceptual experience of the own body, (2) a conceptual understanding of the body in general, and (3) an emotional attitude toward the own body. The second and the third aspects need not be *conscious*, but are a set of beliefs or attitudes and are therefore also part of the intentional system.

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Proprioception is one of the information sources about posture and movement, necessary for the operation of the body schema. Proprioceptive information arrives from kinetic, muscular, articular, and cutaneous sources.[3] The body schema also receives information from other systems than proprioceptive ones, such as vestibular and equilibrial functions.

Yet, proprioceptive processes are not only important for the body schema, but for the body image as well. There are ''intermodal'' abilities, which make communication between proprioceptive information (which informs the body schema) and perceptual awareness (of the own body) possible, and thus help in elaborating the perceptual aspect of the body image.

The concept of 'in-depth body' is largely based on definitions of interoceptive processes. 'Interoception', however, can be defined in a narrow and a more broad sense, and there is no consensus about what to include into the definition. In the broader definition, proprioception is included, whereas in the past proprioceptive information (or prioprioceptive sensations) and labyrinthine functions often were not. Early investigators focused on information (or sensations) originating from the viscera, including cardiovascular, respiratory, alimentary and genitourinary systems, but sometimes also from hematologic and lymphatic systems, the endocrine system, and from chemical, osmotic and volume changes (cf. Cameron, 2002). The broader definitions do not look at effects on awareness or behavior, whereas a narrower definition does take into account whether or not behavior is (with or without awareness) influenced by visceral sensory impulses.

Other authors, such as Damasio, consider the internal biochemical operation of the endocrine system, the immune system, the viscera, the drives, and the instincts as a set of bodily functions and structures that do not become—in general—conscious representations. Damasio focuses on the internal milieu, i.e. the sum total of biochemical processes going on at a certain moment in the organism. From this point of view, the in-depth body is closely linked to homeostatic processes (or more adequately termed: homeodynamic processes).

The in-depth body is not only connected to the brain via somatosensory systems (responsible for e.g. sense of temperature, pain and the internal senses of joint position, visceral state etc.) but also chemically connected via substances (such as hormones) secreted in the body or the brain and transported via the bloodstream.[4]

The stratification of the body arrived at in this way is different from a stratification in terms of body image, body schema and in-depth body. According to Damasio, for example, we can distinguish three subsystems in the somatosensory systems (cf. Damasio, 1999, p. 150). First, the section of the internal milieu and the viscera, second, the section of the vestibular system and the musculoskeletal system, and, third, the section of the fine touch. The first section is continuously active and signals non-stop the state of most of the inner aspects of the body to the brain. The brain is under most conditions also being informed of the state of its musculoskeletal apparatus. The musculoskeletal part of the second section is also called proprioception or kinaesthesia, while the vestibular system maps the coordinates of the body in space. The section of fine touch receives signals from the changes in specialized sensors of the skin, which undergo changes if they are in contact with another object of which texture, shape, weight, temperature, and the like are examined. This section describes, in contrast to the section of the viscera and the internal milieu, *external* objects, based on signals generated on the surface of the body. The second section of the musculoskeletal system is situated somewhere in between, and can reflect both internal states and help to describe the outside world. Damasio's stratification is based on data concerning somatosensory systems, whereas the stratification presented above is also based on other sources, such as clinical and conceptual considerations. Nevertheless, the first section of the internal milieu and the viscera matches to a considerable extent what is meant here with 'in-depth body'. I shall come back to what is to be included into (or excluded from) the in-depth body, but it is important to note that—depending on the specific point of view—different but not necessarily mutually exclusive stratifications of the body are arrived at. The choice for the metaphor of depth to designate this stratum of the body might be

[3] There also exists something like 'visual proprioception', or the subpersonal processing of visual information about environmental motion in the visual field, on the basis of which adjustments in posture can be made that compensate for movement in the visual environment. The visual sense appears here as a source of information for posture and movement.

[4] Damasio does not use the term *body image* for the representations of bodily states based on neural or chemical signals. Instead, he talks of the *representation* of the body, and where he uses the term *body schema*, this term does not cover the same thing as the body schema defined above.

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disputable,[5] but the anatomic structure of the body and the fact that our awareness of the in-depth body is at least very limited in comparison to body image and body schema,[6] are arguments in favour of this term.

2. In-depth body and the subjective perspective: outline of the argument

After this introduction of the in-depth body, it must be spelt out in what way in-depth bodily layers are conditions of possibility for levels on top of them, i.e. in what way the in-depth body is *constitutive of* consciousness, or more in particular, of the subjective perspective (cf. infra, Section 5, the reason for equating consciousness and subjective perspective). The question is not how (in-depth) bodily layers can reach awareness or can be accessed from within a subjective perspective, but rather what happens on the constitutive way from in-depth body to the subjective perspective.

My main objection to a number of recent models that will be presented below pertains to their *representational* setting. More specifically, it will be argued that within a representationalist account, it cannot be explained how representations bring about an object in some cases, and a *subjective perspective* in other cases. The alternative approach I propose will be formulated in terms of auto-constitution. The way the term 'auto-constitution' will be used here, is inspired by the model the phenomenologist Edmund Husserl used for describing the self-constitutive processes of the stream of consciousness. This is in line with recent efforts of combining and integrating phenomenology and neuroscience within the current cognitive sciences. As such, this article may be preparatory to a piece of naturalized phenomenology, or add to the (interdisciplinary) study of the coming about of the subjective perspective in the domain of the cognitive sciences. Little will be said however about the details or the inherent problems of Husserl's model of auto-constitution in his 1905 writings on inner time-consciousness. Husserl's model of the structure of inner time-consciousness will rather enable us to assess an altogether different issue: the coming about of the subjective perspective as it is presented in recent neuroscientific literature.

In opposition to the prevailing intuition that a perspective is itself transparent, or like a tunnel you see through, but, so to speak, without (perceivable) walls, it will be argued that a perspective is not only directed upon objects or contents, but that it has itself inherent 'body' or 'thickness'. This will be called 'interoceptive thickness' of the perspective, and it is not to be confused with representational content or with the object upon which a subjective perspective is directed. The 'thickness' inherent to the subjective perspective results from the specificity of an auto-constitutive model. In the original (Husserlian) model, consciousness is not only directed to objects of consciousness or aspects of objects of consciousness, but it is also directed to itself, i.e. to its own temporal structure. This self-directedness explains the 'auto' or 'self' in the term. This directedness of consciousness to itself, shares the characteristic of *constitution* with the plain intentionality directed to objects. The notion of constitution (cf. infra) will be important for further arguments against representationalist accounts of the origin of the subjective perspective, and it will therefore return later on in this discussion.

3. Interoception and the recognition of the in-depth body

The idea that humans have a representation in the brain of the *surface* body is well spread and discussed in philosophical debates, often in an interdisciplinary context (cf. Cole, 2005; Gallagher & Cole, 1995; Paillard, 2005; Petit, 2005). Representations of the surface body are based on sensory sources such as cutaneous mechanoreception and proprioception, and they guide *somatic* motor activity. Although this system is about the body, it is often considered as an *exteroceptive* system. The reason is that this system is about the body's cutaneous interaction with objects, and the interrelation of the limbs in external space. The development of *interoceptive* (small-diameter) afferents, coming from the depths of the inner body, happens distinctly from the

[5] What is experienced as belonging to a deeper or a lower stratum of the body might for example depend on differences in gender, culture, age, experience, health conditions, way of life, etc.

[6] The discussion about which bodily layers or bodily aspects can reach awareness and whether this awareness is global or rather pertaining to fragments of the bodily is touched upon here, but is not the subject matter of this article, although it would be interesting to elaborate this more extensively.

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development of the exteroceptive and proprioceptive (large-diameter) afferents. According to Craig, "(...) this developmental differentiation seems to reflect a simple physiological distinction between the inside and the outside of the body." (Craig, 2002, p. 657). These physiological differences add another reason for a distinction between surface body and in-depth body.[7] Surface body would include both body image and body schema, although other categorizations situate the proprioceptive or kinaesthetic body, closely tied to voluntary movement, as somewhere between surface body and in-depth body. Craig points to converging evidence that indicates that humans have—next to the representations of the surface body—a representation of the *in-depth* body as well. This representation is distinct from the representation of the surface body and is associated, not with somatic motor activity, but with *autonomic* motor control. Recently, it is claimed that from this in-depth body emotional awareness and the self originate (Craig, 2002, 2003; Damasio, 1994, 1999; De Preester, 2007). As we shall see further on, the terminology (and its concomitant metaphysical frame) of *representation* is rather problematic when it comes not only to emotional awareness and the self, but to consciousness and the subjective perspective itself.

Apart from a few exceptions (e.g. Leder (1990a, 1990b)), philosophers pay little attention to the in-depth body. But also in the neurosciences, the study of interoception has been neglected until more recently. This neglect might be partly due to the fact that interoception was almost exclusively linked with vague and diffuse sensations. Pain and temperature do not share this vagueness and diffusion, and therefore they were (and are) most often considered as belonging to the exteroceptive system. Whereas pain and temperature are thus conventionally associated with exteroception (cutaneous mechanoreception and proprioception) and the somatosensory system, the less distinct feelings of vasomotor activity, hunger, thirst, and other internal sensations are attributed to a distinct, interoceptive system. This way of modeling sensations from the body has run into problems for several reasons (cf. Craig, 2003), such as the fact that lesions of somatosensory cortices lack effect on temperature and pain sensation. Moreover, *all* feelings of the in-depth body share reflexive autonomic effects and affective/motivational qualities.[8] In other words, these in-depth bodily feelings are not neutral, but affect the subject (e.g. in terms of pleasantness/unpleasantness, comfort/discomfort) and drive behavior by motivating the subject to undertake action (e.g. to maintain body integrity).

Craig has therefore recognized the need for a *conceptual shift* and the *redefinition* of the category of 'interoception'. Interoception should be redefined as the sense of the physiological condition of the *whole body* (including pain and temperature), and not just of the viscera.[9] "Recent findings that compel a conceptual shift resolve these issues by showing that all feelings from the body are represented in a phylogenetically new system in primates. This system has evolved from the afferent limb of the evolutionary ancient, hierarchical homeostatic system that maintains the integrity of the body." (Craig, 2003, p. 500). The coming about of a new system results into basic neuroanatomical differences between non-primate mammals, primates, and humans. It can be argued that non-primate mammals, non-human primates, and humans have a *different (representation of the) in-depth body*. As such, they have a different basis to build a self, emotions, self-awareness and consciousness. Therefore, humans, primates and mammals can be said to have a different perspective onto the world because the in-depth body is differently registered in the brain. The absence of a *direct* interoceptive representation in non-primates renders plausible the idea that they do not experience feelings from the body in the same way as non-human primates and humans do.

In humans, there is a re-representation of interoceptive (sympathetic) cortical activity in the right anterior insula. This re-representation is associated with subjective feelings. "This same site is activated in virtually every imaging study of human emotions, and so it seems to provide an image of the physical self as a feeling (sentient) entity, which is a characteristic of human consciousness. The conclusion that the subjective image of the 'material me' is formed on the basis of the sense of the homeostatic condition of each individual's body is

[7] It may also be said that the so-called 'surface body' is directed to the external world, whereas the interaction of the in-depth body with the world is mediated via the surface body.

[8] This might have consequences for the distinction between in-depth body and body schema, since this introduces the aspect of agency also on the level of the in-depth body (whereas it is more common to connect agency and body schema) cf. also footnote 16 for this issue.

[9] The fact that we experience subjective differences between well-discriminated feelings that arise from skin, muscles, and joints and more diffuse feelings associated with the viscera may reflect opponent processing between parasympathetic and sympathetic afferents (cf. Craig, 2003, p. 503.

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consistent with the ideas of [William] James and Damasio, and with recent imaging studies that correlate homeostatic processing with emotional awareness.'' (Craig, 2003, p. 503).[10] As such, the afferent neural system in primates and humans that represents all aspects of the physiological condition of the physical body constitutes a representation of the 'material me' and probably is the foundation for subjective feelings, emotions, and self-awareness.

4. Consequences of the re-representation of the in-depth body

Differences in the foundation of the 'material me', i.e. differences in the way the physical inner body is represented in the brain, result in a different basis for subjective feelings, emotions, and self-awareness. Although this remains hypothetical, it is at least highly probable that these differences will become manifest at the level of these intimately related phenomena, including consciousness. But before this can be further assessed or examined, we should attain more clarity about what happens on the way from in-depth, interoceptive body to the formation of consciousness and the subjective perspective. Therefore, the hypothesis that an interoceptive cortical image, or, more precisely, that the *re*-representation of such an image (possibly unique in humans, and to which the anterior insular cortex of the non-dominant hemisphere would contribute in a very significant way) ''corresponds with the ability to perceive the self as a physical and separate entity—that is, self-awareness'' (Craig, 2002, p. 663) should be read carefully.

According to Craig, the re-representation of the 'material me' is the basis for subjective feelings, emotions, and self-awareness. Craig certainly leaps quite a big distance: from a re-representation of the physical condition of the body to the ability of being aware of oneself (self-awareness). It is not at all self-evident that a re-representation of oneself and self-awareness are the same thing. Self-awareness at least seems to imply two aspects: first of all a *self* one is aware of, and secondly a subjective perspective from which one can be *aware of* e.g. oneself.

What happens in Craig's account is probably the following. The in-depth body is represented as a physical and separate entity. It is taken as an object of interoception-based representations, and self-awareness seems to be explained this way. This hypothesis is plausible insofar as it pertains to the aspect of 'self'. However, nothing is said about the way *awareness* of this bodily self (or of this re-represented body-object) comes about. What is said, pertains to the body as a represented object and might indeed help explaining subjective feelings, emotions (cf. infra), and the formation of the self as a separate entity. Although this 'object' of representation, the body, is very intimately connected to the subject, since it is a sentient body, it is looked upon from a subjective perspective about which very little or nothing at all is said. Yet, we are invited to identify interoceptive re-representation and (the basis of) the subjective perspective.

Two closely tied phenomenological terms related to the issue of constitution might help to clarify this problem: the notions of *constituted* versus the notion of *constitutive.* In Husserlian phenomenology, the term 'constitution' refers to the dynamical activity of consciousness, in which the formation happens of the objects consciousness is directed to. These objects include both perceptual objects as more abstract meanings, 'ideal objects' (such as the objects of arithmetic), and one's own body or the bodily appearance of the other. Intentional acts are constitutive of these objects, whereas the objects themselves are called constituted by the acts of consciousness. It is important not to confuse constitution and (ontological) creation, since to conflate both would amount to a kind of subjective idealism. Rather, constitution and related notions should be considered first of all in an epistemological, not in a straightforward ontological way.[11] Husserl never loses sight of the fact that any constitutive act of consciousness ultimately relies on an empirical-sensory basis. The point is that constitutive acts are necessary conditions of possibility for attaining objects and objectivity (in the very broad sense of 'unities of meaning', and in contrast to non-objectified sensory material). Acts of constitution are (in an epistemological sense) responsible for their objects. One can sense here already the particular difficulty at stake: what about the subjective perspective in which or from which objects are constituted? If consciousness is responsible for the constitution of its objects, what about the reflexive problem of the constitution of

[10] It was Charles Sherrington who considered the feelings of the in-depth body as a foundation for the sense of one's physical self. Sherrington, however, considered pain and temperature as aspects of touch (exteroception). In a way similar to Sherrington, William James considered the feelings arising from our body as the basis for emotion and self-awareness.

[11] Cf. De Preester (2006), for a defense of the epistemological stance in Husserlian phenomenology and its naturalization.

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consciousness itself? It is here that Husserl develops the model of auto-constitution in order to solve the problem of auto-constitutive consciousness.

Let us turn back now to the initial problem about the relation between in-depth body and consciousness or subjective perspective.[12] In phenomenological terms, we would say that in the above neuroscientific account, the body is treated as *constituted* (and that we learn more and more about the body as object in/of the brain), but that it is not clear how the body is *constitutive* for the coming about of the subjective perspective. Yet we seem to be invited to consider the re-representation of the interoceptive body as *at the same time* both constituted (the 'self' in self-awareness, as a separate entity) and constitutive (for the subjective perspective or, simply, awareness, including the 'mineness' of this point of view).

Craig, however, refers us to Damasio's 'somatic marker' hypothesis of consciousness: the idea that self-awareness emerges from an image of the homeostatic state of the body. Damasio, in contrast to Craig, explicitly uses the term 'perspective', and this is also his quest: how does the subjective perspective come into being?

5. The representation of the in-depth body as the origin of the subjective perspective

In a very Kantian way, Damasio attaches to a human organism one particular, individual perspective that accompanies all (conscious) experience and knowledge: *the perspective from which* we experience and know. In a much more radical way than Craig, he considers the representation of the body as the origin of this subjective *perspective* (and not simply of the bodily founded self). In other words, Damasio speculates about the origin of the subjective perspective.

The particularity of his account is that it is *relational*: the relation between organism and object (and the changes this object brings about in the organism) occupies a central place in his account. Moreover, Damasio equates consciousness with the subjective perspective: to be conscious is to have a subjective perspective. This subjective perspective is intentional (in the phenomenological sense), i.e. it is directed toward objects. The subject arises at the moment there is a subjective, perspective that is directed toward an object.

Damasio distinguishes two main levels of consciousness: core consciousness and extended consciousness. The latter includes aspects such as an autobiographical self, identity and personhood. Here, the focus will be on core consciousness, which gives an organism the feeling of self, restricted to one moment (now) and one place (here). This self is a core self, a fleeting instance that is shaped over and over again, in each moment the brain interacts with an object. Core consciousness is produced over and over again, and it is—in the same way the self is—temporary and fleeting.

It will be investigated here what Damasio's precisely means by subjective 'perspective' when he talks about core consciousness. The origin or the basis of the subjective perspective is to be situated in bodily material coming from the depths of the body: bodily information is mapped and represented in the brain. It will become clear that Damasio treats the basis of the subjective perspective, i.e. the material from which the perspective originates, in object-terms. On a certain stage in his story, the bodily information upon which the perspective is built, is turned into something object-like. In Damasio's account, it seems as if the material from the in-depth body is not *incorporated into* the perspective, but can be looked upon *from* a perspective. To put it in phenomenological terms: since the material *constitutive for* the perspective is turned into something *constituted* (upon which a perspective can look), this seems to imply an illogical and inconsistent gulf between the perspective and the material from which it is built.

Before we continue this problem, and in view of what follows, it must be clarified what is meant by 'materiality' here. Although it is rather used in a metaphorical sense, there are a number of good reasons for using the term here. First, it refers to the in-depth body as a material given, but not in the same sense in which objects of the external senses are given to the subject. As will become more clear in what follows, constitutive processes pertaining (or leading) to external objects are intrinsically different from constitutive processes pertaining to interoception. Second, this does not hinder the fact that in-depth bodily processes or interoceptive processes relate to a domain that might be called material (in opposition to abstract or merely formal). The

[12] It would be interesting to continue the problem of how Husserl considers the relation between sensations and the auto-constitution of consciousness, or the relation between the material foundation and his models for inner time-consciousness, but this would probably be only relevant for phenomenologically inclined readers.

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materiality of in-depth bodily processes can be spelt out from a third-person point of view (referring to all kinds of physiological processes) but also from a first-person point of view (referring to the resistance the body offers, in a way similar but not equal to external objects). This would require a description of in-depth bodily experience and subjective attitudes towards one's own in-depth body. Third, the use of the word 'material' echoes the phenomenological use of the term in Husserl's philosophy. For Husserl, a mental act constitutes an object (cf. supra), but this constitutive operation involves not only mental *acts*, but also a *material foundation* upon which these acts are built and bring about their objects. Husserl calls this material foundation, or the sensational data, the 'hylè' (from the Greek for 'matter' or 'material'), whereas the mental act itself is called 'morphè' (from the Greek for 'form'). Following the old Aristotelian schema, form and matter together constitute an object. For external objects, the material originates from the external senses. In a sense parallel to the Husserlian schema, we use the term 'material' for that which originates in the in-depth body and is registered via interoceptive processes. Both external objects and the in-depth body confront the subject with a kind of 'body' or 'thickness', but the way these 'bodies' are constituted, differs in important respects (cf. infra). These differences will be important for what follows.

Let us now have a closer look at what Damasio exactly says. A number of regions in the brain have as their 'object' the body, and not something coming from the external world. Such regions, which have as their object the inner world of the body, are regions that regulate the life processes and other brain maps with representations of several aspects of the body (cf. supra). ''Now consider this: while your visual system changed dutifully at the mercy of the objects it mapped [during visual perception], a number of regions in your brain whose job it is to regulate the life process and which contain preset maps that represent varied aspects of your body did not change at all in terms of the *kind* of object they represented. The body remained the 'object' all along and will remain so until death ensues.'' (Damasio, 1999, p. 21). In this passage, the body is for the first time presented as an object, although the term appears (the second time) between inverted comma's. In Damasio's account, the fact that certain brain regions map the body, or have the body as their object, opens up the way for an explanation of the emergence of a self and of the coming about of consciousness.

6. From proto-self to core-self and core consciousness

6.1. On the way to consciousness

Damasio's conclusive hypothesis is as follows: ''I have come to conclude that the organism, as represented inside its own brain, is a likely forerunner for what eventually becomes the elusive sense of self. The deep roots for the self, including the elaborate self which encompasses identity and personhood, are to be found in the ensemble of brain devices which continuously and *nonconsciously* maintain the body state within the narrow range and relative stability required for survival. These devices continually represent, *nonconsciously*, the state of the living body, along its many dimensions. I call the state of activity within the ensemble of such devices the *proto-self*, the nonconscious forerunner for the levels of self which appear in our minds as the conscious protagonists of consciousness: core self and autobiographical self.'' (Damasio, 1999, p. 22) But what does this ascent from non-conscious representation of the (in-depth) body to self and consciousness look like? How do we get from the body to the proto-self and the core-self? We know that the final result should be as follows (cf. supra Damasio's relational account of consciousness): consciousness, or the subjective perspective, puts the representations (of objects) in the perspective of the organism by connecting them to an integrated representation of the organism itself. In a slightly different formulation: ''I propose that we become conscious when the organism's representation devices exhibit a specific kind of wordless knowledge—the knowledge that the organism's own state has been changed by an object—and when such knowledge occurs along with the salient representation of an object.'' (Damasio, 1999, p. 25). The mechanisms that regulate life—including the body maps—are not themselves responsible for consciousness (or the subjective perspective), yet they are a necessary condition for it.

6.2. Preparation: emotions, feelings and conscious feelings

Damasio prepares his readers by focusing on emotions, feelings and 'feelings of feelings' (or conscious feelings). *Emotions* are closely tied to homeostasis, the regulation of the life processes. The body reacts

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emotionally to the representation of a (certain) object in the brain, and is used as the 'theater' in which emotions are played out. Next to bodily reactions, changes in reaction to the representation of an object also occur in the brain itself.

Background emotions are certain inner states which are the result of (internal) physiological processes more extended in time than emotions in the strict sense. Feeling tensed or relaxed, tired or energetic, comfortable or uncomfortable are examples of it.

The profile of the internal milieu and the viscera plays a major role for background emotions. In general, background emotions do not have an external cause, as emotions do. Moreover, the 'target' of emotions is most often the skeletal muscles and the viscera, whereas background emotions rather target the internal milieu.

In order for an emotion to become 'known' or experienced by the subject, the emotional changes in the body (and in the brain itself) are mapped in the brain. This representation of the state of the body is called a *feeling*. Yet a feeling is not already something we know or are aware of. To know a feeling, or rather, *to feel a feeling*, requires consciousness. ''Eventually, consciousness allows any object to be known—the 'object' emotion and any other object—and in so doing, enhances the organism's ability to respond adaptively, mindful of the needs of the organism in question.'' (Damasio, 1999, p. 56) This quote also makes clear that consciousness can only be 'consciousness of' if something is turned into an object—a condition which is also valid for an emotion. Note that this is a very Husserlian way of reasoning, in which intentional consciousness can only be conscious of something if (and only if) this 'something' is constituted up to a certain degree.

6.3. On the way to core consciousness: proto-self and a new hypothesis

But how does consciousness itself, or the subjective perspective, come into being? Damasio sees a close link between emotions and core consciousness. ''The lack of emotion when core consciousness vanishes may be parsimoniously explained by suggesting that both emotions and core consciousness require, in part, the same neural substrates, and that strategically placed dysfunction compromises both kinds of processing. The shared substrates include the ensemble of neural structures which support the proto-self, the structures which both regulate and represent the body's internal states. I take the lack of emotion, from background emotion on up to higher levels of emotion, as a sign that important mechanisms of body regulation have been compromised. Core consciousness is functionally close to the disrupted mechanisms, interwoven with them, and thus compromised along with them.'' (Damasio, 1999, p. 100). There is thus a close functional link between core consciousness, important mechanisms for the regulation of the life processes (in-depth bodily processes which underlie the proto-self), and emotions. The brain continually has at its disposition a dynamic representation of an entity which does not change dramatically: the body. Damasio distinguishes three basic divisions of the somatosensory system, which convey signals from very different aspects of the body to the brain (cf. also supra). First, there is the division of the internal milieu and the viscera (which relates the internal status of the body). Second, there is the section of fine touch (which describes external objects based on signals from the surface of the body). Third, there is the vestibular and musculoskeletal division. This division can describe both internal and external states.

The internal milieu, the viscera and the musculoskeletal division bring about a continuous representation of the body. This representation is dynamic but has a restricted range, whereas our environment changes dramatically. This is Damasio's resulting hypothesis: ''I propose that the sense of self has a preconscious biological precedent, the *proto-self*, and that the earliest and simplest manifestations of self emerge when the mechanism which generates core consciousness operates on that nonconscious precursor. *The protoself is a coherent collection of neural patterns which map, moment by moment, the state of the physical structure of the organism in its many dimensions.''* (Damasio, 1999, pp. 153–154). In this, the neural structures that regulate the state of the organism are of particular importance.

I will not go into the details of the brain structures necessary for the proto-self, but it is in the right hemisphere that the most integrated representation of the current internal state of the organism is situated, next to representation of the unchanging schema of the whole of the musculoskeletal apparatus. Fine touch, or at least that part of the primary somatosensory cortex (S1) related to fine touch is *no* part of these necessary areas. The proto-self is dependent on several representations of the state of the organism: representations of the internal milieu, of the viscera, vestibular signals, and the whole of the musculoskeletal apparatus.

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The representations of the internal milieu and of the viscera are probably the more important ones for the proto-self.[13]

Now what is core consciousness? According to Damasio: "The specific answer I deduced is presented in the following hypothesis: *core consciousness occurs when the brain's representation devices generate an imaged, non-verbal account of how the organism's own state is affected by the organism's processing of an object, and when this process enhances the images of the causative object, thus placing it saliently in a spatial and temporal context.*" (Damasio, 1999, p. 169). Both the object and the organism are represented as neural patterns. These patterns are called 'first-order maps'. The sensorimotor maps of the object bring about changes in the maps of the organism. These changes can be represented in other maps (second-order maps), which represent the relation between object and organism. These secondary maps can become *mental* representations. The maps of the organism and the secondary maps are related to the body, such that the mental representations that describe the relations are *feelings*. More in particular, the secondary maps describe the relation between the changed proto-self (state of the internal milieu, viscera, vestibular system, musculoskeletal apparatus) and the sensorimotor maps of the object that has caused the changes. In short, primary maps represent the object, on the one hand, and the proto-self, on the other hand. The changes due to the causal bond between object and organism (as represented by the proto-self) can only be represented in secondary maps.

The subjective perspective, or consciousness, is a re-representation of proto-self and object, but this time in their interrelation. If we look back on the role of emotions, we find out why precisely this re-representation might lead to consciousness.

6.4. The double role of emotions

Emotions clearly play a double role in Damasio's account. "We should also remember that, as I noted earlier, emotion has a truly dual status in relation to consciousness: the actual responses whose consequences, as an ensemble, eventually produce an emotion are part of the mechanism that drives core consciousness; a fraction of time later, however, the collections of responses which constitute a particular emotion can also be treated as an object to be known. When the 'emotional' object is made conscious, it becomes a feeling of emotion." (Damasio, 1999, p. 350, footnote 1). Please also note that for emotional reactions to become a *conscious* emotion, they are treated as object.

The process of becoming conscious of an emotion is precisely the same process Damasio discusses for the becoming conscious of an external object.[14] However, it is more difficult to imagine when the object in question is an emotion, for emotion occurs within the organism, rather than outside of it. Moreover, "It may sound strange, at first, that feelings of emotion—which are steeped in the representation of body states, only come to be known after *other* representations of body state have been integrated to give rise to a proto-self. And it sounds strange, for certain, that the means to know a feeling is another feeling." (Damasio, 1999, p. 280). This 'other' feeling most probably refers to background feelings: background feelings and core consciousness are so tightly interwoven, that it is difficult to distinguish them.

7. The constitution of the perspective

7.1. Consciousness: perspective or representation?

According to Damasio, consciousness is a perspective: it pertains to objects other than itself. Following a traditional view, it is a kind of *inner sense*. On the one hand, there is an object, on the other

[13] The proto-self does not only operate with representations of the in-depth body, but also with body-schematic representations, although the in-depth body itself (internal milieu and viscera) probably are more important for the proto-self.

[14] A more detailed account is summarized in the following quote: "The sense of 'happening in the organism' comes from representing the proto-self and its changes in second-order structures. The sense of the 'emotion as object' comes from representing, in structures subserving second-order representations, the activity pattern in the induction sites of emotion. Following what was outlined for other objects, I propose that: (1) the inaugural proto-self is represented at second-order level; (2) the 'object' that is about to change the proto-self (the neural-activity pattern in emotion-induction sites) is represented at second-order level; (3) the ensuing changes in the proto-self [...] are also represented at second-order level." (Damasio (1999, p. 280)).

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hand, consciousness of that object. Both are something different, though there is an intimate link between both.

That consciousness is different from the objects about which consciousness is, could imply that consciousness itself is not based on representations, as an object is. Traditionally, consciousness itself has no 'thickness': it is a perspective that needs to be fulfilled *by* an object. However, this is not very clear from Damasio's account, as both objects and consciousness are based on representations. Nevertheless, this being based on representations leads to an object-representation in one case, and to a subjective perspective in the other case. Core consciousness is based on representations, and gives a nonverbal message about the relation between organism and object.

However, this simplified view does no justice to Damasio's more complex account, for in his view, consciousness is *no external spectator* that looks upon a story about an object. Consciousness floats along not *with*, but *within* the 'story' about an object. ''Most importantly, the images that constitute this narrative are incorporated in the stream of thoughts. The images in the consciousness narrative flow like shadows along with the images of the object for which they are providing an unwitting, unsolicited comment. To come back to the metaphor of movie-in-the-brain, they are *within* the movie. There is no external spectator.'' (Damasio, 1999, p. 171). Although there is a knower (subject) and something to be known (object), the story about the object is not told by someone standing outside the story. It is not told by a 'self', since this self emerges within the story itself. ''Whether we like it or not, the human mind is constantly being split, like a house divided, between the part that stands for the known and the part that stands for the knower. The story contained in the images of core consciousness is not told by some clever homunculus. Nor is the story really told by *you* as a self because the core *you* is only born as the story is told, *within the story itself.''* (Damasio, 1999, p. 191). A phenomenologist will certainly recognize an autoconstitutive story in this account: there is no external place responsible for the constitution. Both the constituted (object) aspects and the constitutive (subject) aspects of the stream of consciousness belong to one single level. The stream of consciousness is both constitutive *and* constituted, and therefore what is constituted and that which constitutes belong to one and the same level.

The final account of how exactly consciousness or the subjective perspective arises, however, remains uncertain. ''The secret of making consciousness may well be this: that the plotting of a relationship between any object and the organism becomes the feeling of a feeling. The mysterious first-person perspective of consciousness consists of newly minted knowledge, information if you will, expressed as feeling.'' (Damasio, 1999, p. 313).

Due to the representational aspect inherent in Damasio's account, two problems arise. One is formulated by Damasio: we do not know what a feeling is. ''What are feelings made of? What are feelings the perception of? How far behind feelings can we get? These questions are not entirely answerable at the moment. They define the edge of our current scientific research.'' (Damasio, 1999, p. 314). Or less dramatic: a representational account seems unable to solve this problem of 'feeling'.

Damasio might just as well have said: what does a perspective consist of? How far beyond a perspective do we get? A phenomenologist might have asked: how is the constitutive perspective itself constituted? What is a perspective made of? And the reader might also ask: why does the representation of the primary feeling (the representation of emotions) sometimes lead to a perspective, and sometimes to an object (a feeling we are conscious of)? Unfortunately, the notion of *feeling* remains too vague to solve these problems. At worst, the problem of the subjective perspective is simply repeated.

7.2. The problem of thinking the perspective

A major problem in trying to trace the origin of the perspective might be that the perspective *itself* is so radically different from the *content* of the perspective. This is nothing more than the old problem of thinking subjectivity while leaving behind the object-based schema of thinking. This difficulty is traceable in Damasio's account. A representational way of thinking is able to explain the contents of the subjective perspective, even if this content is an emotion. Yet, from the moment (background) emotions and the origin of the *perspective* are discussed, the representational account seems to fail, and one has to switch over to (conscious) feelings.

One possible explanation is that the way from the interoceptive basis to representations (the emotion as object of consciousness) or to feelings (consciousness or the subjective perspective itself) is *different with respect to the processing* of the interoceptive material.

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In the case of a representation, or a re-representation, the interoceptive material is taken along to the higher level on which the (re-)representation happens. This is not surprising, since a representation necessarily has content, and the material of the representation originates, in this case, from a level below. In this way of processing, the interoceptive material is not *incorporated into* the perspective. In contrast, it can be looked upon *from* a perspective.

The case of the perspective might be fundamentally different, since the perspective itself has no *intrinsic* content. In contrast, its content comes from elsewhere. The subjective perspective is fulfilled by something object-like (even if this object has an internal origin, as in the case of conscious emotions). As soon as there is talk of content, or material, this content or material is put at the object-side.

In the traditional view, this subject-side, the perspective itself is transparent, lucid, bodiless. Subjectivity itself remains formal and empty, a window through which one can look (or which *is* the look) at objects, but that bears no content in itself or has no 'thickness'. In Damasio's view, the perspective is based on interoceptive material that can become the content of the perspective (i.e. once or at the same time as the perspective is established). This interoceptive material, however, does not fit very well on the subject-side, or the side of the perspective itself. It can only be represented, mapped, or treated in terms of objects. This seems to be the reason why, in his explanation of consciousness, Damasio eventually switches over from representations to feelings. From the very start, the notion of feeling is closer to subjectivity and the notion of perspective than representational content. How, after all, could a perspective arise from a representation? How could we get from content to perspective, from object to subject, or from the constituted to the constitutive?

7.3. Inspiration from auto-constitution?

Husserl's account of auto-constitution, in which consciousness constitutes itself in a process of auto-constitution, may offer a way out of this problem. The most remarkable event in the process of auto-constitution, is that the oppositional schema of 'act' versus 'content' of the act is no longer dominant. The above introduction of the terms of form (act or *morphè*) versus material foundation (matter or *hylè*) on the basis of which the act constitutes its object, was precisely necessary in view of the subsequent collapse of the oppositional schema. This means that the splitting up between an act and the content of an act, or between the act and its object, is not always adequate.[15] In other words, on some levels of analysis, it becomes impossible to distinguish the form of an act from its matter (*hylè* or sensational data).

Thus, according to Husserl, not all constitution follows the schema of act versus content, or less confusingly, of form versus matter. This is clear in the case of auto-constitution of consciousness. The very general idea is as follows. In the stream of consciousness, external (objective) time and internal (subjective) time are constituted, but the stream of consciousness also constitutes itself. In the stream of consciousness, absolute consciousness constitutes not only acts and objects, but also itself. The constitutive (consciousness, the subjective perspective) and the constituted (once again the subjective perspective itself, as a unity) are situated on the *same* level, such that the oppositional schema is no longer proper.

Damasio would probably like the solution of auto-constitution, since it provides us with an account in which the objective and the subjective emerge together, within the same story that is being told (cf. there is no external spectator, *within* the movie about objects, the subjective perspective itself is constituted).

However, he would encounter the following problem: the models of auto-constitution of consciousness Husserl presents in 1905 pertain to the *formal* aspects of the stream of consciousness. 'Formal' refers here to the *way* something is given in consciousness (as present, as just past, as about to come). In other words, auto-constitution does not pertain to content, but to form, because the phases of consciousness (now, just

[15] There are debates about whether the phenomenological term 'matter' is comparable to the term 'object' of a representation, or whether it rather resembles the notion of representation itself. Another possibility is that a representation should itself be divided into content and object, such that 'matter' and 'content' of a representation match. Whatever the particular interpretation, however, the collapse of the oppositional schema remains possible.

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past, about to come) are themselves no (temporal) objects (like e.g. a tone in a melody), but merely formal characteristics of the stream of consciousness.[16] This is quite different from Damasio's account in which the subjective perspective is rooted in representations, to which content pertains.[17]

Is there a way between these two options? Can we escape the opposition between the formal-constitutive to which auto-constitution pertains on the one hand, and the material or the content to which object-constitution or representation pertains on the other hand? In Damasio's account, to think in terms of representations or in terms of the constituted seems unavoidable in tracing the origins of the subjective perspective. The origins of the subject are indeed situated in the depths of the material body, not in any formal aspect of it.

8. A way out? The subject as 'miscarried object'

In Damasio's account, to represent the in-depth body and to approach this mapping of the body in the brain in terms of objects are unavoidably linked. This might be the main reason why the formation of a subjective perspective cannot happen on the basis of representations. Damasio seems to be aware of this problem when he switches over from representations to explaining consciousness on the basis of feelings. However, he does not explain what this feeling (the feeling consciousness consists of) implies. Feelings are on the edge of current scientific research.

Let us suppose now, in line of but different from Husserl's 1905 model of auto-constitution, that the constitution of the material originating from the in-depth body *necessarily fails* in some cases. In this view, the formation of the subjective perspective might be due to the fact that the constitution of in-depth bodily material into something constituted (i.e. object-like) does not always happen (or only under certain circumstances). In other words, when successful, the constitution of the interoceptive material leads to the formation of an object, and when unsuccessful, it would lead to the formation of a subjective perspective. In representational terms, no full-fledged representation happens in the latter case. But what then does happen?

If we look again at the Husserlian schema, we see that the schema constitutive-constituted collapses in regard to the *formal* aspects of the stream of consciousness. In the case of the subjective perspective and the impossibility to build a perspective onto representations, the oppositional schema also collapses pertaining to the *hyletic material* (in this case: the interoceptive data). Something more than auto-constitution pertaining to *formal* aspects happens, since the non-formal, material data from interoception are also involved in an auto-constitutive story. This means that, in the formation of the subjective perspective, an uncoupling of that which constitutes (the material coming from the in-depth body, proto-self, feelings, etc.) and that which is constituted (the perspective) becomes impossible, similar to what happens in auto-constitutive inner time-consciousness.

If we follow this conceptual proposal, the material (or the in-depth bodily content) does *not* shift to the object-pole, but will remain at (and constitute) the subjective perspective. In other words, the perspective itself will have 'thickness', inherent but non-object-like "content". This has two consequences. First, the subjective perspective is no longer merely formal and as such empty. Second, since the interoceptive material 'sticks' to the perspective itself, there is no distance available that might guarantee a subject-object split. This lack of distance prevents the interoceptive material to become an object (or a representation); in contrast, it becomes a subjective perspective. In other words, the epistemological spacing required for the constitution of objectivity is lacking: the material flows into the subjective perspective itself, not into an object or representation looked upon from a subjective perspective.

[16] In this context, 'formal' and the 'form' or 'morphè' (i.e. an act of consciousness) are to be distinguished, since acts of consciousness are themselves also temporal *objects*, and therefore *constituted*.

[17] This does not mean that on the deepest levels of consciousness, Husserl does not admit matter (cf. Mishara, 1990 for a treatment of matter on the deepest levels of consciousness).

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There are interesting parallels with Husserl's later account on the auto-constitution of one's own body, in which kinesthesia and changes due to bodily movements in the field of external perception are intimately coupled (cf. Berthoz & Petit, 2006; Husserl, 1952). [18]

One might say that the process of becoming an object is stopped and that the subject arises as a miscarried object. Such a miscarried object can never detach itself from its origins in the in-depth body. The interoceptive is destined to remain on the side of the subjective and the constitutive. Nevertheless, once the subjective perspective is established, a kind of reflection upon its origins would become possible, as in the case of becoming conscious of an emotion.

In contrast to the Husserlian account of 1905, but similar to his later accounts of the auto-constitution of one's own body, auto-constitution not only pertains to formal aspects of the stream of conscious, but also to the material of the in-depth body. In contrast to Damasio's account, the material 'content' is not fully turned into a representation, but remains at the side of the subject itself. This impossibility of a full-fledged constitution of the material into something object-like, gives rise to a subjective perspective. It is in this sense that the subject might be called a miscarried object: the subjective perspective arises when turning in-depth material into a representation or into a possible object of consciousness fails. Of course, it would need further investigation, both empirical and conceptual-philosophical, to explain the specificity of interoceptive material, its consequent resistance against objectification or representation, and its liability to constitute a subjective perspective. Nonetheless, I hope this can serve as an alternative frame of reference in which empirical data can be assessed in a non-representationalist way.

References

Berthoz, A., & Petit, J.-L. (2006). *Physiologie de l'action et phénoménologie*. Paris: Odile Jacob.

Cameron, O. G. (2002). *Visceral sensory neuroscience*. Oxford: Oxford University Press.

Cole, J. (2005). On the relation of the body image to sensation and its absence. In H. De Preester & V. Knockaert (Eds.), *Body image and body schema, interdisciplinary perspectives on the body* (pp. 311–327). Amsterdam: John Benjamins Publishing Company.

Craig, A. D. (2002). How do you feel? Interoception: the sense of the physiological condition of the body. *Nature Reviews Neuroscience, 3*, 655–666.

Craig, A. D. (2003). Interoception: The sense of the physiological condition of the body. *Current Opinion in Neurobiology, 13*, 500–505.

Damasio, A. (1994). *Descartes' error, emotion, reason and the human brain*. New York: Putnam.

Damasio, A. (1999). *The feeling of what happens, body and emotion in the making of consciousness*. New York: Harcourt and Brace.

De Preester, H., & Knockaert, V. (Eds.). (2005). *Body image and body schema, interdisciplinary perspectives on the body*. Amsterdam: John Benjamins Publishing Company.

De Preester, H. (in press), "Body Image and the Visceral Dimension". *Theoria et Historia Scientiarum*.

De Preester, H. (2007). Epistemological questions concerning the in-depth body and the coming about of the ego. In A. Tymieniecka (Ed.), *Phenomenology of life—From the animal soul to the human mind book II* (pp. 201–225). Dordrecht: Springer.

De Preester, H. (2006). Naturalism and transcendentalism in the naturalization of phenomenology. *New Ideas in Psychology, 24*(1), 41–62.

Gallagher, S., Butterworth, J. E., Lew, A., & Cole, J. (1998). Hand–mouth coordination, congenital absence of limb, and evidence for innate body schemas. *Brain and Cognition, 38*, 53–65.

Gallagher, S., & Cole, J. (1995). Body image and body schema in a deafferented subject. *The Journal of Mind and Behavior, 16*(4), 369–390.

Gallagher, S., & Cole, J. (1998). Body Schema and Body Image in a Deafferented Subject. In D. Welton (Ed.), *Body and flesh: A philosophical reader* (pp. 131–147). Oxford: Blackwell.

Husserl, E. (1952). *Ideen zu einer reinen Phänomenologie und phänomenologischen Philosophie*, Zweites Buch, The Hague: Martinus Nijhoff. Translation: (1989) *Ideas pertaining to a pure phenomenology and to a phenomenological philosophy*, Second book (E. O. Richard Rojcewicz, Trans.). Dordrecht: Kluwer Academic Publishers.

Leder, D. (1990a). *The absent body*. Chicago: The University of Chicago Press.

Leder, D. (1990b). Flesh and blood: A proposed supplement to Merleau-Ponty. *Human Studies, 13*, 209–219.

Mishara, A. (1990). Husserl and Freud: Time, memory and the unconscious. *Husserl Studies, 7*, 29–58.

[18] As Craig himself argues, in reaction to Damasio's point of view on emotions, emotions do not only lead to feelings, but also have an inherently *motivating* power. In other words, Craig pleads for the active agent missing in Damasio's somatic marker hypothesis. The motivational aspects involved in mapping the in-depth body could lead to the acknowledgment of the in-depth motor dimension and its importance for the constitution of the subjective perspective. Moreover, at this point the distinction between in-depth body (largely depending on the autonomic branch of the nervous system) and body schema (depending on the somatic nervous system) should be reconsidered. We owe this remark to Jean-Luc Petit (personal communication).

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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* (pp. 89–109). Amsterdam: John Benjamins Publishing Company.

Petit, J.-L. (2005). A functional neurodynamics for the constitution of the own body. In H. De Preester & V. Knockaert (Eds.), *Body image and body schema, interdisciplinary perspectives on the body* (pp. 189–209). Amsterdam: John Benjamins Publishing Company.

Rossetti, Y., Rode, G., & Farnè, 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. 111–126). Amsterdam: John Benjamins Publishing Company.

Further reading

Husserl, E. (1966). *Zur Phänomenologie des inneren Zeitbewusstseins (1893–1917)* (R. Boehm, Ed.). Husserliana 10, The Hague: Martinus Nijhoff. Translation: (1991), *On the phenomenology of the consciousness of internal time (1893–1917)* (J. B. Brough, Trans.). Dordrecht: Kluwer Academic Publishers.

Please cite this article in press as: De Preester, H., The deep bodily origins of the subjective perspective: ..., *Consciousness and Cognition* (2007), doi:10.1016/j.concog.2007.05.002