

EPISTEMOLOGICAL QUESTIONS CONCERNING  
THE IN-DEPTH BODY AND THE COMING ABOUT  
OF THE EGO

1. INTRODUCTION: IN-DEPTH DIMENSIONS  
OF CONSCIOUSNESS AND BODY

In section 81 of *Ideas I*, Husserl points to a dimension of transcendental life hitherto not discussed.

The transcendently 'absolute' which we have brought about by the reductions is, in truth, not what is ultimate; it is something which constitutes itself in a certain profound and completely peculiar sense of its own and which has its primal source in what is ultimately and truly absolute. (Husserl, 1998, p. 193)

Pure or transcendental consciousness, the foundation hitherto discovered by means of the reductions, is not the *ultimate* ground of consciousness. Underneath, there is a *delimited sphere of problems* (Husserl, 1998, p. 193), which is, according to Husserl, one of exceptional difficulty. It is the sphere of internal time-consciousness and the constitution of time, which makes up the truly basic level of conscious life. The reader of the texts on the consciousness of internal time is indeed immersed in a well-defined domain of consciousness in which the constitution of immanent time and immanent time-objects is thoroughly investigated in several diverging models.

If phenomenological reflection peers deep enough into the structures of consciousness, the *wonder of time-consciousness* discloses itself (Husserl, 1991, p. 290). The phenomenologist is confronted with what underlies the intentional activity of the transcendental ego. It is neither the structure of intentionality itself nor the constitution of transcendent objectivity that is at issue here. Rather, it is that which both structurally and logically precedes the egoic activity of consciousness and that which withdraws itself from the 'ordinary' domain of transcendental reflection. In other words, it is the in-depth dimension of consciousness and the conditions of possibility of consciousness itself that are at stake. In this in-depth dimension of consciousness, the contingent, subjective material is prepared such as to

enable the intentional activity that constitutes the objective world. We are on the fringe of phenomenology's solid ground upon which the numerous analyses of intentional consciousness are erected.

It is in the domain of the intentional activity of the transcendental ego that Husserlian phenomenology has played a pioneering role. This is not only due to its detailed study of the intentional activity of consciousness, but also to its resistance against approaching the body as a merely objective body, studied in anatomy and physiology. Phenomenology has argued in favour of the body as a living or ensouled body, and it is precisely from this perspective that the importance of the body for intentionality could and can be studied. In doing so, the body – supporting and co-enabling the intentional activity of consciousness – is primarily studied from a *sensorimotor* perspective. The sensorimotor aspects of the living and lived body nicely tie in with the analyses of the intentional activity of the ego. The bodily level of sensorimotor activity and the level of consciousness or egoic intentionality are on a par, and form together a description of the intentionality of the embodied, mundane ego.

However, in a way similar to the one in which egoic intentionality is founded upon the deeper dimensions of inner time-consciousness, the bodily sensorimotor activity may be founded on a deeper bodily dimension, hitherto often ignored.

The aim of this article is to give a minimal account of what such a deeper bodily dimension consists of, and what the consequences of taking this dimension into consideration are. In this, both Husserlian phenomenology of inner time-consciousness and recent neuroscientific research into the in-depth body are involved.

## 2. A PHENOMENOLOGICAL STRATIFICATION OF THE BODY: UNDERNEATH BODY IMAGE AND BODY SCHEMA

In this section, a stratification of the living and lived body is sketched from a phenomenological point of view. Well in line with Husserl's (and Merleau-Ponty's) phenomenological approach of the body, recent (neuro-)phenomenological research has mainly focused on the sensorimotor dimension of the body. This means that the body is studied principally to the extent that it is a motor and a perceiving organ. As such, this line of research has led to exciting and productive phenomenological (and other) research concerning *body image* and *body schema*. Body image and body schema are concepts with a long and intricate history in neuroscience, phenomenology and psychoanalysis (H. De Preester and V. Knockaert, 2005). More recently, neurophenomenological research into body image and body schema has led

to clear conceptual and clinical distinctions between body image and body schema. The body image is “(...) most often defined as a conscious idea or mental representation that one has of one’s own body.” (Gallagher and Cole, 1995, p. 370.) This mostly conscious and personal image one has of one’s own body generally concerns the surface body, i.e. the way the body appears in the visual modality<sup>1</sup>. In the body image, the own body appears as the intentional object of a set of intentional states directed toward the own body. The subject takes her own body in an act of reflective intentionality as the intentional object of her act. “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. Thus the body image involves a reflective intentionality.” (Gallagher and Cole, 1995, p. 371.)

The body schema, in contrast, is found at the side of the intentional subject, and not at the side of the intentional object.

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.” (Gallagher and Cole, 1995, p. 371.)

The body schema does not have the status of a conscious representation or a belief. It is a preconscious, sub-personal system that enables and supports intentional motor activity. The function of the body schema thus is to maintain posture and to move without consciously monitoring motor activity. This and the subpersonal aspect differ from the characterization of the body image. The conceptual distinction, however, does not hinder the fact that body image and body schema are functionally interrelated at the level of behavior.

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. The body schema also receives information from other systems than proprioceptive ones, such as vestibular and equilibrational functions<sup>2</sup>. Proprioception, not only giving rise to (unconscious) proprioceptive information but to proprioceptive awareness as well, already points to a deepening of (the experience of) the body. Proprioception can be considered as having an intermediate position between exteroception and interoception (see further below).

Although the body receives a lot of attention from phenomenological and neurophenomenological studies, the focus is mainly directed upon the *surface* structure of the body. The topics of body image and body schema present the body in its perceptual and sensorimotor dimensions.

It seems to be a lot less usual, in contrast, to direct phenomenological attention to the *in-depth* structures of the body. There is at least one obvious reason for that: the in-depth structures of the body recede more or less from conscious awareness. However, the view that phenomenology is about *conscious experience* implies a strong limitation of what phenomenology is. Next to the numerous descriptions of conscious experience Husserlian phenomenology provides, phenomenology is just as much about the conditions that *enable* and *underlie* intentional activity. In other words, phenomenological descriptions of experience are to be situated in a broader epistemological framework that questions the *conditions of possibility* for intentionality and experience (cf. De Preester, 2005b; De Preester, 2006).

A second reason for neglecting the in-depth structures of the body is the following. In the twentieth century, philosophy and studies in cognitive science have coated consciousness with a body, and the topic of embodiment has boomed. Vice versa, however, the body has been invaded by consciousness, such that the focus is mostly on those bodily dimensions of which consciousness or awareness is possible. Yet, the closely related issues of body schema and proprioception include aspects that refer us to dimensions of the body that evade the sphere of the conscious, intentional ego. Here, a slow but important shift is noticeable from the surface body to deeper bodily layers. The transition may be formulated as a transition from the body as constituted (cf. body image) to the body as constitutive (cf. body schema). In its latter guise, the body is no longer originating from the intentional activity of the subject, but rather underlies it. It is this shift from surface body as constituted to the constitutive body underlying the subject that will be explored and refined in the further sections. More in particular, it will be asked what happens if the deepening of the body is continued.

### 3. THE IN-DEPTH BODY FROM A PHENOMENOLOGICAL-DESCRIPTIVE AND A PHENOMENOLOGICAL-EPISTEMOLOGICAL PERSPECTIVE

Phenomenological studies that explicitly and elaborately analyze the structure of the in-depth body are rather scarce. A remarkable exception can be found in the work by D. Leder (1990a, 1990b). Leder's phenomenological perspective is profoundly influenced by Merleau-Ponty and is presented as a supplement to Merleau-Ponty's phenomenology of the body. Merleau-Ponty focuses on bodily sensorimotor intentionality, a focus considered too limited by Leder.

Instead, Leder addresses the ‘anonymous visceral dimension’ beneath the perceiving and perceived surface body.

My sensorimotor being-in-the-world rests upon a set of vegetative functions hidden from myself no less than others. Within me proceed circulatory, digestive, and respiratory pathways which resist the apprehension and control of the conscious ‘I’ and yet, like Descartes’ God, sustain the ‘I’ at every moment.” (Leder, 1990b, p. 200.)

With this, Leder rightly states that the sensible and sentient surface body cannot be equated with the body as a whole, but rests upon a deeper and visceral foundation. It is in this visceral dimension that the phenomenological analyses based on conscious intentionality and subjective awareness reach their limits. In Leder’s phrasing:

My inner organs are, for the most part, neither the agent nor object of sensibility. I do not perceive through my liver or kidneys; their intricate processes of filtration and excretion proceed mainly beneath the reach of conscious apprehension. They are not the conduit by which I immediately know the world, or by which the world knows me. (Leder, 1990b, p. 203.)

Leder’s account distinguishes the corporeal level of the surface body from the corporeal depths that are perceptually elusive and give rise to a pattern of vague and shifting calls. Moreover, ‘viscerality’ not only eludes our *perceptual*, but also our *motor* reach.

Visceral interoceptions tend to be qualitatively restricted, temporally intermittent, spatially indefinite and causally ambiguous compared to the world exteroception reveals. In terms of motility, the ‘I can’ of the surface body gives way, on the visceral level, to something like an ‘it can’. For I cannot simply choose to contract my stomach as I could my hand. (Leder, 1990b, p. 203.)

The distinction between sensorimotor and visceral bodily layers does not lead to a denial of the intertwining of both levels, but points to the sustaining function of personal life by anonymous life.

Leder’s account offers the reader an important and innovative addendum to the phenomenological description of the experience of the body. More in particular, he focuses on a *description* of the ways in which the body is both present and absent in human *experience* (cf. Leder, 1990a). The account that will be offered here differs in that the focus is of an *epistemological* kind (cf. supra Section 2 for the distinction between phenomenological description and epistemological analysis in phenomenology). This is mainly due to the Husserlian perspective applied here, in contrast to a Merleau-Pontian one as applied by Leder. More concretely, the epistemological role and structure of the in-depth body will be addressed in terms of the positions it holds in the schema constitutive-constituted. The models Husserl has developed for taking

into account the role and structure of inner time-consciousness will be helpful for this epistemological approach of the in-depth body.

#### 4. INNER TIME-CONSCIOUSNESS: SEVERAL MODELS

Husserl's analysis of time-consciousness displays a remarkable and continuous development, which can be divided into a number of models (cf. Kortooms, 1999). This section will briefly indicate some main characteristics of the several models. The purpose of presenting some aspects of the structure and function of inner time-consciousness, is to gain more insight into the way the constitution of objectivity originates from the deeper levels of time-consciousness.

In his phenomenological research into time-consciousness, Husserl traces the origin of the temporal way in which objects appear to us. The phenomenological analysis, however, is not just based on the analysis of our subjective *experience* of time, but more essentially on the *a priori* laws governing the constitution of an immanent time object, i.e. the object under abstraction of transcendent objectivity. In order to understand the meaning of intentionality, its origins must be elucidated by means of answering the question what conditions should be fulfilled in order for the constitution of objective time (and objects in objective time) to occur. In his lecture from the winter semester of 1904–05, Husserl is convinced of the temporal nature of time-consciousness itself, i.e. that consciousness of temporal objects requires a consciousness itself extended in time. For Husserl, time-consciousness is a continuum of continua. The operative principle that gives rise to the smooth transition of continua into continua is one of *Verschmelzung* (fusion). Each momentary phase of perceptual consciousness is a continuum made up of a now-consciousness (present) and a number of points representing what has just passed. The succession of these phases is in turn a continuum. This means that primary memory (or retention of what has just past) belongs to the perception of something present. Retention, then, is not re-presenting, but presenting.

The 'stuff' time-consciousness operates with, are sensational data, which are *real, immanent* constituents of consciousness. Husserl, however, does not always consider sensational data as mere contents of sensation. Once Husserl has developed the method of the transcendental reduction, he sees that not only really immanent contents of consciousness are available to phenomenological analysis, but that the perceived as such (the intentionally immanent) also belongs to the domain of phenomenological analysis. In other words, from then on, he considers sensational data as something that already presupposes an intentional constitution.

In the years 1917–1918, the period of the *Bernauer Manuskripte*, Husserl elaborates a number of other, different models for time-consciousness. In a *first* model, he considers the apprehension content of the primal presentation as a real, immanent content of consciousness. In contrast to the model from the years 1904–05, retention would *re*-present this content in a way analogous to the re-presenting function of an image consciousness. Husserl, however, is confronted with the problem that a smooth transition between a presenting apprehension and a re-presenting apprehension is difficult to conceive of. A second problem is the infinite regress of levels of consciousness that is unavoidably produced by this model. The fundamental consciousness, that constitutes temporal units, is itself of a temporal nature, such that another, even more fundamental consciousness, is necessary in order to produce a temporal unification of the first mentioned absolute consciousness<sup>3</sup>. Husserl is thus confronted with the problem of how to account for the necessary unity of the successive phases of perception. This problem repeats itself infinitely, and in order to remedy the above problems, Husserl develops two other models.

In a *second* model, Husserl claims that in the primal flux, nothing in particular has to happen in order for the active constitution of objective time to be enabled. Husserl puts forward the possibility that as long as attention is not directed to the experiences of inner time-consciousness, there is no constitution of temporal units. Without a grasping (*Erfassung*), there is no more than a flux of data, in which no intentional constitution takes place. The problem of this second model is that there is insufficient grip available for an attentional act (and thus for a constitution of temporal units) in such a flow of data. Therefore, prior to the active constitution, a non-active, intentional process of constitution has to be presupposed.

In order to account for this prior constitution, Husserl explores a *third* model, in which the problem of the infinite regress can be solved and the idea of a constitution prior to the active constitution by the *ego* is elaborated. In this model, auto-constitution comes to play a crucial role in avoiding the infinite regress. First, (auto-)constitution means that the absolute time-consciousness effectuates the intentional constitution of the unity of a perception. Second, it means that in absolute time-consciousness the constitution of the temporarily extended unity of this consciousness *itself* also happens (*auto*-constitution). There is, in other words, a double intentionality and a double fulfillment: not only an intentionality constituting immanent time objects (*Querintentionalität* or vertical intentionality), but also an intentionality by means of which the stream of consciousness itself is constituted as an immanent time object (*Längsintentionalität* or horizontal intentionality).

In this model, protention becomes a worthy component of the process. A protention is fulfilled by a primal presenting consciousness. Husserl distinguishes a particular fulfillment and a general fulfillment in the stream of consciousness. The particular fulfillment of a protention refers to an 'ordinary' protention, which is directed to future aspects of the *object* of consciousness. The general fulfillment, in contrast, refers to the *mode of givenness* of an object, not to the object itself, and enables the auto-constitution of time-consciousness. A most concise explanation is the following:

Every phase of consciousness as a whole is characterized by a protentional and a retentive direction towards future and past phases of consciousness. Because of this, every phase of consciousness functions as the fulfillment of the protentional direction of a former phase of consciousness. And what is more, every present phase of consciousness is conscious of itself as being now present. This consciousness is based on the fact that every phase of consciousness as a whole is conscious of its functioning as the fulfillment of the protentional direction of a former phase of consciousness. This intentional interweaving of successive phases of absolute consciousness makes it possible to speak of a self-constitution of the temporal unity of absolute consciousness. (Kortooms, 1999, p. 274.)

In this model, the infinite regress of piling up levels of consciousness is avoided, because – thanks to the process of auto-constitution – the absolute consciousness is also directed to itself.

Also in this model, fulfillment presupposes a *Streben* (aiming), which is a matter of intentionality, albeit a *passive form of intentionality*, i.e. preceding the active intentionality of the ego. Such a passive form of intentionality, which figures in absolute time-consciousness, accomplishes a *non-objectifying* constitution of an immanent time object. On higher levels of consciousness, such a pre-objective, immanent time object is taken up by the egoic intentionality and constituted into a full-fledged objective object.

In a third and final stage of his development (in the C-manuscripts, for the bigger part unpublished, from the late 1920s to the early 1930s), Husserl manoeuvres between the second and the third model of the Bernauer manuscripts. On the one hand, the presupposition that something happens in the stream of consciousness in order for an objectifying constitution of time to happen remains necessary. On the other hand, Husserl no longer wants to consider this as an *intentional*, though *passive*, process of constitution. He therefore designs what Kortooms (1999) calls an affection-and-action model of consciousness. In this, Husserl proceeds in uncovering the role of the *ego* in time-consciousness. So far, the presented models left out the domain of the ego. Now, Husserl takes into account the appeal to the ego to focus on something (*affection*) and the *reply* of the ego to this in *action*. The temporal processes which apply to affection and action are to be distinguished from

the processes in which a sensational content becomes an object of immanent time-consciousness. Husserl develops in this model the idea of a preliminary consciousness of a preliminary being in a preliminary time (cf. supra the pre-object of passive intentionality). This consciousness can waken the ego to focus on such a pre-object of preliminary consciousness, and to act accordingly.

Moreover, Husserl elaborates the issue of *association* here. The fusion of the successive phases of perception brings about the unitary formation of these phases. Based on this associative fusion, a continuous, temporarily extended unity emerges, which forms the perception of time and is accessible as such. The ego, however, is *not* involved in this aiming. That is the reason why Husserl speaks of a *passive* process. The question now is, whether this preliminary consciousness can be considered as an *intentional* consciousness. In other words, the question is whether there is a passive intentionality conceivable, operating prior to the active intentionality that emanates from the ego.

Husserl answers that the hyletic units are constituted in immanent time when the ego is directed to a thing on which it is called upon to direct itself by an affection. In fact, Husserl leaves out the notion of passive intentionality. At the same time, he drops the vertical, foundational model of the structure of consciousness, and turns to a *horizontal model* more akin to the affection-and-action model. Kortooms summarizes first the vertical and then the horizontal model.

The distinguished levels of consciousness are piled up, so to speak. The upper level is founded on the lower level because the lower level constitutes the temporal unity of the upper level. (...) In this model [the horizontal one], a preliminary consciousness of a preliminary being in a preliminary time occurs at first. Because of this consciousness, the ego can be affected, and finally the ego, called upon by this affection, can focus on the thing that affects. This active consciousness constitutes a being that was already the 'object' of the preliminary consciousness, although it then had the shape of a preliminary being. (Kortooms, 1999, p. 277.)

Of course, that something precedes the active temporal constitution by the ego remains valid. That 'something' is brought about by means of the *urassoziative Verschmelzung* (primal associative fusion). It is a *non-intentional* unification of the preliminary being in a preliminary time in preliminary consciousness. When reflection is directed to this primal stream of preliminary objects, this consciousness becomes an intentional consciousness, such that the preliminary consciousness can never become thematized in its ordinary guise. Therefore, preliminary objects cannot be spoken about and cannot be experienced. Passivity is radical here, and excludes intentionality.

Husserl thus rejects the notion of auto-constitution that was used in order to solve the problem of the infinite regress.

#### 5. IN-DEPTH BODY AND INNER TIME-CONSCIOUSNESS: GUIDING QUESTIONS

In the following sections, a problematic domain parallel to the domain of the in-depth, absolute dimension of time-consciousness is explored: the in-depth dimension of the body. Although Husserl occasionally refers to such dimensions in mostly unpublished work, the aim is to give at least the outlines of a more comprehensive and systematic account. Husserl's account of inner time-consciousness will be helpful here, because it provides us with a number of structural models, which can, abstractly considered, be used to model bodily in-depth dimensions. Of course, this will be no matter of straightforward transposition. In the first place, the models offer us a frame of reference in which a number of *epistemological* questions concerning the in-depth dimensions of the body can be meaningfully formulated. The models of inner time-consciousness provide an epistemological clarification of the basis on which objectivity is eventually constituted. The level of inner time-consciousness is characterized as a pre-egoic dimension that prepares the basis upon which egoic, truly intentional acts of consciousness occur. In general, the inner time-consciousness analyses concern the constitution of objectivity. The core material with which inner time-consciousness operates generally originates from external sources and the eventual result is an external perception. Internal perception of perceptual acts will not be discussed here, because this would take us too far afield. Very often, Husserl roughly elaborates the same pattern of constitution for object and acts (as objects), although there are differences in adequacy and other epistemological issues that ask for further discussion<sup>4</sup>.

At a certain stage, the ego with its intentional activity enters the fore and engages the material of inner time-consciousness in a further, explicitly intentional process. Yet, one may wonder where this ego suddenly comes from, i.e. what the origin of the ego is and what the origin of the intentional acts is. Intimately connected to this question, is the question from what level on it is adequate to talk of 'intentional' acts. Of course, this reminds us of the very same question in the analysis of time-consciousness: is it appropriate to talk of *intentional* acts at the deepest levels of consciousness?

In the same vein, a second question is what the processes look like that precede the ego. In the inner time-consciousness analyses, this question was posed on the side of the (pre-) *objective* material, i.e. the pre-objects and the

object-acts (the acts as constituted). Now, such a question has to be posed on the side of the *ego* and the constitution of the ego itself. Questions parallel to those encountered in the domain of inner time-consciousness will rise. Is the constitution of the ego a matter of auto-constitution? What is the material the syntheses that constitute the ego work with? And again, are these syntheses of an intentional kind or not? Is it a matter of passive intentionality or association?

The material from which the ego emerges is not the same material from which eventually objectivity emerges. Its sources lie elsewhere: not in the outside world of the external senses (exteroception), but in the internal world of the body (interoception). That is the reason why, in order to trace the origin of the ego, we need a reduction to the in-depth body. It is no longer exteroception, but interoception that comes to the fore as the origin of the material that is to be processed<sup>5</sup>. To make a start, we first examine what the interoceptive material involves and how it is processed. This may give us the basis upon which we can start answering the above questions. Recent neuroscience is the domain par excellence where interoception, the in-depth body and related topics are investigated.

## 6. INTEROCEPTION AND ITS BROADER CONTEXT

We are all familiar with the classification of the senses into five categories: vision, hearing, touch, smell and taste. Sometimes, a sixth sense is added: proprioception. The view, however, that those five or six senses enable us to interact with the outside world is incomplete. Not only are those senses not solely about the external world, but also about the body. This is most clear in proprioception, which monitors the movement and positions of the body in relation to external space. However, there also exist so-called ‘visceral senses’, which provide visceral sensory information about the in-depth body. C. Sherrington (1857–1952) has given an interesting classification of the senses into teloreceptive (vision and hearing), exteroceptive (touch), chemoreceptive (smell and taste), proprioceptive (limb position) and interoceptive (visceral) modalities. He considered pain and sense of temperature as aspects of touch.

Although the term ‘visceral sensation’ will be often used here, interoception has turned out not to be just about the viscera, but about the physiological condition of the *entire* body, i.e. the physiological condition of *all* tissues of the body. It is for this reason that A.D. Craig (2002) terms interoception as the sense of the physiological condition of the body.

Recent neuroscientific research points to the fact that it is impossible to leave out the in-depth structures of the body and the way in which this in-depth body is mapped in the central nervous system from an investigation into the way in which a conscious and embodied subject is situated in a world. More in particular, the coming about of an object-like external world on the basis of the sensorimotor and proprioceptive system is embedded into a larger *somatosensory* system.

Generally, proprioception is considered as a function of the nervous system related to the *somatic* aspect of the body rather than to the in-depth, visceral, aspect of the body. Yet, there are good reasons to consider both the somatic and the visceral as aspects of *one* body.

To the extent, however, that both visceral and somatic aspects make up one body connected to one nervous system, and to the extent that concepts such as Damasio's 'somatic marker' hypothesis of emotion may eventually be confirmed, an approach to sensory-perceptual and motivational-emotive functions that encompasses the whole body seems worth consideration and exploration. (O. G. Cameron, 2002, p. 212.)

In other words, if there exists a map of the *whole* body, which includes visceral, somatic sensory and motor aspects, it may be adequate to consider those processes as intimately linked.

Would it not be more appropriate to define (as has been done by others) a bodily sense, including interoception, proprioception, labyrinthine function (i.e., the experience of the body in space), and other afferent information from the body? In other words, might it not make more sense to think of all the body outside the nervous system but under the skin as a source of sensory input, just as the external world provides input through the so-called five senses? (Cameron, 2002, pp. 274–275.)

Moreover, and particularly interesting for the issue at hand, it was found *that the genesis of the subjective perspective or the core of the subject consists in the intrinsic connection between object and changes in the in-depth body* (cf. A. Damasio, 1999). Because of this, the constitution of an object-like external world, the coming about of the subject and the in-depth structures of the body are together involved in one single study.

In the *broader* definition of interoception<sup>6</sup>, proprioception is included. Later on, investigators became aware that there is a distinction between a *somatic sense*, referable to muscles and the body generally, in contrast to a specific sense of the visceral organs and their functions. Left out of the *narrower* definition, therefore, is the somatic sense, more specifically, sensory information from muscles, joints, and connective tissue and skin, including proprioception.

In the early history of studies in interoception, i.e. in the early 20th century, J.N. Langley identified and studied the autonomic nervous system. He described it as a *motor* system, a system purely of information *outflow* from the brain to the visceral organs. This characterization of the autonomic nervous system has helped concealing the *sensory* aspect of the autonomic nervous system. Although Langley apparently was well aware of the fact that the autonomic nervous system could not be an efferent system without information about the periphery coming *back* to the central nervous system, the sensory aspect was left out of the picture until recently. Langley introduced the term ‘autonomic’ for the nervous system functions he was studying. He recognized that there were two separate branches of the motor aspect of the autonomic nervous system, with different and often opposite effects: the sympathetic and the parasympathetic autonomic nervous system<sup>7</sup>. Although he also recognized the existence of sensory, afferent nerves, he was unable to study them, and it was not before the 1920s and 1930s that the existence of afferent fibres in the autonomic nerves was verified.

Of course, the fact that interoception, in contrast to exteroception, often does not produce obvious subjective experience, has been a problem in understanding interoception. However,

(...) the apparent (at least relative) silence of visceral sensations in one’s consciousness does not imply silence in affecting thought processes and behavior. The conclusion that visceral sensory receptors participate not only in physiological reflexes involving the central nervous system, but also in higher nervous functions, including conditioning and behavioral control, is strongly supported.” (Cameron, 2002, p. 82.)

Historically, (Skinnerian and operant) conditioning has played an important role in establishing the recognition of this latter aspect, because those studies show a number of important insights concerning interoception.

First, if visceral processes can be conditioned, that would imply that visceral sensory information reaches high enough in the brain to participate in processes involved in learning. (...) For orderly, predictable functional changes in visceral-autonomic systems to be learnable, the centers in which learning occurs must be able to monitor what events are actually occurring in these organs and systems. In other words, visceral sensory information must be reaching these centers, that is, must be feeding back the changes in these visceral organs and systems to the anatomical areas in the brain in which learning is occurring. (...) This need not reach consciousness, but by the broader definition, it clearly qualifies as interoception. (Cameron, 2002, p. 29.)<sup>8</sup>

The ability to demonstrate Pavlovian conditioning in which the conditioned stimulus involves stimulation of a visceral sensory receptor is not necessary but is sufficient to demonstrate the existence of interoception, in the sense of the ability of visceral afferent information to either reach awareness or affect behavior.

7. INTEROCEPTION AND THE REPRESENTATION  
OF THE IN-DEPTH BODY IN THE BRAIN

Let us recapitulate. The central nervous system is constantly and precisely monitoring body function, and interoception refers to the processes by which the brain knows about the status of the body. Neuroanatomically, a distinction is made between the skeletal nervous system, controlling the skeletal muscles and mediating voluntary actions, and the autonomic nervous system, mediating involuntary functions. The sensory aspect of this contains visceral sensory receptors, that are divided into two groups: pain receptors (nociceptors) and physiological receptors, which monitor the function of visceral organs and also mediate visceral reflexes. In addition, there are other specialized visceral receptors such as chemoreceptors, osmoreceptors, and thermoreceptors. These three receptor types are situated in the hypothalamus and elsewhere in the body.

The afferent fibres relate homeostatic information from all tissues. Not only pain and temperature, but changes in a wide variety of physiological conditions such as mechanical stress, local metabolism, cell rupture, cutaneous parasite penetration, mast cell activation, and immune and hormonal activity (cf. Craig, 2002, p. 657). Therefore, the often used and covering term 'nociceptor' is a simplification, although it has had an enormous heuristic value.

Visceral sympathetic receptors provide input into the *sensory* cortex, and there also is *visceral-somatic* sensory convergence at the cortical level. Several regions of the cerebral cortex are involved in interoception. This involvement of regions such as the orbitofrontal cortex, the anterior cingulate gyrus (which is often considered as cortical), probably the somatosensory SII region and parts of the temporal pole, is at least *indirect*, due to their involvement in *emotions*. Yet, most *directly* involved in visceral sensation is the Island of Reil or the insular cortex. Moreover, the insula would be activated by visceral sensation in a *somatotopically* organized way. More in particular, the insula is organized in the anterior-posterior direction, with gastrointestinal and gustatory function in the anterior region, and cardiovascular and respiratory function in the posterior region. Some indicate an intermediate chemoreceptive region, and there is also evidence for a nociceptive function.

In fact, it is more precise to say that the anterior insular cortex contains a re-representation of the interoceptive cortical representation of the state of the body.

In particular, these data are consistent with the neurological hypothesis (...) that the right (non-dominant) anterior insula is integral for the generation of the mental image of one's physical

state, which underlies basic emotional states and is required for the motivation to make rational decisions that affect survival and quality of life – the essence of the ‘somatic marker’ hypothesis of consciousness. (...) The interoceptive re-representation that is lateralized in the right anterior insula of humans corresponds with the ability to perceive the self as a physical and separate entity – that is, self-awareness. The functional imaging data strongly support the integral role of the right anterior insula in the feelings we perceive that are the basis of our perceptions of our selves, and therefore of consciousness. (Craig, 2002, p. 663.)

The sensory system for the physiological condition of the body is of course embedded in the larger neural system, and is itself a vertically integrated system, a hierarchical association with homeostatic mechanisms. As already mentioned, the lack of conscious awareness we have of visceral sensory processes is partly responsible for the poor interest in studying those processes. Lack of conscious awareness was considered as a sign for lack of importance. It is not until recently that the fundamental role of a ‘background bodily awareness’ (cf. Damasio, 1994) for topics such as the self and consciousness is recognized.

Some forms of conditioning and learning and some other cognitive functions, especially those related to emotion, connect consciousness as well as unconscious (and subconscious) higher mental functions to interoception. The most direct connections are between interoception and consciousness of self, that is, the body as a main component of the self and interoceptive processes as essential to awareness of the body. (Cameron, 2002, p. 226.)

Therefore, visceral sensation has become a fundamental issue in studying consciousness.

The idea that the feelings we perceive from our bodies are all related and form a foundation for the sense of one’s physical self is not new, and its recent formulation is not solely attributable to Damasio. Sherrington (cf. *supra*) already considered a sense of self, the ‘material me’ based on bodily feelings. Yet, it is recent functional anatomical work that has laid bare the details of the afferent neural system (in primates and humans) that represents all aspects of the ‘physiological condition’ of the body (cf. *supra* Craig), and provides the basis for thinking about it as the foundation for subjective feelings, emotions, and self-awareness.

As such, the body can be considered as the intermediary between the nervous system and the external world. More precisely, it is the body image, largely based on incoming sensory information (next to a genetic, inborn basis) which functions as intermediary. This body image is no longer restricted to the image of the surface body and its basis in sensory information coming from the surface of the body. Rather, the body image turns out to be consisting of various sensory input layers, ranging from surface to in-depth body and from explicitly conscious information to information closed off from conscious

awareness. However, even in its latter guise, the body remains the ground reference for higher mental functions and behaviour.

#### 8. THE BIGGER PICTURE: ON THE WAY TO THE SELF

The somatosensory systems in the brain are responsible for the *external* sense of touch, temperature and pain, and the *internal* senses of joint position, visceral state, pain etc. In the right hemisphere of the brain, two kinds of representation come together in an integrated way, such that a coordinated, dynamic map of the body emerges. First, there is the representation of the musculoskeletal apparatus, second, a representation of so-called visceral states. In fact, three subsystems can be distinguished. *First*, the section of the internal milieu and the viscera; *second*, the section of the vestibular system (which maps the coordinates of the body in space) and the musculoskeletal system (proprioception); and *third*, the section of the fine touch (which receives signals from the changes in specialized sensors of the skin). The latter section describes *external* objects, based on signals generated on the surface of the body. The second section is situated somewhere in between, and can reflect both internal states and help to describe the outside world.

The idea that the representation of the body is the ground reference for the coming about of a self is extensively elaborated by Damasio (1999; 2003). Damasio focuses on emotions, feelings and subjectivity, and he strictly distinguishes emotions from feelings. He reserves ‘emotion’ to designate a certain collection of responses in the brain and in the body. The term ‘feeling’ is reserved for the private, mental experience of an emotion. An emotion is a set of changes in the bodily state, which is related to certain mental representations that have activated a specific brain system. The *feeling* of an emotion is essentially the *representation* of such changes, which is *juxtaposed* to the representation that has set the cycle into motion. “In other words, a feeling depends on the *juxtaposition* of an *image of the body proper* to an *image of something else*, such as the visual image of a face or the auditory image of a melody.” (Damasio, 1994, p. 145, italics supplied.) Feelings arise from emotions, and are based on the representation of the body while the latter reacts emotionally to certain contents.

However, for a *conscious* feeling, we need something more. In order to say something about this ‘something more’, we need to know what *background-feelings* are. As we already know, the brain receives continually information about all changes in the body: interoceptively and proprioceptively. Proprioceptive information arrives in topographically organized maps. What happens with the interoceptive information is explained higher in the text. These maps

are not static, but continuously changing. Moreover, they are never localized in a single map or in a single centre. In short, these maps are *on-line representations* of what happens in the body, and they constitute background-feelings.

Damasio uses the concept of background-feelings in order to explain the emergence of *subjectivity*, for the conscious awareness of a feeling requires a connection of the feeling with a 'self'. Background-feelings arise from background body states (cf. Craig's sense of the physiological condition of the body) and can be considered as the feeling of life itself, the awareness of being. According to Damasio, without background-feelings, the core of the representation of the self would be broken (Damasio, 1994, p. 151).

Let us therefore have a closer look at background-feelings. The representations of the current bodily state arise in multiple somatosensory cortical regions in the parietal regions and the area of the insula, and also in the limbic system, the hypothalamus and the brain stem. Thus, spread over a large number of structures in cortical and subcortical areas, a composed and continually changing representation of the bodily state arises. Next to these on-line representations, proprioception and interoception (viscera) may provide also somewhat more *stable* representations of the overall structure of the body. For background-feelings, the component of the viscera is probably more important than that of the musculoskeletal system. The core of the neural representation of the self is made up from representations of background state and emotional state. It is the whole of bodily representations that is the basis for our idea of a continually reconstructed self.

In order to arrive at a subjective *perspective*, a third-party neuron ensemble is needed that receives signals from both the representation of the *object* and the representation of the *self*. This ensemble makes a representation of the self that changes while the organism reacts to (the representation of) an object. Therefore, the basic self is a second-order representation, based on two first-order representations: the representation of the object we perceive and the representation of the body changed by the perception of the object.

Let us recapitulate. According to Damasio, the deep roots for the self are found in the whole of brain devices which keep in a continuous and non-conscious way the body state within the small range and the relative stability required for survival. Those devices constantly represent in a non-conscious way the state of the living body, along all its dimensions. This is what Damasio (1999) calls the *proto-self*, or the non-conscious forerunner of all levels of self which are conscious: core-self and autobiographical self (cf. Damasio, 1999, for an extended treatment of those selves). For the proto-self, the representations of the viscera and the internal milieu are most important. In order to feel a *feeling*, the pattern of neural activity in the areas that induce

emotions has to become an *object* that is represented and put in relation to the self in a second-order representation.

#### 9. THE ROOTS OF THE SELF: EPISTEMOLOGICAL CONCERNS

In this section, we turn back to our initial questions. These questions are rather of an epistemological kind and are inspired by the Husserlian account of inner time-consciousness. It will become apparent, in the next section, that the account of the constitution of the subjective perspective as given by Damasio exhibits a particular lacuna. Let us first turn back to our initial questions. At what point does an intentional subject arise and how must the pre-egoic processes that eventually give rise to the self be assessed? These are questions similar to those Husserl tried to solve concerning the constitution of the *object* and the constitution of the stream of consciousness itself.

It seems that the background-feelings that are massively rooted in interoception provide us with the necessary condition of possibility for a conscious, intentional subject, and probably also for the origin of the (human) subject in the most basic way. The body schema, based on proprioceptive information and information from other sources, is the condition of possibility for intentional motor behaviour. The representation of the body in regard to its deeper dimensions turns out to be essential for the constitution of a subjective perspective.

Let us question this from a Husserlian perspective. From such a perspective, it is clear that something can only be experienced if it is *constituted into an object* up to a certain degree. This is certainly valid for the objects of perception, but also for the acts themselves. Here, and from an epistemological point of view on the emergence of the subject from the in-depth body, it is important to trace the epistemological status of the bodily material from which the *ego* arises. In other words, it must be asked what role the in-depth body fulfills: a constitutive or a constituted one. On the one hand, the surface body generally is considered as a body *constitutive* for external objects (cf. touch), but exhibits a kind of *reversibility* concerning the roles of constituted/constitutive (cf. the famous example of one hand touching the other). On the other hand, the body appears as *constituted* in the body image (cf. *supra* the distinction between body image and body schema). Another example is the eye as seeing: eyes are a null-point of visual perception and cannot be perceived *immediately*; they resist perceptual objectification at the time of seeing. This means that the eye *as constitutive* cannot be constituted. It can be constituted, however, indirectly, in the mirror or in intersubjectivity, i.e. when it is no longer constitutive.

What does this relation between constitutive and constituted, and the reversibility between both, look like in the case of the in-depth body? In relation to the in-depth body, and according to Leder,

There are nullpoints of the *visceral* field as well: for example, one seems to have no interoceptive awareness of the parenchyma of one's liver. Yet here the operative principle is of a different sort. The liver experientially disappears precisely because it is *not* the origin of any sensory field. It does not disappear in the act of perceiving, as does the eye, but by virtue of its withdrawal from the perceptual circuit. (Leder, 1990b, p. 207.)

The eye disappears because it is constitutive of a perceptual field. The in-depth body disappears because it is not part of a perceptual circuit or is not the origin of a sensory field. From a phenomenological-descriptive point of view, such an assessment is very plausible.

From an epistemological point of view, however, the reason for disappearance or the reason for the impossibility of constitution may be well different. The in-depth body *as constituted* may be absent for a different reason. At the level of the in-depth body, *the epistemological reversibility between constitutive and constituted roles seems to be largely absent*. In contrast to Leder's account, the in-depth body is the constitutive origin of a field – not of a perceptual field, but of the field of the ego or the subjective perspective. The visceral dimension is considered precisely as a *constitutive* field that indeed largely withdraws from the perceptual circuit, only because the reversibility into something constituted is impossible here.

As the aim of this paper is not to focus on the ego itself, but on that from which the ego emerges, the task at hand is to ask how the visceral dimension is to be further characterized from an epistemological point of view. In this, Husserl's account of inner time-consciousness serves as an abstract model in order to conceptualize the visceral dimension.

Let us first return to the models of inner time-consciousness, and try to formulate questions epistemologically relevant for the in-depth dimension of the body. Whereas the models of inner time-consciousness aim at an elucidation of the origin of the temporal way objects appear to us, a model of the in-depth dimension of the body should clarify the origin of the ego. Therefore, a reduction to the proto-self seems apt here, in the same way as the transcendent, full-blown object is reduced in the inner time-consciousness models. Of course, an important question is in what way the processes operating on the level of the in-depth body and eventually leading to the ego must be assessed. As those processes are prior to the ego, it seems contradictory to consider those processes as active and intentional, i.e. as originating from an intentionally directed active ego (egoic intentionality). A possible solution similar to the second model of the Bernauer manuscripts is to say that

as long as attention is not directed to the experiences of the in-depth body, there is no constitution whatsoever happening. A problem similar to the one Husserl encountered emerges here: there may be insufficient grip available in such a flow of data. Therefore, a non-active, intentional process of constitution might be considered. Such a passive form of intentionality would accomplish a preliminary constitution. A third model would eliminate the intentionality completely and turn to an associative fusion in a rather horizontal model.

In contrast to the inner time-consciousness model, however, an additional problem arises here: how must the material which the intentional or associative process elaborates be characterized? Although it may well be possible that the in-depth body 'consciousness', in analogy with the inner time-consciousness, operates as a process of continua made up of continua, it seems a lot less plausible to characterize that material of the in-depth body as a field of pre-objects which are pre-temporal and pre-conscious. In other words, the question is whether each process of constitution, be it intentional or associative, leads to the constitution of objects. For Husserl, '*consciousness of ...*' (intentionality) and objects seem to presuppose each other. The question is, however, whether such a model is also applicable to the constitution of subjectivity. *Is the ego, epistemologically seen, an object?* Or rather, has the proto-self the status of a proto-object, parallel to the constituted results of inner time-consciousness?

#### CONCLUSION: THE IMPOSSIBLE CONSTITUTION OF THE SUBJECT?

We have seen that the core of the neural representation of the self is made up from representations of background states. Such a set of representations of the body – mainly the visceral body – holds a position epistemologically considered parallel to the (pre-temporal and pre-conscious) pre-object in inner time-consciousness. These pre-objects grow into full-blown objects once the ego is intentionally directed to them. Such an ego seems to be logically and structurally absent in relation to the material present in the representations of the visceral body. The reason is, of course, that the ego, or the subjective perspective, precisely emerges *from* the material present in representations of the visceral body.

According to Damasio, the representations of the visceral body are re-represented at a higher level in order to form the subjective perspective. If this account is correct, however, the question arises why the re-representation of the pre-object leads over into an object, whereas the re-representation of the proto-self leads over in a subjective perspective directed upon an object

(cf. *supra*). There must be a reason *why* the third-party neuron ensemble that receives signals from both the representation of the object (the pre-object in Husserlian terms) and the representation of the self (the proto-self or the representation of the body changed by the perception of the object) does not lead to two *objects* related to each other: a body-object and an object-object. In other words, the way the body is re-represented and the way the object is re-represented must differ in important respects.

Let us look again at what an emotion is. An emotion is the representation of certain changes in the body (and in the brain) during a rather short period of time. Background-feelings are on-line representations of what happens in the body and are continuous. Nevertheless, the two kinds of representations differ profoundly, because emotions become conscious emotions (feelings) if they are taken up into a subjective perspective, whereas background-feelings seem to be responsible for the emergence of the subjective perspective *itself*. It is due to the re-representation (or the second-order representation) of the changes in the body in the subjective perspective (in Husserlian terms: it is due to the constitution of the body by egoic intentional activity), that an emotion becomes a conscious feeling. In other words, the emotionally reacting body is to a certain extent treated *as an object*: the Husserlian way of reasoning in which something has to be constituted into an object in order to become conscious, is valid here. Yet, the question pertaining to what happens to background-feelings remains unanswered. Why is the second-order representation of the visceral body different from the representation of the emotional changes in the body? Why is it that background-feelings give rise to the emergence of a subjective perspective, whereas emotions give rise to a pseudo-objectified body (in a feeling)? Related to this question and the reason for calling the body 'pseudo-objectified' in a feeling, is why a feeling is not experienced as objectively as another constituted object. The three kinds of constitution or representation seem to be ranged on an ascending line from subjectivity to objectivity: from the coming about of the subjective perspective, over feelings, to objects. Yet, Damasio does not give an account of the reason why the subjective perspective, feelings, and emotions enjoy such a differing epistemological status. From a Husserlian perspective, a frame can be sketched in which this issue might find a solution.

If an intentional ego is initially absent in the process in which the information of the in-depth body is treated, then a possible way-out may be searched for in a process of *auto-constitution*. Although the reason for invoking auto-constitution is different from Husserl's, who encountered the problem of infinite regress, auto-constitution can help solving the problem of the absence of the ego. It is impossible to assume that nothing at all happens

at the level of the in-depth body, until an intentional subject comes to the fore. Not only because there is insufficient grip for further constitution, but also because there is no instance who can direct itself to such a stream. A model of auto-constitution for the in-depth body seems to be the only model that can take into account the coming about of the subject, because it is the only model that can account for constitution without invoking an already existing subject. The peculiarity of the auto-constitution-model is precisely that in the auto-constitutive process, the process is directed to itself, and the constitutive and the constituted collapse. On the side of the constitution of objectivity, radical passivity on the deepest level of consciousness remains a valid alternative for a passive form of intentionality. On the side of the emergence of subjectivity, such an alternative is less plausible, because the emergence of an active ego out of an associative process is less conceivable than the emergence of an active ego out of a process of auto-constitution, i.e. passive intentionality. If Husserl had had more attention for the coming about of the ego in the context of inner time-consciousness, he might have considered the issue of auto-constitution as an adequate account for the coming about of the subject.

By now, a tentative answer may be formulated as to the question why the re-representation of the pre-object leads over into an object, whereas the re-representation of the proto-self leads over into a subjective perspective directed upon the object, and not to two *objects* related to each other. The answer is situated in the special connection between the constitutive process and what is constituted. In order for an object to be fully constituted, an intentional ego has to come to the fore to complete the process. In this case, however, the ego does not originate from the material to which it is intentionally directed. The ego comes from elsewhere, and has its material origin in a dimension different from where the pre-objects (whether constituted on the basis of a kind of passive intentionality or built on the basis of associative processes) come from. The ego is a pole different from its object. There remains an epistemological spacing between ego and object. This distance can also be traced on the level below, even in the model where the stream of consciousness constitutes itself. In inner-time consciousness, auto-constitution pertains to the *formal* aspect of the stream (the mode of givenness of an object or act), not to its material content per se. The stream is auto-constitutive in relation to its temporal form in the first place. In other words, the auto-constitution does *not* pertain to the material, which is always constituted, and never constitutive.

This relation between what is constituted and what is constitutive alters once the coming about of the subject is accounted for. First, it is impossible that the ego comes to the fore from elsewhere. In contrast, the ego emerges *from*

the pre-material, in this case the proto-self. The term 'auto-constitution' can be adequately used here for both the formal and the material aspects. Now, it is possible to say that the auto-constitution does not only pertain to the formal aspects of the sensational stream, but *essentially* pertains to the *material* aspects of the stream, for the self is a re-representation of what is going on in the body. In other words, and in contrast to what happens at the object-side, in the auto-constitutive process, no untying is possible between what constitutes (the process and its formal characteristics) and what is constituted (a content with its material and intrinsic characteristics). It is here that the reason can be found for why the subject is not constituted in the same way as an object. First, at its deepest level, that which is constituted, the ego, can never be untied from that which is constitutive (the background-feelings); we have here a remaining peculiar and singular epistemological interweaving between both. Indeed, according to Damasio, background-feelings (interoception) and core consciousness are so closely linked that it is difficult to distinguish between them. Second, it is because of this intrinsic connection between the constitutive (the interoceptive material) and the constituted (the re-representation of the interoceptive material), that the ego can never – for itself – become an object. This means that the ego can never take a distance from its own material, because the material is not only constituted, but constitutive at the same time. It is only when or once a subject is established, that it can – in turn – constitute an aspect of itself as a pseudo-object (cf. emotions). This means that there is at least some distance between what constitutes and what is constituted, or between the ego and its body. Emotion, background-feelings and body are yet too closely tied for a complete object-constitution in a feeling to be possible. The ego, thus, can never become something completely constituted, because its material is built-in in its constitutive perspective. Although reflection is possible, the ego always takes along – or *is* – the intrinsic interweaving of constitutive and constituted. On the one hand, the ego can never develop into something purely constituted, but always drags along its constitutive character. Vice versa, it can never detach itself from itself, because the material from which it emerges precisely constitutes the subjective perspective. On the other hand, its origin is not just formal, but mainly material (cf. the visceral dimension), such that a perspective upon its content remains possible, in a feeling, or in a more abstract reflection upon itself.

Those aspects of the body situated at the border between inside and outside, such as proprioception and touch, do have the possibility to switch from the role of constituted to the role of constitutive (cf. *supra*). This possibility, however, seems to terminate in the case of interoception. There, the schema constituted-constitutive collapses or folds onto itself in the process

of auto-constitution. Husserl has hesitated to accept his model of auto-constitution for the constitution of the stream of consciousness itself. There, Husserl is already working at the verges of subjectivity or the subjective perspective. It is when the emergence of the subject is studied as a central theme, that the model of auto-constitution, but this time differently used, can elucidate a number of epistemological issues concerning the bodily origins of the subject.

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#### NOTES

<sup>1</sup> For the consequences of a body image in which the visceral dimension is taken into account, cf. De Preester, 2005a (in press).

<sup>2</sup> 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. But here, a distinction between proprioceptive *information* and proprioceptive *awareness* must be made. Proprioceptive information informs the body schema, but can serve also as the physiological basis for body-awareness (or the perceptual sensation of one's own movements). The latter is proprioceptive awareness: a conscious perception of movement and position, and it is this felt experience of bodily position that contributes to the constitution of the perceptual aspect of the *body image* and to *body awareness* (cf. Gallagher and Meltzoff, 1996, p. 223).

<sup>3</sup> The infinite regress is of course produced because Husserl is convinced of the rule that a succession of phases of consciousness is not in itself a consciousness of a succession, but requires something more in order to be so.

<sup>4</sup> Cf. Dan Zahavi (2004).

<sup>5</sup> In fact, Husserl never extensively deals with the origin of the material, at least not to the extent that the origin is empirical. In this, he follows Brentano's principle that descriptive philosophy is not explanatory, but descriptive. Alternatively formulated, Husserl follows his own principle that the phenomenological field of research is limited to the immanent domain. Nevertheless, the sources or origins of sensory material can be elucidated, not only empirically and explanatorily, but in an *a priori* and epistemological way as well.

<sup>6</sup> Cameron (2002) has written an up-to-date, in-depth review of the topic of interoception (cf. references).

<sup>7</sup> By that time, a third branch of the autonomic system was also recognized: the gastrointestinal tract also has an endogenous, relatively autonomously functioning enteric nervous system.

<sup>8</sup> The answer to the question if any type of conditioning can have an effect upon visceral functioning, is a tentative 'yes'. It is, however, not clear if this happens directly (via Pavlovian conditioning) or indirectly. "In other words, they might be hard-wired to the brain processes and simply be 'along for the ride' when the brain processes are changed by the Pavlovian procedure." (Cameron, 2002, p. 29.)

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