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The Genesis of the Minimal Mind: Elements of a Phenomenological and Functional Account

Abstract

In this article, we endeavour to lay the theoretical fundaments of a phenomenologically based project regarding the origins of conscious experience in the natural world. We assume that a phenomenological analysis (based upon Edmund Husserl's philosophy) of first-person experience could substantially contribute to related empirical research. In this regard, two phenomenological conceptions provided by Husserl are of fundamental importance. The first relates to the essential and necessary *embodiment* of every subjective experience; the second concerns the intrinsically *holistic and concrete character of consciousness*. These considerations have two crucial implications. First, every mental content and capability ultimately refers to a bodily basis as its carrier and realizer ('embodied manifestation thesis'). Second, there is a minimal set of bodily structures that carries and realizes the minimal mind ('minimal context thesis'). Based upon these assumptions, *we can use phenomenology to select from the empirical theories of consciousness*. We argue that currently, Bjorn Merker's *subcortical theory of consciousness* appears to be the best candidate for a phenomenological approach. In phenomenological regard, however, it is highly challenging to test a subcortical theory; therefore, we suggest that certain experiments based upon emergence from general anaesthesia might help test such a theory in a phenomenologically legitimate way.

Keywords: minimal mind, phenomenology of embodiment, phenomenology of animal mind, Edmund Husserl, subcortical theories of consciousness

1. Introduction

We humans are conscious beings, meaning that we have conscious, lived, subjective experiences. We see, smell, and taste things in a conscious way, and we have painful and joyful

experiences. It is most likely that we are not the only conscious living beings on this planet: in the light of the empirical evidence provided by their behaviour and functional apparatus (nervous system), it is very probable that at least some non-human animals are conscious to a certain degree. But which ones? And why? In this article, we endeavour to clarify certain elements of a *phenomenologically* based project whose main aim is to contribute to answering these questions.

The term 'phenomenology' here refers to the philosophical method employed by Edmund Husserl and his followers to analyse our first-person experiences (cf. e.g. Husserl, 1960, 1983; Moran, 2000). The classical authors of the phenomenological movement held the view that properly prepared and carefully conducted *reflections* on conscious, lived experiences and subjective existence as a whole could yield related *necessary* insights and disclose their fundamental features and laws. Two such insights are of particular interest to our enterprise. The first regards the *holistic* nature of our subjective existence. From this perspective, our conscious being should be conceived of as a concrete, coherent *whole* in which every particular subjective event, every segment, layer, and structure, is interrelated with the others. The second insight is that our existence is essentially *embodied*. In other words, every concrete subjective experience, as well as our entire existence, implicate that we are bodily creatures in the world. In this regard, it is also of the utmost importance that in Husserl's opinion, the subjective and objective aspects of body, *Leib* and *Körper*, have a phenomenologically demonstrable a priori necessary connection.

In our enterprise, we will keep in mind first and foremost the Husserlian version of phenomenology, as elaborated in the publications and numerous manuscripts of Edmund Husserl; however, we will frequently refer to other authors of the movement, especially Merleau-Ponty, whose considerations on embodiment are particularly important to us. One central point of this project is that the necessary characteristics and relations of lived experiences disclosed by phenomenological reflection from a *first-person perspective* could orient empirical investigations from a *third-person view* regarding the external features of consciousness. Phenomenology could guide us regarding what to look for in the objective, physical world and where; in this way, it could help contribute to a scientific explanation of the origins of consciousness in the natural world.

One can, of course, always refer to the fallacies inherent in first-person perspective investigations – due to, for example, cognitive biases, unjustified presuppositions, perceptual mistakes, and hallucinations. Phenomenologists are intensely aware of such difficulties, which is why they ascribe tremendous importance to scientific discourse and intersubjective

corrections of individual failures and errors (cf. ANONYMIZED1). The ultimate source of evidence and knowledge in phenomenology, however, is always the first-person perspective – every correction should be finally acknowledged as legitimate and justified from the phenomenologist's own perspective (cf. Husserl 1983, pp. 44–45).

The essential matter of this study is articulated into two main sections: A Phenomenological Study of the Minimal Mind and Its Embodiment (section 2) and The Presumable Functional Architecture of the Minimal Mind (section 3). In section 2, we attempt to clarify the phenomenological foundations of this project, first and foremost relying upon Husserlian considerations. In section 3, we take a closer look at certain empirical theories of consciousness and focus on the question of which features could form the basis for a natural scientific theory that is a promising candidate for a phenomenological approach, providing an adequate and plausible empirical correlate from a third-person perspective.

2. A Phenomenological Study on the Minimal Mind and Its Embodiment

This section, the first main part of the study, will treat the theoretical groundwork of first-person access to the minimal mind from a phenomenological perspective, which for us – as indicated in the introduction – first of all means the viewpoint of Husserlian phenomenology. Here we endeavour to show the most important structures of the minimal mind and various ways in which the results of first-person phenomenological reflections and investigations could be connected to empirical research.

After an initial clarification of the concept of the minimal mind, we will treat the phenomenological notion of subjective existence as a concrete, coherent, unified, and holistic mode of being-in-the-world, which is essentially embodied. The microanalysis of this embodiment will show that its subjective and objective moments are strongly intertwined and that the overall subjective aspect of the body, *Leib*, cannot be separated from its objective aspect, *Körper*. This leads us to a conception that we call the embodied manifestation thesis, according to which all subjective capabilities, content, and events necessarily refer to an objective bodily structure or process that carries and realizes the former.

These considerations enable us to provide a more elaborate phenomenological conception of the minimal mind, that is, a partly hypothetical reconstruction of the subjective mental life and architecture of at least minimally conscious subjects – such as the minds of, eventually, lower-level invertebrate animals and human embryos. The holistic conception of subjective existence, along with the embodied manifestation thesis, result in the idea that to a minimal mind, there corresponds a set of objective bodily structures that makes this mind possible,

activates it, and allows it to function. We will refer to the idea that the minimal mind implies a minimal set of subjective, mental, and correlated objective bodily conditions as the *minimal context thesis*. A systematic phenomenology of the minimal mind would be a methodologically conscious exploration of this minimal context.

These developments enable us to proceed to the thesis of section 3, namely that based upon the principles of the embodied manifestation thesis and minimal context thesis, we could articulate an assumption, which of the currently existing empirical models of consciousness is best supported by such a phenomenologically articulated theory of minimal mind, that we present in this section.

2.1. An Initial Notion of the Minimal Mind: Conceptual Clarifications

Consciousness has many different forms, manifestations, and layers. Self-consciousness, rationality, and linguistically shaped abstract thoughts in human beings represent its highest level. We, however, are seeking the *lowest*, most fundamental form and level of consciousness, which is subjective, conscious, sensuous experience – such as feeling pain, joy, or having a visual experience. Consciousness, above all, means *being conscious of something*, which, in this context, at the deepest level of experience, is sensory, perceptual content or givenness. Moreover, consciousness, especially at the level of sensuous experience and sensory perception, necessarily possesses a particular *phenomenal and qualitative character* (Nagel, 1974; Chalmers, 1995, 1996; Gallagher and Zahavi, 2008, pp. 107–116). Experiences such as seeing the sunrise, smelling a rose, tasting a coffee, or touching the smooth surface of a silk robe each has a unique qualitative feature.

Sensory data can have different grades of *intensity*. A sound can be louder or softer. These data do not stand separately on their own; rather, they relate to one another and comprise the parts of a larger, coherent, organic whole, which also represents the attributes of an *objective space* in the form of a *perceptual field*. Our attention, guided by our temporary or general interests, always articulates the perceptual field, highlights patterns and forms in the latter, and arranges it according to *figure-and-background* and *foreground-and-background* relations. Perception (and, correlatively, the perceptual field) has a focal point and marginal parts, which also implies that in the perceptual field or stream, *not all phenomenal content* is necessarily directly, explicitly, and clearly *accessed* at the same time (Block, 1995). Certain mental content might be stuck below the surface of clear consciousness.

The general sensorimotor and cognitive apparatus of living beings has three fundamental subsystems which, after attaining a certain point of complexity and grade of organization, lead

to phenomenally conscious states and acts. The *exteroceptive* system represents the external environment of the organism. *Interoception* represents the states and changes of the body. The *affective-evaluative* system furnishes bodily and sensory-perceptual states and events with a certain valence: it defines whether an event or a state of affairs is actually or presumably good or bad for the subject; it bestows a peculiarly positive or negative affective character (most generally, pain or joy, punishment or reward) to bodily or sensory-perceptual reports of certain states and events (e.g. Feinberg and Mallatt, 2016; Ginsburg and Jablonka, 2019). Finally, we should also add that a concrete perceptual experience – from a phenomenological point of view – necessarily has a *temporal* character. In other words, a perception cannot be concrete unless we *retain its recently passed phases* (this retained or fresh memory is called 'retention' by Husserl) and *anticipate what might come* (a short-run or immediate anticipation; in Husserl's terminology, 'protention') (Husserl, 1991, 2001).

In contrast to *consciousness*, which mostly refers to individual conscious acts and content, *mind* is a term for the *entire mental sphere*; it embraces all mental acts and content, including those that are conscious, subconscious, and unconscious. In our view, to the 'minimal mind' pertains the essential capacity of *having phenomenally conscious, subjective experiences*. We believe that we cannot consider a living being conscious in the strict sense (i.e. we cannot legitimately attribute a mental sphere to it in the narrow sense) if it lacks the capability of clear, explicit, phenomenal consciousness. In the following subsection, we take a closer look at the general features of the organization of the minimal mind through the lenses of phenomenological reflection.

2.2. The Totality of Subjective Existence as a Concrete Way of Being-in-the-World

The classical authors of phenomenological philosophy and philosophical anthropology have all agreed that subjectivity and existence in the case of humans, as well as animals, should be conceived of as a coherent, unified, and organic system of structures within which every moment and capability has a definite place and is interrelated with the others. For Husserl, it was the operation of phenomenological reflection in particular whose main aim was to unfold the general features and microstructure of the organic system of subjective, conscious life (cf. e.g. Husserl, 1983, p. 174). Husserl believed that proper and meticulous application of the phenomenological method could reveal to us the a priori relations of different phenomena, namely, those of consciousness and the relationship of consciousness to body and world (Husserl, 1960, 1983). Husserl further claimed that – especially from an empirical regard and

in an objectifying manner – we should conceive of the entire mental sphere *as soul* (Husserl, 1989a).

In Husserl's opinion, the soul does not stand on its own, separated from the body and our concrete, practical relation to the world, but just the opposite. In his eyes, the entire soul is present in every bodily movement and gesture, in every segment of our worldly praxis (cf. Husserl, 1973a, pp. 69–70). For him, the different mental capabilities have the function of helping us to get along in the world; they connect the subject – the ego – to the world. The three fundamental modes of sensuous, perceptual consciousness mentioned in the previous section – exteroception, interoception, and affective-evaluative consciousness – have exactly this purpose of enabling us to live our lives; for animals, this means basically to survive and reproduce, and for humans, to achieve higher, culturally shaped goals as well. In Husserl's interpretation, the soul is a complex and coherent organization of mental capabilities which represents the internal, subjective aspect of a concrete – and from an empirical viewpoint, evolutionarily evolved – way of life, which is the inner side of our being-in-the-world.[1]

In the next subsection, Husserl's emphasis on the essential *embodiment* of soul and subjectivity is of crucial importance. According to Husserl, every segment of subjectivity, all mental capabilities, and their actual realization is fundamentally characterized by the fact that we are bodily beings in a physical world (cf. e.g. Zahavi, 1994, 2003; Behnke, 2011; Moran, 2015). Accordingly, he holds that the bodily aspect of existence is involved or indicated in every subjective capacity, in all mental states, events, and actions. Embodiment is the condition of possibility for our practical activity in the world, and the fuller, more concrete meaning of our subjective existence can only unfold with a special regard to it. In the following subsection, we take a closer look at Husserl's understanding of soul and body and, more specifically, his interpretation of the subjective and objective aspects of body, *Leib* and *Körper*.

2.3. Husserl's Conception of the Constitutive Connection Between *Leib* and *Körper*

In this subsection, we attempt to show that the classical phenomenological conceptions of embodiment that we find in Husserl and Merleau-Ponty can serve as parts of theoretical foundations for phenomenologically based but empirically related research on the emergence of consciousness. We will try to demonstrate that an accurate and intersubjectively embedded

[1] The later Husserl, from time to time, used this Heideggerian term ('in-der-Welt-Sein') (Husserl, 2008, pp. 462, 490). But as Merleau-Ponty had already noticed (2002, p. viii), this idea was present in him long before Heidegger's *Being and Time* in his notions of 'natural conception of world' ('natürlicher Weltbegriff'), 'natural attitude', and also in the early – pre-thirties – notion of the life-world (Lebenswelt) (see Overgaard, 2004).

analysis of the body yields what we call the 'embodied manifestation thesis', according to which every subjective capacity, state, or event refers to an objective *correlate* in the body as a bodily capacity, state, or event, and they are connected in an a priori necessary way. We should emphasize that the embodied manifestation thesis *is not* an identity thesis. 'Correlation' is not identity. On the contrary, we would like to emphasize that according to the standpoint that we adopt, subjectivity has certain *irreducible* features – most importantly, its *qualitative* character.

For a proper understanding of Husserl's conception of embodiment, we should first examine more closely two fundamental notions of his philosophy: *constitution* and *phenomenological reduction*. Regarding the former, Husserl refers to the a priori laws and features of appearance with the term 'constitution' (cf. e.g. Sokolowski, 1970; Moran, 2000, pp. 164–166; Zahavi, 2003, pp. 72–77). He says that a particular thing is somehow 'constituted' to specifically highlight the a priori fashion of its appearance. For him, things cannot appear in an entirely arbitrary way; instead, every appearance is subject to certain a priori laws. To a concrete perception, for example, according to Husserl, necessarily pertain recently passed phases in the form of retentions, along with certain anticipatory tendencies as protentions (Husserl, 1990, 2001), just as the appearance of the front side of a three-dimensional object inevitably indicates its unseen parts. As we shall soon see, he also assumes such a necessary, constitutive connection between soul and body and the subjective and objective sides of our body.

As regards the latter notion, Husserl elaborated a methodologically sophisticated application of phenomenological reflection that he called *phenomenological reduction* (cf. Husserl, 1960, 1983). This refers to the philosopher suspending or 'bracketing' every belief, assumption, and presupposition that does not rest upon *immediate* or *immediately accessible experience* (Husserl, 1983, pp. 44–45). What truly matters for the philosopher regarding phenomenological reduction is not the question of whether a subjectively appearing thing exists in reality, outside her mind, but of *how this thing appears and what objective sense* (*gegenständlicher Sinn*) *it carries*. Reduction, in his interpretation, leads us back to a sphere of pure appearances and a complex web of objective meanings whose particular content was made concrete and specific by this very context. In this framework, 'transcendence' and 'being transcendent' are such objective meanings. In Husserl's eyes, one should examine, through phenomenology, which phenomena exhibit the meaning of 'transcendence' or 'transcendent' and how.

Concerning phenomenological reduction, two crucial issues are the status and results of the empirical sciences. Theoretically, with this reduction, the phenomenologist must exclude all

information neither acquired through the phenomenological method nor based upon phenomenologically clarified immediate or immediately accessible experience (i.e. every piece of knowledge derived from non-phenomenological empirical research). Husserl, however, has a solution for this in what he calls 'double' or 'intersubjective' reduction, a specified and extended version of phenomenological reduction (Husserl, 1973a, pp. 177–179, 188–191). This specification of the phenomenological method makes it possible for the phenomenologist to regain the results and assumptions of the empirical sciences for phenomenological investigations as complexes of meanings of limited phenomenological validity, meaning that they require further phenomenological supervision and clarification. Husserl uses this method extensively in the second and third books of *Ideas* (1980, 1989a) and in other works.

This is the overall context of Husserl's theory of embodiment, which entails an a priori necessary connection between soul and body (1989b, pp. 11–12), internally experienced (*Leib*) and externally appearing (*Körper*) aspects of the body, and finally, immanent and transcendent sides of the body, namely, the body as it appears and as a physical, mind-transcendent entity in nature (cf. e.g. Husserl, 1973a, p. 75, 1973b, p. 263; Zahavi, 1994, 2003). A careful and thorough phenomenological study of the bodily nature of experience, according to him, could shed light on the exact manner in which soul and body, internal and external, immanent and transcendent moments of the body are connected to each other *in an a priori way*.

From the inside, internally, the body, as *Leib*, manifests itself as a constant stream of proprioceptive (experiences of bodily states, processes), kinaesthetic (experiences of bodily movements), and affective feelings, articulated in a well-organized system. The microanalysis of these internal bodily experiences reveals intrinsic indications referring to externally appearing and transcendent moments of the body (as *Körper*) to which the former are necessarily linked. In Husserl's interpretation, the flow of bodily experiences and the intimate weave of internal and external moments of the body make manifest the inseparable unity of *Leib* and *Körper*: the fact that they are two sides of one and the same unity (cf. e.g. Husserl, 1973a, pp. 262–263, 1973b, pp. 414, 462, 1977, pp. 150–151).

In Husserl's theory of embodiment, the notion of *organ* has a special role in creating this unity; the body, also in a phenomenological regard, could be thematized as a compact, coherent unity of organs (Husserl, 1997; Claesges, 1964). An organ is a bodily part with a particular function of making possible and realizing certain moments of one's being-in-the-world. The functioning of our organs, just like the body as a whole, has internal and external, immanent and transcendent aspects. We have *internal* (proprioceptive, kinaesthetic, affective) experiences regarding the functioning of – at least some of – our organs; some can be experienced *externally*

(we can see or touch them); we can find certain ways to experience others (think of a doctor who – if necessary – could operate on herself); and we can also experience the *functional achievements or results* of those organs (e.g. vision as the result of the proper functioning of our eyes and the wider visual system of the body).

Specifically, the sense organs have the function of connecting us to the world in specific ways. If they malfunction, the correlative form of sensible experience cannot be adequately realized. In *Thing and Space* (1997) and other works, Husserl devotes detailed, microscopic analyses to the internal, external, and functional[2] aspects of the experience of sense organs, and he emphasizes how strongly and intimately these aspects are interrelated. Our embodiment is through and through indicated in the functioning of our sense organs. Accordingly, the functional achievements and realizations of these organs are always accompanied by internal (proprioceptive, kinaesthetic, and affective) bodily experiences, and our entire bodily being as a whole is always implicated in them. The sense organs – along with the particular sensory system (e.g. the eye and the visual system of the body) – realize a perceptual field whose particular realization is dependent on the actual position and movement of the particular sense organ in question, on the one hand, and on the momentary position and movement of our entire body on the other. From the fundamentally embodied character of subjectivity in general, and perception in particular, it follows that every change in the perceptual field refers to a change in the bodily basis which realizes it.

Of course, we can regard a certain type of perceptual field (e.g. the visual or tactile field) on its own, separated from our entire bodily existence and the particular sense organ (eye, ear, etc.) that realizes it. From the viewpoint of the phenomenological theory of constitution, however, this regard would be *abstract*. Such a treatment would be isolated from the complex web of meanings disclosed by phenomenological reduction. If we separate the perceptual field from its bodily basis and the sensory organs that realize it, we neglect its fuller, concrete constitutive meaning. In this case, we cannot explain *phenomenologically* why this perceptual field changes in strong correlation with changes in the functioning and position of sensory organs and our whole body.[3]

[2] 'Functional' here simply means what these organs can actually perform and achieve (e.g. eye – vision).

[3] Husserl's example in the second book of *Ideas*: 'When I eat santonin, I see things abnormally, as through yellow lenses' (1989a, pp. 67–69, 78). If I abstract from my embodiment, I cannot explain this change in the perceptual field. One could add, without further delay, that it is a causal, empirical explanation that we supposedly excluded under phenomenological reduction. Husserl is very well aware of this, but – as mentioned earlier – he also claimed that such causal and empirical explanations could be revised in the phenomenological attitude, in a critical manner, so that they could be available to a phenomenological approach and, thus, their deeper, constitutive phenomenological meaning could be unfolded.

2.4. The Constitutive and Ontological Relationship between Soul and Body: The Embodied Manifestation Thesis

Husserl believed that there exists a particular organ specifically responsible for the body–soul connection that enables the functional realization of all our sense organs. He spoke of this organ, namely, the *nervous system*, as the 'central organ' of our body (Husserl, 1989a, p. 304). Husserl posited a *functional connection* between mind and body, and mind and nervous system in particular. From a Husserlian perspective, it is the nervous system that establishes the 'psycho-physical dependency' of the soul and body, somehow connecting these two realms (Husserl, 1989a, pp. 161–165, 302–310, 2020, pp. 47–66; Yoshimi, 2010). As we might expect, Husserl's viewpoint here is anything but naïve. He was keenly aware that the nervous system belongs to the *transcendent* aspect of our body and that empirical science informs us about its proper nature and functioning. Nevertheless, he considered that the knowledge of the nervous system that natural science provides us is phenomenologically relevant. It has particular significance for a phenomenological theory concerning the constitution of the body, provided that we are careful to use this empirical knowledge in the phenomenological attitude.

For Husserl, the relationships between *Leib*, *Körper*, the nervous system, and the soul are quite complicated. He very clearly argued that *Leib* and *Körper* constitute a coherent unity, in which these two aspects – the immanent and transcendent sides of the body – belong together a priori. Husserl even frequently used the term *Leibkörper* to express their unity (see e.g. Wehrle, 2020).[4] How does this *Leibkörper*-unity, together with the nervous system, affect our soul, our subjectivity? Regarding our lower mental faculties, sensations (*Empfindungen*) and the purely sensible aspect of perception, Husserl is again completely clear: every change in our experiential field refers back to bodily changes in our sense organs and nervous system. Sensations, in his interpretation, are totally dependent on our bodily functioning; they correlate

[4] 'In differentiating between *Leib* and *Körper*, Husserl highlights two related but ultimately different aspects of human embodiment. First, in response to a popular Cartesian dualism, he emphasized the aspect of a lived, sensing and moving body (*Leib*) in contrast to the mere extended body. Against such dualism, he emphasizes the necessary conjunction of the lived and physical aspects of embodiment by using the combined term "Leibkörper"' (p. 500).

to bodily states, changes, and processes (Husserl, 1989a,[5] 2020[6]). Husserl assumed a constitutive connection between the functioning of the sense organs and the nervous system on the one hand, and the emergence of sensations on the other. In his view, we cannot grasp the concrete phenomenological meaning of the emergence of a sensation by abstracting from the concrete bodily functioning to which it refers.

As regards the relationship between higher mental faculties (e.g. fantasy, image-consciousness, or thought) and the entire mental sphere as such (the soul) on the one hand, and our body and its nervous system on the other, Husserl assumed the *partial dependency* of the soul on the body (Husserl, 1989a, pp. 302–310; Yoshimi, 2010). More precisely, he held that the body and the soul have a fundamentally empirical and contingent relationship, although he did not conceive of this relationship as entirely contingent, claiming that it *also has certain a priori necessary features*.[7] The soul needs a body through which it can connect to the world, and the way in which this connection is achieved is not arbitrary but rather determined by the peculiarities of the body. Regarding specific mental phenomena, Husserl hypothesized that some of them might not have a physical basis or carrier and that experimental psychology has the duty and authority to decide which have a bodily basis and which do not (Husserl, 1989a).[8]

Husserl's overall conception of the relationship between mind and body has a further strongly related peculiarity that should be noted. Namely, he emphatically denied that their connection could be characterized in terms of causality. In other words, he rejected that the soul could have a causal effect on the body and nature in general (Husserl, 1989a).[9] He spoke of

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[5] 'As regards sensations, the dependence means that a certain Bodily state (or, rather, a certain form of Bodily states, admitting the process of metabolism, which removes the individual identity of the elements of one and the same organ, of the same nerves, ganglia, etc., though it maintains the same particular form) has, as its univocal and Objective consequence, a certain sensation in a determinate stream of consciousness bound to its respective Body' (p. 304).

[6] 'The appearances and other contents of consciousness (lived experiences) depend on the body (Leib)' (p. 52).

[7] To this we should add the following remarks. First of all, from time to time, Husserl used the terms *leibseelisch*, *leib-seelisch*, and *körper-seelisch* ('bodily-mental'), which also express the strong and intimate unity between soul and body (e.g. Husserl, 1973a, pp. 27, 539, 2008, p. 682). Secondly, he asserted that souls which pertain to individuals of different biological – human and non-human animal – species are essentially (eidetically) differently articulated and imply different bodily capacities and achievements. In this way, he compared, for example, the embodied manifestation of the soul of a cat and a human, with special regard for the fact that these two types of soul imply completely different coherent sets of embodied abilities and performance (Husserl, 1973a, p. 69). Thirdly, according to him, every soul has a *lowest*, 'somatological' level and aspect, which enables the soul to acquire sensible experiences, and which has an a priori necessary connection to the body (Husserl, 1977, pp. 100–101, 109–111, 1980, pp. 9–17). Husserl emphasized the independence of the higher layers of the soul and the autonomy of psychology over somatology and physiology; however, he also assumed that the lower, somatological aspect of the soul and the organic body have a constitutive and necessary relationship.

[8] Concerning the psychophysical dependency of experiences on the body, Husserl said: 'Obviously, how far all this extends can only be decided empirically and if possible by means of experimental psychology' (p. 308).

[9] '[T]he soul does not interfere with "nature," which remains what it "is" whether the soul has effects in it or not' (p. 355).

motivation as 'the fundamental lawfulness of spiritual life' (Husserl, 1989a, p. 252), and standing in opposition is causality, the fundamental law of nature. He claimed that the order of the will is 'completely different' than the order of the nervous system, and he even added that 'the nervous system has no effect on the mental [sphere]' (Husserl, 2020, p. 64). We should interpret these words carefully.

First, it should be emphasized that Husserl *does not assert* that there is no interaction of *any kind* between the mental and physical-bodily spheres. He explicitly and passionately rejected what we call epiphenomenalism as 'absurd' psychophysical parallelism (e.g. Husserl, 1980, p. 15, 1989a, pp. 302–308). He only asserted that these two spheres are governed by completely different types of laws. We can describe physical causality with exact laws, whereas the psychological sphere, in his view, lacks this exactness. I interpret this approach to have two implications. First, the decisions and actions of a subject can never be precisely predicted; rather, a person can certainly act to initiate a completely new causal line without causal antecedents in the realm of nature (Husserl, 2020).[10]

For Husserl, the necessary relationship of *Leib* and *Körper* and the – at least partially – necessary relationship between soul and body[11] rest upon an *order of appearances* and the a priori features of this order. In his opinion, this a priori relationship can be conceptualized, first of all, between the lower levels of the soul (our purely sensible mental capabilities) and the body. I believe, however, that this necessary connection might also be extended to the higher levels and abilities of the mental sphere. Later, Merleau-Ponty dedicated incredibly nuanced lifelong efforts to show that every manifestation of mental ability, content, and achievement is essentially embodied, including activities of memory, imagination, and conceptual thought (1967, 1968, 2002). Merleau-Ponty adopted an *ontological* stance concerning the mind-body relationship; accordingly, in his interpretation, the a priori features of the relationship between consciousness and the body are rooted in the order of Being. This conception became an empirically related, concrete research project in later phenomenologist proponents of *embodied cognition*, who attempted to show how every moment of conscious life is shaped and formed through embodiment, thus leading the mind–body problem back to the body–body (*Leib-*

[10] In *Studien zur Struktur des Bewusstseins* (2020), Husserl called the crucial moment of decision that sets a completely new chain of causes in motion 'fiat'. Regarding mental causation and the connection between the decision and the first moment of a bodily action, see Staiti (2019), Spano (2020), Williams (2020), and Liu (2023). In my view, Husserl's conception of decision – at least as it is treated in *Studien zur Struktur des Bewusstseins* – could be interpreted as an autonomous, self-determining act of an embodied subject.

[11] Husserl also held that the relationship between soul and body has certain empirical and contingent motives (see e.g. Husserl, 1989a; see also Yoshimi, 2010).

Körper) problem (cf. e.g. Varela, Thompson and Rosch, 1991; Thompson, 2007; Gallagher and Zahavi, 2008; Fuchs, 2018).

What we have called the 'embodied manifestation thesis' is a logical consequence of all the considerations treated in this section. This requires a partial revision of Husserl's conception of embodiment, from the perspective of Merleau-Ponty and representatives of the school of embodied cognition. Husserl, as we saw, conceived of the soul as a 'mixed reality' (1989a)[12] that is intimately bound up with the body but that also has content that does not or – at least – might not have a physical, bodily basis (1989a, p. 308). To the best of this researcher's knowledge, no empirical study has yet found any single mental event – following a scientifically verified and documented protocol – which lacks a physical, bodily basis. Moreover, based on existing empirical research on the psychophysical connection of mind and body, no mental event or capacity has been found to exist independent of the body.[13] In short, as science stands today, no mental phenomenon is thought to exist independent of the body.

If we accept Husserl's contention that the ego necessarily and in an a priori fashion constitutes herself as an embodied being in the world (Husserl, 2008, pp. 251–258,[14] 2012[15]), and if we also accept the considerations regarding the strong embodiment of the entire mental sphere found in Merleau-Ponty and the school of embodied cognition, we can venture to posit the 'embodied manifestation thesis', according to which every capability and instance of mental content refers back in a necessary way to a physical-bodily carrier, and there is a necessary connection between them, which, from the viewpoint of the phenomenological theory of *constitution*, could also be considered a priori. In my view, this would represent a mere extension of Husserl's own conception of the constitutive connection of mind and body, achieved by incorporating – following Merleau-Ponty and certain representatives of the embodied cognition school – the necessary and strong embodiment of higher (and all) mental faculties.

The comprehensive bodily basis that carries all mental content and capabilities could be conceived of as a 'functional skeleton' whose task is to channel the concrete conscious aspect

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[12] 'Hence it appears, speaking in principle and formally, that realities are to be divided into mere natural realities, supernatural realities (not of nature, having no natural sides, no natural determinations), and mixed realities, ones which, like the soul, have a natural side and an idiopsychic side. The second possibility is for us an empty possibility, and it is problematic whether it can be demonstrated at all' (p. 145).

[13] If scientific research could find a mental event which verifiably does not have any physical basis that, in my view, would be a strong empirical support for classical metaphysical substance-dualism regarding the mind-body relationship.

[14] Editorial title of the text: 'The apodictic certainty of my human-bodily existence as part of the apodictic certainty of the Being-ground "World". Rejection of the Cartesian attempt to doubt.'

[15] 'A person cannot be concrete, unless she has a physical body (Körper) as lived body (Leib)' (p. 380).

of a living being into the world. The next subsection represents and attempt to show the consequent implications regarding the minimal mind, resulting in what could be referred to as the 'minimal context thesis'. The minimal mind, as we will see, also has an underlying 'functional skeleton', which is part of this 'minimal context'.

2.5. A Phenomenologically Elaborate Conception of the Minimal Mind: The Minimal Context Thesis

Since he started dealing with the problem of intersubjectivity around 1905 (Husserl, 1973a), Husserl dedicated thorough and careful analyses to the problem of the animal mind and lower forms of consciousness (including the presumable subjectivity of early infants and possibly embryos) in particular (cf. Vergani, 2021; ANONYMIZED2; ANONYMIZED3). Husserl approached lower levels of consciousness in two general ways: externally, based upon *empathy* regarding other subjects, and internally via a *deconstructive-reconstructive* (*Abbau-Aufbau*) method established through phenomenological reflection on one's own consciousness. The problem of embodiment, nevertheless, plays a crucial role in these investigations on lower-level *subjects*. Such phenomenological investigations could lay the foundations for empirically related research regarding the ontogenetic and phylogenetic emergence of consciousness in the natural world.

As mentioned in the previous subsection, Husserl believes that if I experience a body similar to mine in visual, behavioural, and functional (bodily structure) regards, I am capable of constituting it as the lived body (*Leib*) of another subjective, conscious person (e.g. Husserl, 1960). For him, the experience of this similarity triggers a passively intentional process that he calls '*pairing association*', which enables me to constitute the body of the other person as *an analogue of my body*, a subjectively lived body, *in an a priori fashion* (Husserl, 1960, pp. 80–81, 112–113). *Empathy*, which is a composite and founded type of intentionality that presents the other subject to me as a conscious, living, feeling, sensitive person, is based upon this pairing association. In Husserl's interpretation, empathy is not restricted to human intersubjective relations but is also possible amongst *different species*. In other words, I can also empathize with animals, and animals can empathize with each other too.

From the perspective of an adult human person, in Husserl's view, animals and early infants (embryos) could be thematized as *anomalous subjects* (cf. Ciocan, 2017), meaning they might be very different from us; nevertheless, they still have rudimentary subjective experiences and some sort of lower-level concrete, conscious existence. Husserl assumes that we have at least two reasons to attribute consciousness in the strict sense to animals and early infants (embryos).

First, they sufficiently resemble us in functional, bodily, and behavioural regards to intelligibly constitute them as conscious beings. They are *similar* enough to us to motivate a phenomenologically grounded empathy in us towards them. Second, they have a nervous system, which is – for Husserl – a phenomenologically accessible subsystem of the body and a peculiar organ which is inevitable for the activation of consciousness and realization the psychophysical dependency of the soul on the body.

Though Husserl sometimes plays with the thought that living beings below the level of animals, such as plants, unicellular organisms, might have consciousness (cf. Lee, 1993, pp. 225–230), he generally deems them too far from us in functional, bodily, and behavioural regards to conceive of them as creatures with concrete consciousness, in the strict sense, or to give rise to a phenomenologically motivated empathy in us (Husserl, 1980, pp. 8–9).[16] He presumes that the presence of a nervous system in animals also indicates the boundaries of phenomenologically legitimate empathy and intelligible constitution of concrete conscious subjects. In this way, his recurring example of a minimal subject with a concrete minimal mind is the *jellyfish* (Qualle), with its decentralized nervous system (Husserl, 1973a, pp. 112–119, 2003, p. 136, 2020, p. 52).[17] But what might such a minimal subject look like 'from the inside' according to Husserl?

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[16] In *Ideas III*, Husserl writes about the possibility of plants' having subjectivity: 'It would therefore not exclude plants' having sensitivities after all; it only means that we would be incapable of recognizing them, because there is lacking any bridge of empathy and of mediately determined analysis.' (Husserl, 1980, p.8-9).
Edith Stein, in the dissertation that she wrote under the supervision of Edmund Husserl, said, 'It is at least doubtful whether the plant has sensations, and so our empathy is unjustified if we believe we are inflicting pain on a tree by cutting it down with an axe. A plant is not the center of orientation of the spatial world either, nor voluntarily mobile, even though it is capable of alive movement in contrast with the inorganic' (1989, p. 69).
It should be noted that at least to my knowledge, Husserl never made explicit why the capability of consciousness should be restricted to animals with a nervous system. As I have just mentioned, in several textual locations, he even considers the possibility that all living beings possess a consciousness of their own. Most probably, the fact that a living being has a nervous system – a bodily part that he grasped as the organ of psychophysical dependency – served for him as a plausible point of orientation regarding this matter.

[17] From a wider phenomenological perspective, we can raise the question of whether a nervous system is really necessary to have consciousness. As one of the blind peer reviewers of this paper pointed out, in the enactivist approach, bacteria are frequently referred to as 'minimally intentional agents' (cf. e.g. Thompson, 2007). Can we then not assume that even unicellular beings have a certain sort of consciousness of their own?
Evan Thompson, for example, proposes the idea of life-mind continuity and explicitly denies a sharp line of demarcation between conscious and non-conscious beings. On the one hand, I would like to avoid confrontation on this topic, which is why I restrict myself to discussing concrete, clear consciousness 'in the strict sense', thus leaving space for other interpretations in this regard. I nevertheless believe that there is a reasonably clear and distinct line between living beings that continuously possess a stable and relatively clear consciousness in the strict sense and those that do not. On the other hand, my problem with life-mind continuity is that beyond the point of possible phenomenological, first-person perspective verification, when there is no subject that can communicate with the observer and bear witness that the functioning of the proper bodily structures is connected to conscious experiences, the entire theory becomes all-too speculative and hypothetical from a phenomenological viewpoint, inviting the conclusion that everything could be said to be conscious that exhibits even the remotest signs of agency.

His other, 'internal' way of apprehending lower minds is the deconstructive-reconstructive approach. This method implies that the philosopher reflects on her own consciousness and attempts to *abstract* from the higher layers (e.g. clear self-consciousness and conceptual thought), excavate the lower, *purely sensible* layers of subjectivity characteristic of lower-level subjects, and focus on the microstructure of these layers. In Husserl's interpretation – as seen in subsection 2.2 – conscious existence must be concrete on every level – a coherent, specific mode of being-in-the-world, even on the level of a *minimal subject*. The total sphere of subjectivity of such a being should consist of a *minimal set* of conscious structures and capabilities which make possible a minimal concrete subjective being-in-the-world. This set should be further defined by thoroughgoing *embodiment*. But what exactly would be the main elements of such a minimal set?

In Husserl's view, such a simple or minimal subject (a lower-level animal or human embryo) simultaneously represents the highest level of conscious (wakeful) *passivity* and the lowest level of activity. He presumes that even the lowest level of life should be characterized by a certain grade of activity (cf. ANONYMIZED4); however, the case of a minimal subject represents possibly the lowest degree of conscious activity. In this regard, Husserl's concept of *instinctive intentionality* is of fundamental importance (cf. e.g. Husserl, 2006, 2014, pp. 83–136; Lee, 1993). Husserl rigorously distinguishes the phenomenological notion of instinct from its naturalistic and biological conception. For him, instinct in the phenomenological sense refers to a passive, teleological directedness in the consciousness: an entirely or predominantly passive form of constitution. Instinctive intentionality articulates and guides the formation of our fields of perception, sensation, and action, motivating us to achieve certain ends, though not informing us how. It indicates certain directions, makes us reach out gropingly, triggers half-automatic sequences of actions, and urges experimentation to find ways to realize somehow those indefinite goals that it sets us. What, from an empirical regard, appear as instincts of individual and generic *self-preservation*, from a phenomenological point of view, could be treated as instinctive ways of constitution of the ego to preserve certain forms of self-constitution, namely, self-constitution as a *physical being* at the lower levels and as a cultural being at the higher ones.

Of course, one can always ask what the nervous system, this peculiar material compound, has to do with such an ontologically significant phenomenon as consciousness. In my opinion, what makes the nervous system special in this regard is its particular functional organization and role, which enables an *especially dynamic and flexible relationship to the world*, which – at a certain level of complexity – is intrinsically connected to consciousness. Consciousness in the strict sense from this – third-person – viewpoint could be interpreted as the higher level of functioning of a living being.

The minimal subject experiences a flow of sensations articulated by this instinctive intentionality. This flow basically represents the external environment in a very rudimentary way. The field of sensory perceptions already has more or less salient patterns and is articulated by the instinctively driven attention of the subject into relations of foreground and background. The stream of exteroceptive sensations is accompanied by a flux of affective feelings, positive or negative evaluative experiences, and experiences that continuously report the current state of the body to the ego, namely, kinaesthetic and proprioceptive experiences. These exteroceptive, affective-evaluative, and interoceptive ways of functioning (seen in subsection 2.2) form a concrete, coherent, single weave and together contribute to the constitution of a concrete subjective being-in-the-world. Further, these sensations already have *a certain grading*: they might be more or less intensive. Therefore, a minimal mind implies a *minimal scale* for the capacity of conscious sensations and experiences.

Husserl also holds that subjectivity, even at the lowest level, has an essentially and necessarily *temporal* character. No sensation can be concrete unless connected with primary, short-term memory and anticipation – in Husserl's vocabulary, retention and protention. But the minimal mind, for Husserl, should also have a minimal range of long-term memory and anticipation; otherwise, *learning* would be impossible. Husserl claims that learning and motivation based upon memory are both indispensable to enable a concrete way of life in the world (e.g. Husserl, 1989a).[18] All of these subjective, conscious faculties (mentioned in the previous subsection) are fundamentally embodied and – in an extended version of Husserl's theory of bodily self-constitution about which we wrote in the previous subsection – refer to a bodily basis as their carrier and realizer.

What we called the 'minimal context thesis' is a direct consequence of these considerations. It means that *a minimal subject is embedded into a minimal context, which is a composite set of subjective and objective conditions and structures that make a concrete and minimally but continuously and clearly conscious way of life possible*. It is a minimal set of capabilities and actual performances of exteroceptive, interoceptive, and affective-evaluative subjective experiences, along with the *bodily foundations that carry and realize them*, which – based upon discussion in the previous subsection – should be conceived of as *a minimal functional*

[18] Obviously, long-term memory in this context need not to be understood as the capability of clear recollection. A consciousness restricted to the extended living present could not be concrete. Here however, long-term memory refers exclusively to the possibility that certain experiences are somehow preserved in the deep layer of the mental life of a living being, while also having an effect on the present. This means that a living being can acquire new habits and patterns of behaviour and, thus, can dynamically adapt to the challenges of the surrounding world. In fact, it is quite the same as that which Simona Ginsburg and Eva Jablonka referred to as the capability of 'Unlimited or Open-ended Associative Learning' (2019).

architecture. Every body part belongs to this functional architecture, which is *directly responsible for the realization of consciousness*. From an empirical – or phenomenologically revised empirical – perspective, such parts mostly belong to the *nervous system* since no stimulus can be conscious unless it enters the central nervous system.

The insights of this part of our study have immediate empirical implications. *The minimal functional architecture is represented by the functional arrangement and achievements of a neurological and neuroanatomical set which can realize the minimal mind*.[19] This structural set must reflect a concrete conscious mode of being-in-the-world, which, at the lowest level, is the conscious life of a minimal subject. If we trust the results of the phenomenological method and not only accept the necessary connection between the subjective and objective sides of the body (which is the embodied manifestation thesis) but also accept that the minimal functional architecture reflects a concrete, minimally conscious being-in-the-world (which is the implication of minimal context thesis), then we must also accept the fact that there are certain empirical and, more specifically, neurological models of consciousness endorsed and supported by first-person perspective phenomenological research *more*, and there are others which are *less consistent* with the results of a phenomenological approach.

[19] Earlier, especially in the previous subsection (2.4), I have made an effort to show the particular importance of the *nervous system* for a phenomenological – and particularly Husserlian – approach.
Here I would only like to add that one can argue both from a phenomenological perspective on more theoretical ground as well as from a more empirically related standpoint for the special phenomenological relevance of the nervous system.
As regards the more theoretical account, we have seen that Husserl thematized the body as a system of organs and a tool of agency. In his view, the body is necessarily constituted in this way, and it cannot be constituted otherwise. A person can only be concrete through a particular embodiment which channels the individual's existence into the world. These organs grant concrete access to the world. This belongs to the specific constitutive meaning of *particular modes of experience* that they are essentially the bodily functioning of sense organs. Vision is, for example, according to Husserl, the concrete bodily functioning of a visual organ, the eye (Husserl, 2009, p. 616). In *Ideas II*, furthermore, Husserl argued that to the constitution of the body pertains a 'central organ', an organ that coordinates the functioning of other particular organs, and which connects the soul to the body (realizes the 'psychophysical dependency of the soul on the body'). It is also the organ through which the *will of the ego* can be manifested in the world with a 'fiat', as Husserl phrased it in *Studien zur Struktur des Bewusstseins*. From a Husserlian point of view, one can argue that a material organic body, which in principle makes a person's concrete existence possible in the world, cannot be constituted without such a central coordinating organ. The constitutive meaning of the particular sense, affective (*Gefühlsorganen*), and motile organs implies the constitution of a central organ to which they are related and that connects and coordinates them.
From a more empirical stance, one can say that the results of empirical research into the functioning of the nervous system support, legitimize, and ultimately justify its phenomenological usage by showing the intimate relationship between the mental sphere and the nervous system. The growing amount of information in this field continually provides us new details and nuances about the real depth of this intimacy, which makes the nervous system an increasingly inescapable topic from a philosophical and, in particular, phenomenological regard within the context of the mind–body relationship. Furthermore, the results of related research provide ever-greater empirical support for Husserl's view that we should treat the nervous system as a central coordinating organ for other bodily organs which realizes psychological dependency and enables us to act in the world (see also Fuchs, 2018, especially pp. xvii–xviii, 68).

That is, from a phenomenological perspective, the fundamental structure of the minimal mind as it appears 'from the inside' under phenomenological reflection must encompass in its structural aspects the presumed functional architecture of the bodily realizer of consciousness as it appears 'from the outside'. Next, we try to find the best-fitting neurological model for this phenomenological conception, which is also verifiable by phenomenologically founded, first-person perspective research.

Earlier, especially in subsection 2.4., we made several attempts to show the particular importance of the nervous system from a phenomenological regard.

3. The Presumable Functional Architecture of the Minimal Mind

According to the considerations of section 2, the phenomenological reflections on the minimal mind and the relationship between mind and body (*Leib* and *Körper*) have certain serious and inevitable consequences for empirical research into the origins of consciousness in the natural world. If we accept the results of Husserl's investigations on the embodied nature of conscious experience and the minimal mind (as we slightly modified in the previous section), we must also accept that concrete consciousness as a whole and individual conscious experiences necessarily refer to a bodily basis as their carrier and realizer.[20]

In the natural world, a specialized functional apparatus connects the organism to its environment and helps it to receive, gather, and process information about its surroundings. To be sure, before multicellular animals with neurons, other creatures (e.g. fungi, plants, and unicellular organisms) also possessed non-neural ways of carrying out these functions. In animals, nervous systems appeared as specialized subsystems whose central function was to process and integrate sensorimotor, affective-evaluative, and cognitive information; they proved to be extremely effective tools (cf. e.g. Ginsburg and Jablonka, 2019, pp. 251–273).

[20] As one anonymous reviewer of this paper noted, we should at this point clarify the relationship of empirical subjectivity and transcendental subjectivity with embodiment, and more specifically, the problem of whether the necessity of a bodily basis holds true for transcendental subjectivity, that is, whether the latter is also carried by observable bodily phenomena as are empirical and psychological subjectivity.
We should respond to this request for clarification as follows. First, it must be said that this article addresses the *empirical* genesis of subjectivity and the relationship between *empirical* subjectivity and the body. Second, for Husserl, empirical subjectivity always has a transcendental aspect, meaning that we can always conceive of subjectivity as not only a merely empirical reality, subjected to the laws of nature, but also as a non-empirical source of truth, meaning, values, and validity (cf. e.g. Sokolowski, 2000, pp. 115–116, 156, 161, 176). Husserl, in this regard, speaks about the 'wondrous parallelism of the psychological and the transcendental' (Husserl, 1968, p. 275). I can accept the possibility that the transcendental ego and subjectivity possess an aspect which is completely independent of nature, as Husserl did. However, when we speak of such aspects as concrete personal subjectivity, which potentially acts and is manifested in the real world, we must say that yes, every relevant instance of content, capability, and structure is necessarily related to a bodily basis and carrier by the a priori order of the self-constitution of the ego.

Based on current knowledge regarding the empirical features and indicators of consciousness, it seems almost certainly activated and realized by certain neural circuits in human – and in certain animals, the non-human – brain. In this section, we aim to identify which currently existing neural model of consciousness is endorsed by an 'internal' phenomenological approach as perhaps the most appropriate.

Though there are researchers who believe that consciousness is fundamentally illusory and self-reflection could easily lead us astray (e.g. Daniel Dennett or Susan Blackmore), Husserl and his followers – the latter to this very day – strongly believe that methodologically careful reflections can still yield apodictically true insights into consciousness. Intersubjective discourse could correct eventual errors of individually conducted self-reflection. The concreteness of conscious existence, even on the minimal level, and the intrinsic embodiment of conscious experience are rather consensual insights in the phenomenological tradition. These ideas have considerable consequences for phenomenologically oriented empirical research on consciousness.

Proponents of embodied cognition, in particular, periodically emphasize that a nervous system is always embedded in a wider context and is not viable on its own, separated from this context (Gallagher and Zahavi, 2008; Cosmelli and Thompson, 2010; Fuchs, 2018), as the non-neural parts of the body participate in concrete realizations of consciousness in a fundamental way. However, it is also generally accepted that *no stimulus can become conscious until entering the nervous system*. Therefore, we first focus on the presumable neural basis of the minimal mind as its structural and functional foundation. Based upon the results of the previous section, we suppose that *there must be a minimal neural structure that forms the functional basis of the minimal mind*. We believe that the assumed neural structure or structural set must enable a concrete, coherent, conscious way of life as a whole.

3.1. Which Natural Scientific Theory of Consciousness Is Best Suited to a Phenomenological Approach?

Consciousness has certain characteristic *general and intrinsic features* which are independent from its particular bodily basis. It also has a certain *qualitative character* in general (i.e. there is something to live through a peculiar experience, e.g. to taste a certain coffee). It is always related to or directed at something: certain aspects, elements, or events of the internal or external environment (*intentional relatedness*). Last, but not least, we also should attribute a certain *self-relatedness or self-manifestation* to consciousness (Husserl, 1991, p. 83; Gallagher and Zahavi, 2008; Zahavi, 2017, p. 198). This means we are always *implicitly aware* of consciousness

functioning and the peculiar way it functions. For example, if we lose our sight, or if our normal visual experience suddenly changes drastically for some reason, we are usually immediately aware of it. Phenomenological reflection informs us about these general features of consciousness.

There are other, *specific characteristics* of consciousness, however, which refer to the bodily basis and its peculiarities. The different structures and capabilities must form a concrete sort of consciousness reflecting a concrete way of being-in-the-world (subsection 2.2). This must refer a certain set of concrete bodily structures. The concrete, specific capabilities and their achievements, the conscious mental states, content, and processes, as well as their internal relations, however, always refer to a concrete bodily basis, state, or process that realizes them (subsection 2.3). From a phenomenological perspective, an empirical theory and model of consciousness must therefore be, in the end, supported by the findings of phenomenological reflection. In praxis, this means that a phenomenologically grounded theory must first meet all of the following *four criteria*. 1) Consciousness, as a conscious aspect of a concrete way of being-in-the-world, must be *concrete*. 2) Consciousness must be strongly *embodied*. 3) A *minimal mind*, as a conscious way of existing on the minimal level, implies a *minimal set of bodily structures* (a 'core realizer') that realizes this (Chalmers, 2000; Block, 2005; Cosmelli and Thompson, 2010). We assume that this minimal structure is *primarily a certain neural pathway or architecture*. 4) Such a theory, in the end, must be verifiable *from the first-person perspective* – from the perspective of an adult human person – which is a point of departure for phenomenological investigations.

A phenomenologically based framework for empirical research regarding the origins of consciousness requires one more presupposition: the principle of phenomenologically legitimate *maximal extensibility* of the capability of consciousness.[21] This principle is rooted in

[21] The limits of this 'maximal extensibility' are certain bodily structural features. Specifically, it is reasonable to assume the existence of fundamental structural isomorphism and continuity that extends from the lowest phenomenologically verifiable grade of human consciousness to the simpler non-human creatures to which we would like to attribute a 'minimal mind'.
We are certainly aware that this stance is not unproblematic. However, we claim that from a strictly phenomenological perspective, it is perhaps the best possible. Earlier, in footnote 17, we noted that certain representatives of the enactivist approach (e.g. Evan Thompson, 2007, 2022) refer to much simpler forms of life, such as bacteria, as minimally intentional agents. There we indicated our main problem with that position, namely that it is a highly speculative and hypothetical view that cannot be properly verified from a rigorously phenomenological perspective.
Some would view the position presented in this paper as very much anthropocentric. This opinion might be shared by Jonathan Birch (2022), who might label our approach as 'theory heavy' (a term he reserves for a theory of animal – in his article, invertebrate (insect) – consciousness that strongly relies upon theoretical presuppositions concerning human consciousness). In our view, however, it is simply a question of the limits of phenomenological verifiability, that is, whether we can – theoretically – test and prove a conception of consciousness from a first-

the nature of phenomenological investigations, according to which the phenomenologist should seek the *limits of phenomenality*: the boundaries of the realm of a particular type of phenomenon.[22] This implies that the answer to the question of which living beings are possibly conscious *should not be trivial* or all too convenient on the one hand; however, on the other hand, the answer should also be fully phenomenologically legitimate: a non-trivial, legitimate answer.

A large number of empirical and natural scientific theories of consciousness exist (cf. e.g. Seth, 2007, 2018; Bayne and Seth, 2022; Signorelli et al., 2021). No article could possibly have enough space to present just the moderately influential ones. Here, we can only mention the most prominent theories and approaches, those which are directly relevant to the issues addressed in the present paper.

Perhaps the three most well-known and influential approaches in consciousness studies are the neural correlates of consciousness (NCC) (Crick and Koch, 1990), integrated information theory (IIT) (Tononi, 2004), and global workspace theory (GWT) (Baars, 1988). NCC seeks the minimal necessary and sufficient neural set for the constitution of a concrete conscious percept. IIT connects consciousness to the causal structure of a physical system that specifies a maximum amount of irreducible integrated information (cf. also Bayne and Seth, 2022, p. 441). Consciousness, according to GWT, means 'global availability' for a number of different general cognitive capabilities, such as attention, memory, evaluation, and communication. An unconscious process becomes conscious when it enters a special cognitive terrain called the 'global workspace'. The neurobiologically elaborated version of GWT, the 'global neuronal workspace' (e.g. Dehaene, 2015), connects this global workspace to certain *cortical* regions.

From a phenomenological point of view, we should state the following regarding these approaches. NCC is *a specific research method* to identify the minimal neural substrates *for a particular state, process, or manifestation of conscious content* rather than a holistic, overarching theory of consciousness. IIT, from our viewpoint, is all too 'generous'. It attributes a certain grade of consciousness to every piece of integrated information; thus, it is open to *panpsychism* (Koch and Tononi, 2015), a phenomenologically unjustifiable view that we hope

person perspective or not. In fact, this approach could be framed from either a phenomenological or a third-person empirical stance: from the former, as necessary structural implications of the self-constitution of the transcendental subjectivity or the transcendental ego; and from the latter, as a set of structural, functional, and cognitive features which make possible a highly dynamic and flexible relationship with the world, and which can be conceived of as highly reliable indicators of the presence of conscious activity in an organism.

[22] Amongst others, it is based upon Husserl's method of *eidetic variations*. This refers to a systematic effort to demarcate the domain of a particular type of entities or phenomena. This demarcation should be legitimate, grounded by a genuine phenomenological motivation, but this domain also must embrace all of its possible members (cf. e.g. Husserl, 2012).

to avoid. GWT, on the one hand, in its neurobiological interpretation, is *all too cortex-bound*, which is not confirmed by the previously mentioned principle of maximal extensibility. On the other hand, it is also *all too general and formal*, meaning it does not imply a particularly *concrete and coherent* set of physical structures as the basis for such cognitive and conscious faculties necessary for a concrete conscious existence, according to the considerations of subsections 2.2 and 2.4.

The last several years have witnessed several further ambitious attempts to offer a systematic *phylogenetic* and neurobiological explanation for the emergence of consciousness; we highlight two here. Feinberg and Mallatt (2016) believe that a specific neural architecture, a complex set of nested and non-nested neural hierarchies, can model internal and external environments such that phenomenal consciousness of a certain grade of complexity accompanies it as an intrinsic feature of this peculiar form of neuronal modelling. Ginsburg and Jablonka (2019) asserted that a specific cognitive capability and underlying neural structure represent a highly reliable indicator of phenomenally conscious mental states, namely, the faculty of 'unlimited or open-ended associative learning', which – for them – referred to the dynamic capability of behavioural adaptation to a perpetually changing environment.[23]

Feinberg and Mallatt assume that the fundamental conscious capabilities (exteroceptive, interoceptive, affective-evaluative) evolved separately, independent from each other. Therefore, they claim that from an evolutionary, phylogenetic perspective, distal exteroceptive senses (such as vision) became conscious first, with the emergence of the first Arthropoda (more specifically, insects). This view that the fundamental conscious capabilities can be essentially separated from each other, however, violates the principle of concreteness of the minimal mind (the minimal context thesis). As concerns the model of Ginsburg and Jablonka, it is *rather general* regarding the *specific* neural architecture of concrete consciousness and, at least for me, the *direct link* between phenomenal consciousness and the capability of 'unlimited or open-ended associative learning' has not been made exceedingly clear and explicit.

Despite Feinberg and Mallatt's model not harmonizing with a phenomenological conception concerning the concreteness of the minimal mind and Ginsburg and Jablonka's approach not being very specific regarding the concrete neuronal bases of consciousness, both models offer the great advantage of claiming that structural and neurological foundations – at

[23] 'We also predict that the neural processes and structures that are essential for consciousness in humans will also be necessary for their UAL [= Unlimited Associative Learning] and that the homologs or analogs of these structures and processes will be necessary for UAL in other animals. UAL is a sufficient (but not necessary) condition for minimal consciousness in evolved extant animals' (Ginsburg and Jablonka, 2019, p. 455).

least from a phylogenetic perspective – lie much deeper than the cortex; thus, they enable us to legitimately extend the capability of consciousness beyond the level of mammals, and according to these authors, as far as insects. This satisfies the abovementioned principle of maximal legitimate extensibility of consciousness. *There are other subcortical models of consciousness,* however, which harmonize more fully with an overall phenomenological account of the minimal mind.

From the considerable number of different subcortical models, we highlight here Bjorn Merker's approach (2005, 2007), which updated and further developed Penfield and Jasper's theory (1954) as a conception which perhaps best suits a phenomenological account of the minimal mind such as that we treated in section 2. Merker's theory, on the one hand, conceives the fundamental form of consciousness (core, minimal, or primary consciousness) as a concrete way of functioning and an interrelated system of specific conscious modes; it connects consciousness to such a functional architecture (a group of systematically cohering and cooperating subcortical structures) which – according to current information regarding the neurological bases of consciousness – is capable of opening the way to the maximal possible extension of the capability of consciousness.

Merker believes that consciousness emerged during evolution as an intrinsically necessary consequence of certain *neural logistics* that helped animals to cope with specific environmental challenges. These neural logistics created in animals a behavioural '*core control system*' that granted them a dynamic decision-making system (2005). Such a 'core control system' implies and includes several factors which – according to Merker – were crucial for an elementary form of consciousness. These were an integrated, multisensory model of self and world, a complex representation of the subject's moving body in a constantly changing environment, and memory.[24] This dynamic, complex modelling of internal and external environment, along with memory, were inherently connected to the other essential aspect of this 'core control system', called the '*selection triangle*' (2007). This refers to the abovementioned dynamic decision-

[24] As one blind peer reviewer noted, Merker's terminology is rather representationalist, which is at odds with phenomenology's – and Husserl's – prevailingly anti-representationalist stance. I concur in this. Merker even refers to consciousness as the 'neural simulation' of external physical reality (2005, 2007), speaking of the 'naïve realism' with which we – in our daily activities – believe we deal with things directly in the external world and not merely the content of a 'neural simulation' or 'neural fiction' (cf. 2012, 2013a, 2013b).
In this article we do not want to embroil ourselves in the representationalist–anti-representationalist controversy. In this regard, I only want to say that Merker's view could be reformulated within a strictly phenomenologist framework and possibly adjusted to be consistent with an anti-representationalist conception of perception. The resulting 'integrated multisensory model' of the self and the world could be grasped and *reinterpreted* in terms of Husserlian intentionality as a *direct* relationship to oneself and the world that has – besides its directness – *an incredibly nuanced and sophisticated microstructure*.

making system, whose fundamental components are *action selection*, *target selection*, and *motivation*.

In Merker's interpretation, these functions together inevitably realize consciousness too, and all their neurological foundations can be found in the mesodiencephalic regions of brain. More specifically, he claims that the selection triangle can be specified as follows: the substantia nigra pars reticulata as the source of the collicular action selection signal, the hypothalamus and PAG as the source of the motivational, and the colliculus itself as the source of target-selection information. However, using these sources to constitute consciousness requires their integration within a joint and unitary ego-centric coordinate system supplied by the ego-centric spatio-motor mapping framework of the colliculus itself (2007, p. 72).

For Merker, this system is structurally isomorphic to all vertebrates and could possibly be extended even to embrace lower invertebrates, such as insects. But how might such a model be empirically verified? On the one hand, Merker refers to experiments on animals whose cortex had been surgically removed, noting that they nevertheless exhibited clear signs of consciousness (2007; cf. also Panksepp et al., 1994; Panksepp, 2005; Barron and Klein, 2016). On the other hand, he cites and analyses cases of children with hydranencephaly, which is a tragic congenital malformation whereby children are born without the majority of or the entire cortex. These children, Merker tries to show, still behave and react to environmental stimuli in an explicitly and evidently conscious way. However, these are third-person perspective-related cases and experiments.

In my opinion, Merker's conception concerning the origins of consciousness dovetails best with the fundamental insights of the phenomenological approach outlined earlier. There are several crucial points that make Merker's theory possibly the best current empirical third-person correlate for the phenomenological approach that we delineated above (in section 2 and the first half of the present subsection). First and foremost, Merker characterizes consciousness as an intrinsic feature of the 'core control system', in which motivation and complex decision-making are crucial factors. This system enables a living being to adapt dynamically to a threatening environment which changes continually and rapidly. In Merker's view, consciousness is an essentially concrete and coherent phenomenon related to the life-process of an organism which must make decisions quickly and effectively in order to survive. This interpretation seems to entail all the fundamental components which we earlier attributed to a phenomenological conception of minimal mind (subsection 2.5). Specifically, it is the concrete and holistically

organized consciousness of an embodied being with an intricate motivational basis,[25] an ego-centric perspective on the world, and fundamental mental capabilities that include learning, memory, temporally extended perception, and anticipation, which contribute to the constitution of its concreteness.

Secondly, because of its special emphasis on subcortical structures (especially parts of the mesencephalon and diencephalon), this model enables a wide extension of the capability of consciousness in the natural world while preserving the fundamental structural continuity between human and non-human conscious beings. A cortex-bound theory would drastically limit the spread of consciousness in the living world. If we accept and take seriously the indirect pieces of evidence which indicate the presence of conscious activity in living beings without a cerebral cortex, it seems evident that the cortex is not responsible for the phenomenon of consciousness as such but only for its higher and more sophisticated forms.

There remains, however, the serious question of *how to verify a subcortical theory of consciousness phenomenologically*.

3.2. A Proposed Way to Prove a Subcortical Theory of Consciousness from the First-Person Perspective: General Anaesthesia

In phenomenology, there is a key factor of verification for an intersubjective, scientific community: the *communication* of one's first-person perspective experiences. This obviously fails in the cases of decorticated animals and children with hydranencephaly, who cannot communicate.

In my opinion, experiments based upon emergence from *general anaesthesia* might help to identify the neurological bases of consciousness. The underlying idea is this: under general anaesthesia, the neural activity of the brain is minimized, and the particular way in which the brain 'reboots' could be by orientating the neurophysiological structures necessary for consciousness. Scientists have been systematically using such experiments in researching consciousness for at least twenty years; the oldest related experiments go back to the beginning of the 1980s (Uhl et al., 1980).

In this context, it should be noted that general anaesthesia does not shut down the brain globally. This could be achieved by a drug-induced coma, although this is not permitted for experimental purposes as it is too risky. For general anaesthesia, doctors use various anaesthetic

[25] Elsewhere (ANONYMIZED5) I argued for the view that *motivations* and *the affective sphere* play a fundamental role in organizing the sphere of consciousness and rendering it concrete. For more on this question, see also Maiese (2011).

drugs and their ‘cocktails’, each of which affect brain regions differently (cf. Bonhomme et al., 2019). General anaesthesia, however, could still minimize neural activity in the brain and suppress consciousness so as to provide highly valuable and orientating information regarding the neural bases of consciousness. In this section, I propose a specifically modified version of these experiments which – to my knowledge – has not yet been conducted in this form.

During emergence from general anaesthesia, the brain reaches its pre-anaesthetic, normal level of activity in a very complicated way. Bottom-up and top-down processes in parallel characterize the process of restoration. On the one hand, there is linear progress in the activation of bodily structures from the simpler to the more complex: a slow return of brainstem reflexes, then uncoordinated somatic movements, followed by the return of higher functions (Långsjö et al., 2012: 4940). On the other hand, higher functions simultaneously return along with the lower ones: there is increasing activation of the cortex from the very beginning, in parallel with the restoration of simpler neurophysiological functions (Mashour et al., 2021). These processes continually communicate with and support each other. In fact, as a recent study shows, the first neural structure to reach the ‘baseline’, the pre-anaesthetic level of activity, is the executive and problem-solving part of the prefrontal cortex (Mashour et al., 2021).

Because cortical processes are present from the start during awakening from general anaesthesia, many authors presume that these experiments rather support the cortical models of consciousness, and global neuronal workspace theory in particular (Mashour et al., 2021). However, the overall results of these experiments are, at the moment, far from unambiguous. They do not currently provide conclusive support for any model of consciousness. Perhaps the most important outcome so far is that the brain restores itself after general anaesthesia in a highly complicated way through parallel series of lower and higher processes which mutually support and enhance one another. Nevertheless, I believe that such an experiment could contribute to the verification or falsification of a subcortical theory of consciousness from the first-person perspective.

There are two major problems with testing the subcortical theory of consciousness with anaesthetic experiments. *First*, when patients or test subjects are awake and capable of verbally reporting on their mental states, the entire brain, including the full cortex, is operational. In other words, it is already too late. This is why many scientists have viewed these real-world experiments as supporting a cortical theory of mind. *Second*, emergence from general anaesthesia is usually followed by a few minutes of temporary amnesia. Thus, patients or test subjects cannot accurately report their experiences immediately upon waking from anaesthesia, which would be crucial for a phenomenological analysis of such experiences.

I believe that an experiment prepared and conducted carefully enough could address these difficulties. *As a general principle*, I suggest that an experiment that aims to test a subcortical theory of consciousness should *focus on the behaviour of the mesodiencephalic parts of the brain* during emergence from anaesthesia, utilizing the appropriate neuroimaging technologies (such as fMRI and PET). More specifically, regarding the *first* point above, I propose the following suggestions.

On the one hand, I assume this experiment would require a special anaesthetic 'cocktail'. First, we need a drug that minimizes cortical activity as much as possible and disrupts communication between the cortex and thalamus. Propofol would serve this purpose (cf. Bonhomme et al. 2021). Second, another chemical component is needed which enhances the activity of the specific subcortical areas whose role in the emergence of consciousness we would like to test. Several pharmacological substances have effect on such deeper regions of the brain, including Levodopa or amphetamines.[26] During emergence, the task of the researchers would be to slow down the reactivation of the cortex as much as possible while simultaneously speeding up the restoration of subcortical areas as much as they can.

On the other hand, testing for the presumable presence of consciousness should take place, again, as early as possible: immediately upon awakening from anaesthesia. When the test subject is able to speak, it is already too late because the ability to report verbally presupposes a relatively high level of cortical activity.

To this (subcortically focused) type of general anaesthesia experiment, we can connect *directly and indirectly first-person related clinical testing techniques*. There are at least two sorts of indirectly first-person related methods. *First*, according to recent studies, checking *brain stem reflexes* could be used as *a considerably reliable indicator* of the early emergence of minimally conscious states; this procedure could also be applied to anaesthetic experiments (Bao et al., 2019). *Second*, there are certain learnt, voluntary behavioural patterns whose appearance during quasi-sedated, not-yet-fully-aware states (such as the early stage of emergence from general anaesthesia before the full activation of the cortex) could be used as indirect evidence for the presence of consciousness (cf. Birch, 2022, pp. 140–147).

Regarding directly first-person related techniques, the task would be *to retrieve hypothesized memories before the full activation of the cortex*, when only subcortical structures

[26] These substances, of course, interact with each other, and for this reason, such an experiment should be designed very carefully. A human experiment with such pharmacological materials should be preceded by successful animal experiments which show that – with necessary circumspection – the proper 'cocktail' could be used safely on humans. I am grateful for the remarks of Professor András Csillag on this matter.

have reached moderate or normal levels of activity. In my opinion, retrieval cues and *mental reinstatement of context*, in particular, where reproduction of the original situation is used to access forgotten or unconscious memories, could be helpful in this respect (cf. Goldstein, 2011; Griggs, 2012; Wheeler and Gabbert, 2017). Based upon these types of retrieval methods, the patient should be stimulated by certain characteristic, composite visual and/or auditive patterns before the full recurrence of cortical activity. A couple of minutes later, in a fully awakened state, if the patient is capable of completing the pattern given to her in part (or if it at least seems familiar to her), that would be convincing evidence for the subcortical theory of consciousness.[27]

These considerations suggest that while it may be very challenging, subcortical theories of consciousness can be made accessible for a phenomenological description. In this way, such experimental procedures could be also investigated using empirically related phenomenological methods, such as neurophenomenology (Varela, 1996) and micro-phenomenology (Petitmengin et al., 2018).[28]

The last crucial question of our study is this: if we assume that a subcortical theory of consciousness could be verified from a first-person related phenomenological perspective, then how far could the boundaries of legitimate attribution of consciousness be extended beyond the human world into nature?

3.3. Conclusion: The Presumable Borders of Consciousness in the Natural World

We prefer the subcortical theories of consciousness, and Bjorn Merker's conception in particular, for two reasons. First, they seem best suited to a phenomenological approach to consciousness. Second, they grant a legitimate and, from an empirical regard, properly grounded maximal extension of the capability of consciousness in the natural world. If the

[27] One of the most important contributions of the phenomenological method to empirical research on consciousness in general is the first-person perspective as a point of departure and perpetual point of orientation. A scientific theory, no matter how sophisticated or supported by indirect third-person perspective evidence, always remains dubitable from a phenomenological perspective if a possible first-person account is missing. The very point of this experiment would be to secure this first-person foundation in case this experiment were successful. If a person were capable of reporting on experiences that emerged during a state when her cortex was not fully operational, it would provide very strong evidence for subcortical theories of consciousness.

[28] If one wants to use these methods to verify subcortical theories of minimal mind, or at least to render such theories more plausible, they require significant adjustments because in their present form, they are and could be used to examine the correlation between mind and neural states and processes in awake adult persons with *a fully operational cortex*.

Experiments employing these methods – to my knowledge – have yet to be conducted; however, it would be possible to arrange them to collect either indirect or direct pieces of evidence for a subcortical approach.

model provided by Merker is accurate, then *all vertebrates*, and maybe *even some lower invertebrates*, such as *insects*, are conscious.

If a subcortical model of consciousness (versus a cortical one) could be verified, it would mean that the cortex is not responsible for the very being of consciousness in general but only for its higher and more sophisticated forms.

To be sure, even if a thalamocortical (e.g. Llínas et al., 1998) or cortical (e.g. global neuronal workspace theory) model of consciousness were proven accurate, unlike a subcortical model, it would still not mean that *only* mammals and birds could be conscious beings. As far as we know, it is not the specific cerebral regions themselves that are crucial in the generation or activation of consciousness but a certain *functional architecture, a particular set of neural pathways* necessary for being conscious.

Regarding GWT, Bernard Baars emphasizes that it is essentially a *cognitive model* of consciousness and, in principle, has nothing to do with the cortex. ('The 1988 version of GWT made no assertions about the role of cortex in consciousness. These claims are mistaken, and indeed, self-contradictory'; Baars et al., 2021). Accordingly, Murray Shanahan (2016), for example, claims that GWT could be reconciled with a considerably modified Merker model offered by Andrew Barron and Colin Klein (2016) and, thus, could be extended even to *insects*.[29]

I would suggest, however, that we should prefer a subcortical model of consciousness which is smaller in *size* and in the number of *involved functional units from the outset*. This would be more economical than a cortical model. Although, as we mentioned, the emergence of consciousness most probably depends on a specific functional architecture, it also seems very likely that the functional units (in this case, neurons) and their connections in this architecture cannot go *below a certain number* if it is expected to sustain *a concrete form of consciousness* permanently and coherently. Thus, living beings with fewer than a certain number of neurons and their connections cannot be conscious in the strict sense. I believe this because panpsychism, and even biopsychism (the assumption that every living being is conscious), *are phenomenologically unjustifiable* from the first-person perspective of an adult human person.

I deem that *from an empirical standpoint*, Bjorn Merker's approach is currently one of the best conceptions regarding the emergence of consciousness that also contains every fundamental element and structure – along with their proper relations – prescribed by a detailed phenomenological description of the minimal mind. In Merker's model (unlike IIT), it is not

[29] We should note that in Merker, we can already find the possibility that insects – regarding their functional architecture – might be conscious too.

indifferent *which type of information* is integrated and *how*. Furthermore, within this framework, the integration and procession of the proper pieces of information is enough for consciousness; the 'broadcast effect', a requisite in GWT, is not required. Thus, Merker's conception is more economical than GWT. In my opinion, it is a *simple, non-trivial, and elegant model of consciousness*, which is also strongly supported by a first-person phenomenological approach and Ockham's razor.[30]

Finally, in concluding our study, we should make one last important remark. Our phenomenological stance imposes certain very strong constraints regarding the testability of a theory of consciousness – namely, *there must be certain empirical conditions under which it can be tested and verified*. Otherwise, from the phenomenological perspective, such a theory would remain completely hypothetical and speculative. Accordingly, if an insect, such as a honeybee, is conscious, which is a possible implication of Merker's theory and an explicit claim of Barron and Klein, then such a theory must be capable of verification from the first-person perspective of a normal adult human person. In other words, if such an extension of consciousness (e.g. to insects) is supposed to be true, then there must be certain empirical circumstances when, in the case of a healthy adult human, *only those neural circuits are in function* which are held responsible for consciousness in insects, and the human in question can later somehow confirm that during this extremely low level of neural functioning, she had conscious experiences.

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[30] The reference to Ockham's razor here means that a scientific theory must be as simple as possible, although not trivial. It must contain every explanatory element necessary for the full explanation of a phenomenon.

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