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Consciousness: A Four-fold Taxonomy

…it should be understood that 'consciousness' means not a stuff nor an entity by itself, but is short for conscious animal or agent, for something which is conscious. (Dewey, 1906)

…consciousness is neither a definite nor a usable concept… [B]elief in the existence of consciousness goes back to the ancient days of superstition and magic. (Watson, 1924/1970)

…The concept of consciousness is a hybrid or better, a mongrel concept: the word 'consciousness' connotes a number of different concepts and denotes a number of different phenomena… (Block, 1995)

Abstract: *This paper argues that the many and various conceptions of consciousness propounded by cognitive scientists can all be understood as constituted with reference to four fundamental sorts of criterion: epistemic (concerned with kinds of consciousness), semantic (dealing with orders of consciousness), physiological (reflecting states of consciousness), and pragmatic (seeking to capture types of consciousness). The resulting four-fold taxonomy, intended to be exhaustive, implies that all of the distinct varieties of consciousness currently encountered in cognitive neuroscience, the philosophy of mind, clinical psychology, and other related fields ultimately refer to a single natural phenomenon, analysed under four general aspects. The proposed taxonomy will, it is hoped, possess sufficient clarity to serve as a sound theoretical framework for further scientific studies, and to count as a significant step in the direction of a properly formulated unified concept of consciousness.*

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Introduction

Consciousness, once considered to be exclusively dependent for its explanatory grounding on being firmly located 'inside the head', was, by the end of the last century, almost locked therein. While the principle of the 'brain's causal priority' (Bickle, 2008, p. 272) continues to be upheld in explanatory models, anybody insisting today that only the brain is relevant to an understanding of consciousness is liable to be diagnosed with what might be called — to paraphrase a well-known state of impairment — 'methodological locked-in syndrome'. Having been thus radically 'embrained', the emphasis now falls, though, on thinking of consciousness as *embodied* and *situated*, and this relative to a wider environment that includes the social realm (see Thompson and Varela, 2001; Chemero, 2009; Prinz, forthcoming). Extending the analogy just employed to characterize the previously prevalent paradigm, we might gloss radical versions of the new view as embodying a commitment to 'methodological out-of-body experience'.

The most striking consequence of endorsing this 'externalistic turn' in consciousness studies is the strong conviction that almost everything we know now has potential relevance to the attempt to explain consciousness. Cognitive science, which has always exhibited a markedly interdisciplinary character, has, as a result, evolved into a *multi-levelled* and *trans-disciplinary* affair, involving modes of explanation that function at almost all known levels of scientific description of the world (from the microphysical to the social), and in terms that frequently involve close cooperation across a wide range of scientific disciplines.

It seems reasonable to think that in uncovering such a rich network of connections between areas, processes, and seemingly remote domains, we are making some sort of definite progress in the science of consciousness. Unfortunately, however, an *ultra-synoptic vision* of this sort may also prove problematic (see Sellars, 1962), since the concept of consciousness informing the scientific investigations in question then appears to take on an increasingly ambiguous character. Within contemporary debates, as well as in research projects and medical practice, a multitude of varieties of consciousness have come to

be distinguished: *phenomenal* and *access*, *creature* and *state*, *perceptual* and *reflexive*, *normal*, *impaired* and *altered*, *clouded* and *epileptic*, *visual* and *auditory*, *bodily* and *social*, *animal* and *machine* — to name just a few (see Vimal, 2009; 2010a; Brook, 2008; Brook and Raymont, 2006).[1] Because a *unified concept of consciousness* does not exist, it is even harder to prove that the foregoing examples refer to a single neural or biological phenomenon. But are there any stronger connections between the above-mentioned variants, apart from the somewhat fashionable term 'consciousness' itself? Or should we rather agree with Block (1995, p. 227), that '[t]he concept of consciousness is a hybrid or better, a mongrel concept: the word "consciousness" connotes a number of different concepts and denotes a number of different phenomena'?

The overriding aim of this paper is to get closer to a unified concept of consciousness — in effect, to reinforce its positive credentials as they currently stand. The first step in this direction — the one explored here — is the assembling of a stable framework of connections between the varieties of consciousness under investigation, with the aim of showing that they do in fact correspond to multiple aspects of a single natural phenomenon. In the first section, the basic everyday meanings of the terms 'conscious' and 'consciousness' will be briefly described. Subsequent sections will then seek to demonstrate that the many and various conceptions of consciousness propounded by cognitive scientists can all be understood as constituted with reference to four fundamental sorts of criterion: epistemic (concerned with kinds of consciousness), semantic (dealing with orders of consciousness), physiological (reflecting states of consciousness), and pragmatic (seeking to capture types of consciousness). The resulting four-fold taxonomy will, it is hoped, have the potential to serve as a reliable theoretical framework for further scientific study in this field.

Basic Meanings

In everyday language, the words 'conscious' and 'consciousness' are usually used in one or other of two senses: to indicate a person's *waking state* or to assert that they are *aware* of something. As regards the state of wakefulness, the question one typically asks is 'Is he or she conscious?' 'Unconsciousness' here implies that the subject has fainted or is in a coma. Regarding a relationship to an object of aware-

[1] Vimal lists and describes 40 distinct meanings attributed to 'consciousness', classified according to a 'dual-aspect framework' as functions or experiences, while Brook's list encompasses 50 different usages of the term.

ness, on the other hand, the sort of question one typically asks is 'What is he or she conscious or aware of?' 'Lack of consciousness' here implies that the subject is *unaware* of some thing. To be precise, used in reference to the state of wakefulness the term 'conscious' is a one-place predicate (i.e. true for subjects who are awake), whilst used in reference to a subject's awareness it is a two-place predicate (i.e. true when the relation between a given subject and some particular information is fulfilled — when the subject is aware of that information). These meanings may seem trivial but, as will be shown in due course, they form a necessary basis for subsequent distinctions. They will hereon be referred to as follows:

(M1) 'X is conscious', 'X has consciousness' (state of wakefulness)
(M2) 'X is conscious of Y', 'X has consciousness of Y' (relation of awareness)

In popular dictionaries, a few additional meanings are also attached to these terms. For instance, when 'consciousness' is understood as *collective* or *individual mentality* (in sentences like 'The year 1989 penetrated deeply into the Polish consciousness'), or when 'conscious' refers to *intentional action* ('It must have been a conscious act of violence'). However, those meanings are not very important in the current debate.[2]

In 1906, the philosopher Dewey was already in a position to distinguish as many as six different senses, two of these corresponding, respectively, to our M1 and M2. Interestingly, he considered *wakefulness* a newly coined meaning, parasitic on the then emerging discipline of psychology, while at the same time judging 'the distinctively philosophical use' of the term to be a 'peculiar combination' of several other meanings (Dewey, 1906, pp. 40–1). The philosophical concept of consciousness surely remains such a 'peculiar combination', but in fact it was the very distinction *between* psychological and philosophical meanings that turned out later to be crucial, leading as it did (at the end of the last century) to a fundamental split into two *kinds of consciousness* (described in the next section).

[2] See *Webster Encyclopedic Unabridged Dictionary*, p. 311, New York: Gramercy Books (1989) (four meanings for 'consciousness', nine for 'conscious'); or the online dictionary at http://dictionary.reference.com/browse/consciousness (seven meanings) and at http://dictionary.reference.com/broswe/conscious (nine meanings) (accessed 20 Nov 2010). See also note 1.

Kinds of Consciousness

Few if any would dispute the claim that any conscious subject must experience something (distinct sensations, feelings, perceptions, etc.), and in this sense consciousness may be said to be intertwined with experience. It is also claimed that conscious experience is essentially private or *subjective*: i.e. directly accessible only to its subject, meaning that nobody else knows, in the way that the subject does, 'what it is like' to have it (see Nagel, 1974; Searle, 2000). At the same time, there are many *objective* characteristics of the phenomenon of consciousness observed by science. Externally observed manifestations of consciousness are usually correlated with sufficiently complex, non-random, goal-oriented behaviour, or with modes of action involving adaptation to changing conditions, non-standard problem solving, decision making, and so on. Today, it is also possible to detect consciousness objectively by monitoring the very low-level 'internal' activity of the subject: i.e. metabolic and electrical activity in specific brain regions. This sophisticated form of *micro-behavioural observation* can furnish strong scientific evidence for the presence of consciousness in an observed subject.

In the sense described above, consciousness is cognizable 'from the inside' or 'from the outside' — from the subject's (first-person) or the observer's (third-person) perspective. This *epistemic* fact may serve as an initial criterion that will enable us to distinguish two *kinds of consciousness*, i.e. *subjective* and *objective*. The criterion itself, and the distinction that rides on it, will appear in our taxonomy as follows:

C.1 Epistemic criterion: kinds of consciousness[3]
1.1 Subjective (SKCs, cognized from subject's perspective, experienced)
1.2 Objective (OKCs, cognized from observer's perspective, observed)

Explaining the difference between these two kinds of consciousness has proved to be one of the greatest challenges facing contemporary philosophy and science. Wittgenstein (1953, § 412, p. 131) had already noticed it over sixty years ago: 'The feeling of an unbridgeable gulf between consciousness and brain-process… This idea of *difference in*

[3] The criterion is called 'epistemic', rather than 'epistemological', in order to emphasize that what we are concerned with here is just *first-order cognition*, in that the *meta-cognitive reflection* typical of epistemology is not regarded as relevant. For more on this, see Wolenski (2005, pp. 83–4). The label 'epistemic' is also broad enough to encompass most similar sorts of division: e.g. Block's P-consciousness vs. A-Consciousness, Chalmers' phenomenal vs. psychological, and Vimal's experiential vs. functional.

kind is accompanied by slight giddiness…' (italics added). That 'unbridgeable gulf' between subjective consciousness and objective brain processes has later come to be referred to as the explanatory gap (see Levine, 1983; 2001), and has played a major role in subsequent discussions.

An epistemic criterion also underlies the famous distinction made by Block (1995) between *P-consciousness* and *A-consciousness* (*phenomenal* and *access*, respectively). Inasmuch as both kinds of consciousness are accessed in a sense — one only from the inside (i.e. subjectively), the other also from the outside (i.e. objectively) — the use of the terms 'phenomenal' and 'access' here can be questioned. A detailed discussion of whether or not the distinction itself is theoretically sound (see Kriegel, 2006) or empirically valid (see Mangan, 1997) lies beyond the scope of the present article. It is sufficient for our purposes, however, to note that the basic idea underlying it would appear to be consistent with the subjective-objective distinction.

Chalmers, who has strongly endorsed Block's idea, makes use of the notions of 'phenomenal' and 'psychological consciousness' in much the same sort of context (Chalmers, 1996, p. 23). Nevertheless, for him the idea has stronger consequences, inasmuch as he claims that these two notions effect a division of the entire mind–body problem into two distinct domains — one fairly 'easy', the other really 'hard', or even, perhaps, intractable for the sciences. 'The really hard problem of consciousness is the problem of experience. When we think and perceive, there is a whirl of information-processing, but there is also a subjective aspect. As Nagel… has put it, there is something it is like to be a conscious organism. This subjective aspect is experience' (Chalmers, 1995, pp. 200–1). Although not particularly innovative, the *hard problem* has become extremely influential, surfacing as it did at just the right time — when raging reductionism was becoming increasingly unpopular in philosophy — and in just the right form — effecting as it did a synthesis of the many anti-scientistic arguments inherited from past discussions.

The notion of epistemic subjectivity, central to such topics as the 'hard problem', the 'explanatory gap', and 'phenomenal consciousness', has been around in the philosophical debate for much longer. Not only was it embroiled in the complicated problem of qualia (genetically not very far from atomistic associationism and the sense-data debate; see Crane, 2000), but it also formed a basis for such notions as *secondary qualities, acquaintance, appearance*, and *raw feels*. Over the years, subjectivity has become the weapon of choice in the critique of the dominant paradigms in scientific (objective)

explanations of mind — one not easily disarmed, in that understood as something almost primitive and indefinable, its meaning tends to become rather vague and elusive. Today, for example, subjectivity is sometimes identified with awareness 'of point of view' or 'of the self', or with a 'feeling of what it is like to be someone' (see Kriegel, 2006, p. 3; Levine, 2001, pp. 6–7). Other authors extend it to the point of insisting that 'all consciousness is essentially subjective' (see Searle, 1992, pp. 20–1; 2000, pp. 561–70), or even further, claiming existence of 'unconscious subjectivity' (see Neisser, 2006, pp. 1–6). Not surprisingly, eliminativism has cut little ice with such an elusive entity: it seems easier to disarm the implications of subjectivity by clarifying the meaning and reference of the concept (with relation to qualia and phenomenality; see Bayne, 2009) than by seeking to eliminate it. One positive result of the debate over subjectivity is that the latter has acquired significance as something to be explained within consciousness studies. Yet this probably does not correspond to a substantial shift in the foundations of science: we still expect it to be objective, even when targeting subjectivity itself.

Finally, it is worth noticing that when distinguishing two kinds of consciousness on the basis of the epistemic criterion, both of the basic meanings (M1 and M2) are in play. 'Being in a state' of consciousness (M1), as well as 'being conscious of' something (M2), will invoke certain objective manifestations (at a micro- or a macro-behavioural level) and may, at the same time, result in certain subjectively experienced qualities. Considered in isolation, and especially when understood along Dennettian lines (Dennett, 1988) as *intrinsic, ineffable, immediately accessible, private* feelings, qualia (essential for P-consciousness) may seem more like states (M1). For example, certain altered states of consciousness (e.g. hypnosis, trance, meditation) quite often lack any distinct referential content actually known to the subject, and so tend to be characterized in an essentially qualitative way, in terms of 'what it is like' to undergo them.[4] Nonetheless, one might also regard them as relational states holding between a subject and a phenomenal property, or even between proper (internal) parts of a subject of consciousness.[5] In A-consciousness, on the other hand, meaning M2 seems to be more evident, as one must have access to something if one is to be 'conscious of' it.

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[4] Altered and other states of consciousness will be discussed separately in this paper.

[5] I owe this remark to an anonymous referee of this article.

Orders of Consciousness

To build a *materially adequate* definition of truth, avoiding paradoxes, Tarski (1933/1983) made an important semantic distinction between, as he called it, *object-language* (the language under discussion) and *meta-language* (the higher-order language used to talk about an object-language). His famous sentence, *'snow is white' is true if and only if snow is white*, is in the meta-language, as it concerns the first-order truth conditions for the object-language sentence about snow. Consequently, this commentary (about Tarski's meta-language sentence) must itself be in a meta-meta-language, or third-order language, which in turn brings *this* actual sentence to the level of fourth-order status, and so on.[6] In practice, though, it is rare that we have cause to go beyond third-order constructions.

When one construes consciousness in the sense of M2, similar gradations of semantic order are clearly in evidence. A subject X may be just 'conscious of Y', may be 'aware of being conscious of Y', or may even be 'conscious of the fact that she was aware of being conscious of Y', etc. Obviously, an increase of semantic order will reflect, directly or indirectly, a variety of physiological, developmental, and social factors: for example, the possession of certain neurological structures, the instantiation of appropriate developmental conditions, involvement in essential environmental or social interactions, and so on. This is why we find that the various hierarchical models of consciousness presented in the literature tend to feature a mix of all these elements, with the proportions reflecting the chosen area of specialization of the individual researcher. (For a brief overview of theories proposing multiple levels of consciousness, see Morin, 2006.)[7]

It is worth noticing, here, that the semantic hierarchy of conscious information is *linear*, whereas biological systems operate *non-linearly*, with the information used by organisms being processed on many levels at the same time (*parallel*), and in different structures of their nervous system (*distributed*). Naturally, the whole process is dynamic: i.e. subordinated to the actual state of both the organism (aims,

[6] Generalizing the idea, for any n-order sentence it will be possible to create a higher-order sentence (n+1) in a richer meta-language where first-order sentences function as the bottom-level limiting cases that directly refer to the world.

[7] The expression 'levels of consciousness' is quite popular, but unfortunately also ambiguous, as it is used not only to denote semantic orders of reference but also levels of (behavioural or metabolic) arousal and of (individual or social) development. For the sake of clarity, I suggest using the expression 'levels of consciousness' just to denote neuronal or behavioural *arousal*, the phrase 'orders of consciousness' just to convey the idea of a *semantic hierarchy*, and 'degrees of consciousness' to refer just to gradations of a *developmental* kind.

emotions, physiology) and the environment (quantity and quality of available information, available reaction time, place or context of action).[8] The meaning of information used by a given organism is evolutionarily embedded, socially altered, and subjectively grounded (relative). Although the linear semantic hierarchy is correlated or *naturally supervenient* on such non-linear factors, it is important not to mix the two. We distinguish semantic *orders* of consciousness by the referential content of the conscious information they involve, whereas physiological and environmental data provide the criteria for differentiating both *states* and *types* of consciousness (to be described in the following sections).

It is also worth noting that intentionality, considered by many a definitional feature of consciousness (see, for example, Searle, 1992; 2000), is directly connected with the notion of semanticity or referentiality invoked in this section. This is just to concur with Pierre (2003), who asserts that '[b]ecause intentional states are *of* or *about* things other than themselves, for a state to have intentionality is for it to have semantic properties'. However, 'intentionality' itself is a highly complex concept, steeped as it is in long-standing and wide-ranging philosophical discussions (with respect to both its 'classical' Brentanian version and subsequent applications in phenomenological and analytic philosophy). These have imbued it with complex associations that tend to be unavoidably implied or inferred whenever the term is employed. For our purposes, then, it seems better to just make use of the term 'semantic'.

Consciousness, as it occurs in the animal world, presents us with at least five consecutive orders of reference. For example, when an organism engages in non-random avoidance of obstacles, utilizing visual or auditory information present in its environment (such as photons or sound waves), and does so without being conscious of either what has been avoided or the avoidance behaviour itself, one may say that it exhibits *first-order consciousness* of the environment (1^{st}OC). As the outcome of basic sensory detection processes, 1^{st}OC enables 'online' motor coordination, and thus may be called *sensorimotor consciousness*.[9] Consequently, information accessed at the level of *second-order consciousness* (2^{nd}OC) is about the first-order

[8] The general aim of the process is to select efficient patterns of action out of those stored during development (individual history or *ontogenesis*) while also belonging to a set of genetic possibilities (established during *phylogenesis*).

[9] For efficient motor actions, the organism will also need basic (first-order) body-consciousness (based on proprioception). For our purposes, body-consciousness will be located in the category *types of consciousness*.

information, and so does not refer directly to the environment itself. At this level, sensorimotor information comes to be integrated into basic perceptual wholes or percepts, making *perceptual consciousness* an appropriate term here. A creature whose perceptual information is thus integrated should be capable of *proto-categorization*: apart from obstacle avoidance, they should be able to execute choices, to respond differentially to what counts, for them, as being or not being safe, desirable, useful, edible, and so on. In a sense, it is at this point that the subject's cognitive system starts to answer the '*What-is-it-I-am-perceiving?*-question' in addition to the '*Where-is-it?*-question' of the previous stage.

As a scientific justification for such a view, we may invoke the well-supported hypothesis of the existence of two relatively independent pathways in the brain, known as the *dorsal* and *ventral streams*, adapted respectively for motor actions and perception (see Milner and Goodale, 1998). Recent findings suggest that these two paths are not as independent as initially assumed (see Farivar, 2009): they are, in some way, coupled together, functioning as consecutive or integrated steps in an overarching process of cognition. This surely makes for a picture of what is going on in cognition that is significantly more consistent with the implications of the notion of semantic orders of consciousness.[10]

Described like this, both 1stOC and 2ndOC are frequently seen as not amounting to consciousness at all. These early stages of motor and perceptual responses are more often labelled as *pre-conscious, subliminal*, or even *unconscious*. But why assume that this process of arriving at successive levels of *semantic superstructure* only acquires the special feature we call 'consciousness' at a certain higher-order level? The very fact of 'information use' by a given subject should, regardless of its order, be taken to constitute consciousness of that information — no more and no less — so no special further ingredient is needed.[11]

Third-order consciousness (3rdOC), in so far as it transcends the basic perceptual information present in 2ndOC to yield information about one's own perceptions themselves, may be termed *meta-*

[10] The famous 'D.F. case', studied by Milner and Goodale, is sometimes interpreted as a case of 'seeing without consciousness', but should rather be understood as an example of 'acting without perception'. Indeed, that was the position of the authors themselves, and remains compatible with the claim that D.F. possessed first-order visual consciousness at least, but without higher orders of visual awareness.

[11] Of course, the essentially pragmatic characterization of consciousness and the notion of information implied here ought to be spelled out in more detail, but that task will have to be addressed elsewhere.

perceptual consciousness.[12] Being aware of the perceptual process, at this stage, a subject will be able not only to categorize percepts, but also to make basic choices and predictions within and upon perceptual modalities. For example, he or she will now 'know' that some particular acoustic and visual data come from the same object, and may correct the relevant perceptions more efficiently (e.g. matching up the blurred image of an animal with the distinctive sound it makes). At the next level of abstraction (4^{th}OC), which takes us beyond perceptual processes, the subject should begin to be aware of the existence of their own agency and/or selfhood, thus acquiring *self-consciousness*. Admittedly, certain informational elements pertaining to the self will have already had to be present within consciousness at previous stages, but it is only here that 'the self as a whole' can become an object of consciousness.[13] Although a proto-conception of selfhood already emerges here, the formation of a coherent conception of self calls for yet another stage. Fifth-order (5^{th}OC) *meta-self-consciousness* requires a capacity to engage in symbolic thought about one's own self — the sort of capacity only made possible by something as distinctive as human language.[14] Whereas previous semantic levels, up to and including self-consciousness, are shared by us with other species, *meta-self-consciousness* seems to be unique to the human brain.[15] Recent studies also point to the evolutionary immaturity of this highest form of consciousness in respect of what human brains are potentially capable of (see Fleming *et al.*, 2010).[16]

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[12] This level of consciousness is sometimes characterized as 'introspective' or 'reflexive' (see e.g. Van Gulick, 2004; Kriegel, 2007). However, because the very notion of *introspection* is itself ambiguous, while *reflexivity* may refer to either different orders or the same one, the label 'meta-perceptual' seems more neutral and appropriate.

[13] Elements of *proprioceptive body-consciousness* and certain *social consciousness* will have had to be present before the subject becomes self-aware. Empirical data suggest that animals capable of being self-aware learn this mainly from social relations, distinguishing their own bodies by observing others (thanks to mirror neurons and empathy). However, this is not a new thought: it was already endorsed a century ago by pragmatists in America and, in Europe, by Bergson, who was then followed by the phenomenologists (especially Merleau-Ponty).

[14] The crucial role of language in higher-order consciousness processes is emphasized by, among others, Clowes (2007), Stamenov (2003), and Morin (2005).

[15] Animals that efficiently recognize themselves in a mirror (passing the so-called *mark test*) are generally thought to be self-conscious in virtue of this fact. Indeed, it has been proved that apart from human beings and great apes, elephants and some marine mammals, such as bottlenose dolphins and orcas, also do this. See Smith (2009), Plotnik *et al.* (2006), Reiss and Marino (2001), Delfour and Marten (2001).

[16] In an experiment, Fleming and others found that not everybody is able to introspect and evaluate their own conscious decisions with equal accuracy: those who performed best were found to possess a substantially greater volume of grey matter in the region of the

To sum up, then, the orders of consciousness, distinguished on the basis of a semantic criterion, will be as follows:

C.2 Semantic criterion: orders of consciousness
2.1 Sensorimotor consciousness (1stOC, about the environment)
2.2 Perceptual consciousness (2ndOC, about percepts)
2.3 Meta-perceptual consciousness (3rdOC, about perception)
2.4 Self-consciousness (4thOC, about the perceiving subject)
2.5 Meta-self-consciousness (5thOC, about the self-conscious subject)

A hierarchy of this type is visible in various kinds of approach to the issue of consciousness in philosophy, psychology, and cognitive neuroscience (many examples are listed in Morin, 2006, as well as below). The total number of orders posited, the specific names used for consecutive levels of consciousness, and the scientific contextualization of these, may all vary significantly between individual approaches, but the idea of successive levels of *superstructure* defined in terms of what they are semantically *about* is a constant feature.

Philosophically, this idea may be said to have originated — like many — in ancient philosophy. Aristotle, observing in *De Anima* (425b, 12–25) that 'inasmuch as we perceive that we see… it must either be by sight or by some other sense…', was probably the first to note the *reflexive* nature of consciousness.[17] In the modern era, the problem posed by *the Philosopher* was subject to some fairly momentous developments in the writings of Locke and Kant, both of whom assumed the existence of a distinct inner sense enabling one to reflect on one's own perceptions. Around this time, Leibniz even went so far as to propose a *continuum* of grades of consciousness, describing *apperception*, usually identified with self-consciousness, separately.[18] In contemporary philosophy of mind, the Aristotelian idea is present in many kinds of theory involving the notions of *inner sense* and *higher-order levels*. Here, consciousness either figures as a sort of *higher-order perception* (see, for example, Armstrong, 1981; Lycan 1996), *higher-order thought* (see e.g. Rosenthal, 1986), or *higher-order*

anterior prefrontal cortex. The claim that their meta-self-consciousness was fully developed seems legitimate.

[17] See Hicks (1907, p. 113); Hamlyn (1968, pp. 47–8).

[18] See Locke (1689/1996, pp. 33–9), Kant (1781/1997, p. 153), and Leibniz (1704/1996, preface). Leibniz is known for the many innovative observations he makes, contributing in essential ways even then to what we would now call consciousness studies — for example in areas such as attention, memory, motivation, and unconsciousness, to name but a few.

availability (Carruthers, 2005; Gennaro, 2005; Van Gulick, 2004).[19] These theories characterize phenomenal consciousness by making use of some sort of semantic ascent.[20] In Rosenthal's HOT model, for example, at least three grades are indicated: *intransitive creature consciousness* with basic responsiveness, world-directed *transitive creature consciousness*, and self-directed *state consciousness*.

Semantically differentiated orders of consciousness are easy to find in classical psychology, but, unsurprisingly, are more closely connected with developmental, physiological, social, and other factors. In Jamesian philosophical psychology it is possible to distinguish four grades: the *material self, social self, spiritual self*, and *pure EGO*. The spiritual self has a lot in common with self-consciousness, whereas pure EGO, in which a subject sees himself or herself as a conscious 'thinker', shares more with meta-self-consciousness (James, 1890/1999, pp. 291–330). In *Mind, Self and Society* (1934) Mead emphasized the idea that the sort of mental 'functioning' involved when one becomes an object of one's own 'thought-processes' is a product of social interactions and language use: we first acquire the idea of the *other*, then the idea of *self*. Behaviourists, on the other hand, would prefer to eliminate consciousness entirely from the scientific realm, making any investigation of its functions redundant (e.g. Watson, 1924/1970). Their attempts, while apparently successful at first, subsequently provoked the rapid growth of consciousness studies still visible today.

Contemporary psychologists also often see consciousness as a process exhibiting gradational structure. For example, four out of six

[19] See Kriegel (2007), and Carruthers (2009).

[20] As an anonymous reviewer of this paper has perceptively pointed out, it is by no means easy to accommodate so-called self-representational theories (see Kriegel, 2006; 2007) within the model of a semantic ordering of conscious experience, especially given the Tarskian preamble invoked here. Hence such self-representation or self-reference may, in all probability, need to be ruled out by stipulation. Although much more detailed analysis would be required to properly resolve the issue, we may glimpse the beginnings of where it might lead by taking due note of the following: while it is true that we distinguish semantic *orders* of consciousness much as we do orders of language, by *referential content*, in the case of consciousness the question of whether orders are numerically or logically independent from one another remains open. Certainly, the most important semantic feature that consciousness shares with language is its referentiality, or *aboutness*, but the main difference is that consciousness is not embedded in a language-like symbolic system. Higher-order language has to be richer than a lower-order language system (to avoid self-reference), whereas higher-order consciousness is embedded in the same cognitive system as lower-order consciousness — only it uses more complex cognitive structures contained within that system. From one perspective, then, consciousness seems to be a complex but unified biological process, whilst from another it appears as a multi-levelled semantic structure. In that case, the discussions surrounding the nature of its semanticality seem destined to continue well into the future.

varieties of consciousness described by Natsoulas (1983; 1997a,b), may be understood as consecutive semantic orders, with that author's 'consciousness six' bearing a close resemblance to the idea of meta-self-consciousness described earlier. The five 'kinds of self-knowledge' that Neisser (1988) distinguishes reveal an even more obvious gradational structure of a semantic nature, moving from the idea of an *ecological self* to that of a *symbolic-self-concept*. As we have already mentioned, Morin (2006) has juxtaposed and systematized many theories like this: gradational orderings are discernible, for example, in both Zelazo's (2004) developmental approach and the neuroscientific approach of Stuss and Anderson (2004).[21]

In neuroscience, well known contributions compatible with the 'semantic orders view' include Damasio (1999), involving a distinction between *protoself*, *core consciousness*, and *extended consciousness*, and Edelman (1992), analysing *primary consciousness* not just in terms of a contrast with *higher-order consciousness* but also in terms of sub-levels (*conceptual categorization*, *scene formation*, and *symbolic representations*). Within attempts to arrive at a strictly scientific characterization of consciousness, however, semantics is usually subordinated to the sort of physiological factors underlying the distinctions explored in the next section here.

States of Consciousness

Whereas the term 'consciousness' was deployed in the previous section in the sense of M2 (X is conscious of Y) when exploring semantics-based orderings, it will now be used in that of M1 (X is conscious) to talk about *states of consciousness*. This reflects a shift of focus away from the object of consciousness to the subject itself: from the question 'What is X conscious of?' to the question 'Is X conscious and, if so, in what way?'

The states of consciousnesses distinguished in this section differ in respect of both physiological and behavioural characteristics. Being in a given state is directly or indirectly determined by a variety of factors. These may include the metabolic and electrical activity of the nervous system itself, brain lesions, aetiologically diverse forms of damage to the body, specific environmental conditions, incidents with special affective (e.g. emotional) significance for a subject, performances of certain actions (e.g. praying, dancing, high-altitude climbing), effects of psychoactive substances, and so on. Depending on

[21] Gradations-of-consciousness-based approaches are also discernible in both Vimal (2010b) and Bruzzo and Vimal (2007).

how these factors influence a given organism's physiology, its conscious state may remain fairly normal or become more or less impaired or altered. Precise assessments of the resulting state, based on codified procedures, as well as brain scanning, assume primary importance in the fields of clinical psychology, psychiatry, and neurology. Modern neuroimaging methods enable us to identify, with a significant degree of accuracy, the neurological basis for distinct alterations and impairments to consciousness, and in so doing serve to highlight the sheer complexity of the processes underlying consciousness.

Physiologically normal states of consciousness, roughly speaking, occur in a 'healthy' organism (able to maintain homeostasis), in 'ordinary' environmental conditions, and during 'regular' or 'common' activities. Being in such a state, a subject should exhibit coherent patterns of behavioural response to given stimuli, as well as standard levels of efficiency with respect to cognitive tasks (object recognition, self-recognition, etc.) and social interactions (communication, empathy, etc.). No strict definition of 'normal state' exists, partly because terms like 'healthy', 'ordinary', 'regular', and the like do not fulfil rigid conditions. *Normal consciousness* is, then, more of a statistical idealization or approximation than a real state: nobody is ever actually in such a state. However, the fact remains that the more deviation there is from these 'idealistic standards', the greater the impairment or alteration of consciousness that can occur, up to the point where we border on pathology. Among physiologically 'normal' states, we may also distinguish between cycles of *wakeful-states* (WSCs) and *sleep-states* of consciousness (SlSCs).[22] Further distinctions within waking/sleep modes reflect levels of arousal (behavioural, metabolic, neuronal) and task performance; only in the human case are they based on verbal reports of one's own experiences while in a given state.

The neuronal basis for transitions between WSCs and SlSCs is to be found in the reticular activating system (RAS) connecting the brainstem to the cortex. The RAS also correlates the arousal of the relevant cortical structures with the level of importance and recognition of a given stimulus (less familiar and more important stimuli will increase activation).[23] While countless attempts have been made to uncover the neural correlate of consciousness (NCC) — a distinct area in the brain

[22] For instance Faw (2009, pp. 64–6) distinguishes a *normal wakeful state* of consciousness (NWS), *dream-sleep consciousness* and *slow-wave-sleep consciousness* and *unconsciousness*.

[23] This initial selectivity for stimulus importance and familiarity at brainstem level is accomplished in structures such as the dorsal raphe nucleus, pedunculopontine tegmantal nucleus (PPTN), and locus coeruleus.

responsible for switching it 'on' — no such a thing seems to have been found, and neither is there any consensus about what it is that is supposedly being looked for.[24] Scanning methods have shown, at the very least, that complex phenomena such as the 'feeling of being someone' or the 'experience of colour' employ vast and sometimes distant regions — albeit almost always centred around the thalamo-cortical complex (T-C). Moreover, there is now a consensus that structures correlated with consciousness (e.g. the prefrontal areas, anterior cingulate gyrus) do not process information in the early stages, and are involved in complex, far-reaching connections.[25] According to another finding, if activity in those areas occurs for approximately half a second, with firing-potentials synchronized in time and at a certain frequency (mainly at gamma-wave level), there is a strong likelihood that the subject will be conscious.[26] We definitely do know something here, but are still awaiting a detailed specification of how these connections within the T-C complex could give rise to the whole range of events involved in consciousness. (*Dynamical core theory* is one of the most popular accounts of this: see Edelman and Tononi, 2000.)

Things become still more problematic when seeking to differentiate between a *minimally conscious* state and one entirely bereft of consciousness (see Dehaene *et al.*, 2006). This is not only theoretically complicated, as manifestations of consciousness are not well defined, but also challenging in practice, especially when certain disorders and impairments affect the normal state. In clinical practice, fixing the borders of consciousness is sometimes a life-or-death matter and, as such, should not ever be permitted to be mistaken. Unfortunately, as Giacino (2005) found, up to forty-one per cent (!) of cases may be misevaluated. Patients with severe consciousness disorders are assessed, in mainly quantitative terms, against certain scales. The diagnostic procedures are based on the recording of certain behavioural responses to induced stimuli, with the score obtained on a given scale crucial to the prognosis for recovery and the planning of treatment. The first and most popular diagnostic tool, the Glasgow Coma Scale (*GCS*), is still used in refined and revised versions; others used today

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[24] For discussions of NCCs see, for example, Metzinger (2000), Noë and Thompson (2004), and Hohwy (2009).

[25] However, scientific enquiries are mostly concerned with 'higher-order phenomenal consciousness of a certain type': e.g. the higher-order experience of vision (*visual consciousness*).

[26] A time delay in higher-order consciousness is revealed for example in the famous ERPs P300 and N400, correlated, respectively, with new and semantically incoherent stimuli.

are, *inter alia*, *CRS* and *CRS-R* (Coma Recovery Scale-Revisited), *FOUR* (Full Outline of UnResponsiveness scale), and *WHIM* (Wessex Head Injury Matrix).[27]

The patients most often subject to misdiagnosis were those who, being in fact in a *minimally conscious state* (with sensorimotor or even basic perceptual responsiveness preserved), were assessed as being in a *vegetative state* (with RAS operational, sleeping-waking cycle preserved, yet not even rudimentary sensorimotor consciousness). However, the most dramatic mistakes concern patients with *locked-in syndrome* or *pseudocoma*: i.e. those presenting themselves as entirely unresponsive behaviourally (except, sometimes, for preservation of eyelid movement), while nevertheless being in fact almost fully conscious at the time (see Plum and Posner, 1982, and Patterson and Grabois, 1986, which includes a review of 139 such cases).

Various *impaired states of consciousness* (ISCs) are defined in clinical psychology. Some, like clouded consciousness, confusion, delirium, obtundation, drowsiness, and stupor, are construed with reference to pathologically diminished levels of arousal, right down to the level of actual coma. Others, like epileptic consciousness, are defined in more qualitative terms, as being accompanied by the distinctive sorts of experience that typically co-occur with certain disorders, like epilepsy (see Alvarez-Silva *et al.*, 2006; Johanson *et al.*, 2003). There are, potentially, more states of consciousness of the latter sort: for example 'schizophrenic consciousness', or 'consciousness-in-depression', and so on. *Sleep disorders* should also be included here, as consciousness is sometimes seriously impaired during sleep (see Moller *et al.*, 2006; Bosinelli, 1995; Cologan *et al.*, 2010).

There is also a large catalogue of so-called *altered states of consciousness* (ASCs).[28] Specific alterations in consciousness are reported as occurring during hypnosis, trance, meditation, drug-induced states, mystical experiences, near-death experiences (NDEs), out-of-body experiences (OBEs), extra-sensory perceptions (ESPs), and lucid dreaming (LD). Despite their allegedly supra-natural character, emphasized by some, it is most likely that ASCs, like other states, are caused by specific biochemical changes in the brain, induced by the situations listed above. However, ASCs differ in their nature from

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[27] See Teasdale and Jennett (1974), as well as Schnakers *et al.* (2008). Giacino (2008), moreover, lists seventeen different scales used in consciousness disorder assessments.

[28] This term, originally coined by Ludwig (1966), was popularized by Tart (1969). Detailed analysis of the many varieties of ASC may be found in Kokoszka (2007), who distinguishes between *profoundly altered* (PASC) and *superficially altered* (SASC) states of consciousness.

other states, since unlike those they have been traditionally defined with reference to subjective data (see Tart, 1972, p. 1203) and so are difficult to study empirically. Another difference is that while all states depend on physiological changes to some extent, the alterations in question are temporary and for the most part do not impair conscious abilities: their nature is therefore not properly described as either neuro- or psycho-pathological. (Some would even say that they involve the addition of something extra to the normal state.) Yet another is that most altered states are not life threatening, and are typically induced through intentional action — sometimes of a rather specific socio-cultural character. Such features may be adduced to account for the fact that ASCs, and their specifically physiological basis, have not been subject to any particularly intensive scientific enquiry for quite a while, thus leaving the way open for a proliferation of para-scientific activities.

In this section we have sought to distinguish states of consciousness on the basis of the varied conditions and states of the subject's body. The assumption that all fluctuations in the state of consciousness — whether subjective alterations or objective behavioural changes — are physiologically determined seems legitimate, and so the overall criterion employed here may be safely labelled as *physiological*. Both normal wakeful states and sleep-states of consciousness (WSCs, SlSCs) have been differentiated from neurologically and psychologically impaired states (ISCs), as well as from altered states ones (ASCs). It would, perhaps, be logically correct to group these states of consciousness into the physiologically *normal* (WSCs, SlSCs) and *abnormal* (ISCs, ASCs), but such a grouping, apart from being ethically questionable, would not be of much use, given that we can only define *normal states* in relative terms. Hence, we may pass over it as we proceed to summarize the distinctions outlined above:

C.3 Physiological criterion: states of consciousness
3.1 Wakeful states (WSCs, occurring in physiological wakefulness)
3.2 Sleep-states (SlSCs, occurring in physiological sleep)
3.3 Impaired states (ISCs, occurring in neuropsychological disorders)
3.4 Altered states (ASCs, occurring in non-standard conditions)

Types of Consciousness

Where the semantic criterion was concerned, our focus was on information accessed in consciousness: its order-of-reference, to be

precise. Where the physiological criterion was concerned, it was on the subject's states of consciousness. In the current section, though, both factors show up as important. Further distinctions — this time between different *types of consciousness* — are made according to a criterion that can be considered *pragmatic*, as it concentrates on the following three problems:

(1) What is the major *source* of the information the subject is conscious of?
(2) For what purposes, and in what circumstances, may the information given be made use of? Put another way, what is the *aim* and *context*-of-use for the consciousness?
(3) Who or what is the subject of consciousness? That is, what type of animal or cognitive system can, and does, possess consciousness?

As far as (1) is concerned, it is not possible to discern more than a few *source-defined types of consciousness* (SoTCs). In the case of humans and many animals, what may be distinguished are just *visual* and *auditory*, *olfactory* and *gustatory*, *tactile* and *proprioceptive* (or *bodily*) types. These are listed in pairs, in so far as they stand in close relations to one another structurally and functionally: e.g. the *visual cortex* lies close to *auditory areas* and both senses may serve as a basis for spatial orientation. It is worth noticing, however, that some sensations, like pain (important in consciousness studies) and balance, rely on intertwined inputs from multiple sensory systems. At the same time, not all sensory systems have distinct sensory organs — proprioception, for example, lacks a particular organ — or even a distinctive type of receptor: smell and taste both rely on chemoreceptors, touch and hearing on mechanoreceptors. One feature that particularly calls for further investigation here is the fact that not all types of sensory information count for the higher orders of consciousness: in human beings, for example, visual consciousness may certainly inform the symbolic order, but proprioceptive information seems only to count for a significantly lower one.

In answer to (2), we may assert that there are, indeed, many *use-defined types of consciousness* (UTCs), including *social consciousness, emotional consciousness, body consciousness, spatial consciousness, motor-skill consciousness, time consciousness*, etc.[29] Each of these refers to a certain type of information and an ability to

[29] Social consciousness is understood here as 'individual skilfulness' in making use of social information (gestures, signs, emotions, etc.), not as a 'collective mentality' emerging within a closely interacting group setting (Pareira and Ricke, 2009, p. 40). The notion of

use it in specific situations. Roughly speaking, information accessed at a given moment (i.e. entering consciousness) is an outcome of comparisons between external information (i.e. of an environmental sort) and internal information (i.e. the kind stored in memory systems). These cognitive resources differ between individuals, even within a single species. For example, it is simply not the case that every man or woman has identical social or motor skills: effectiveness and competence with respect to consciousness of any particular type will always be a function of individual history, 'habitus' (i.e. ecological *niche* and social group), and way of life (such as the amount and type of activities entailed) — not to mention genetic determinations of what is feasible.

An important point to make with respect to UTCs is that cognition embedded in natural systems is, as far as we know, strongly adapted to use in certain environmental contexts, fulfilling biologically specified needs (aims): in short, such cognition is always *situated*. The organism, finding itself in a given situation, is always committed to making certain cognitive assumptions, at one and the same time adjusting its sensory systems (sensitizing itself to this or that stimulus type) and reducing the set of possible modes of action (active heuristics). Such a procedure is not only economically justified, but also practically efficient, in spite of its susceptibility to error. Consciousness in nature is, then, definitely designed to be of use in specific conditions: *usability* or *situatedness* should be thought as one of the most important factors when explaining the functioning and origins of consciousness as a natural phenomenon. For this reason alone, it would be a mistake to neglect UTCs in favour of other varieties of consciousness described in the article.

As regards (3), where the question concerns the type of animal or cognitive system that may possess consciousness (*system-defined type of consciousness*, SyTC), a multitude of theoretically and practically challenging problems have been raised. Scientists and philosophers associate consciousness not only with naturally evolved systems, like chimpanzees, bats, dolphins, and fruit flies (see the studies of animal consciousness in Griffin and Speck, 2004, and Edelman and Seth, 2009), but also with artificial systems (see the investigations of machine consciousness in Holland, 2003, and Torrance *et al.*, 2007), and even with counterfactual or hypothetical systems such as Zombies, Martians, 'Mary the neuroscientist', thermostats, 'the population of

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'social consciousness', in the latter sense especially, was developed in the early twentieth century by Royce (1895), Cooley (1907), Mead (1910), and others.

China', and so on. There are many fundamental arguments about the form of consciousness possessed by those creatures — is it phenomenal or not, self-consciousness or merely perceptual consciousness, normal or somehow altered? — and about the very possibility of possessing it.

Relative to the pragmatic criterion described in this section, the term 'consciousness' may be said to function in both of its basic meanings (M1 and M2), since both states and referents of consciousness count here as important. In sum, we have sought to distinguish the following types of consciousness:

C.4 Pragmatic criterion: types of consciousness
4.1 Source-defined (SoTCs, according to type of sensor)
4.2 Use-defined (UTCs, according to type of situation)
4.3 System-defined (SyTCs, according to type of system)

The Four-fold Taxonomy

Based upon the epistemic, semantic, physiological, and pragmatic criteria (C.1–4) and two basic meanings (M1, M2) outlined above, four major varieties of consciousness have been distinguished here: kinds, orders, states, and types. In more precise terms, these amount to two kinds of consciousness (SKCs, OKCs), five consecutive orders (1^{st}–5^{th}OCs), four state categories (WSCs, SlSCs, ISCs, ASCs), and three type categories (SoTCs, UTCs, SysTCs), altogether making fourteen different categorizations of the phenomenon of consciousness. The distinctions form a clear *four-fold taxonomy*, presented in Table 1.

Criteria	**Varieties of consciousness**	**Description**	**Examples**	**Basic meanings involved**
Epistemic Kinds of consciousness	1.1 Subjective consciousness (SKC)	Cognized from subject's perspective (experienced)	*Phenomenal, first-person, qualitative, for-me-ness, what-it's-like-ness*	**M1** 'X is conscious' (awake) **M2** 'X is conscious of Y' (aware)
	1.2 Objective consciousness (OKC)	Cognized from observer's perspective (observed)	*Access, psychological, third-person, functional*	

Criteria	Varieties of consciousness	Description	Examples	Basic meanings involved
Semantic Orders of consciousness	2.1 Sensorimotor consciousness (1st OC)	Refers to environment. Applied in basic motor actions	*Sensorimotor awareness, ecological self, proto-self*	**M2**
	2.2 Perceptual consciousness (2nd OC)	Refers to one's own perceptual content (percepts). Enables adjusting motor actions	*Transitive consciousness, core-consc., perceptual categorization*	
	2.3 Meta-perceptual consciouness (3rd OC)	Refers to perception itself. Enables adjusting perceptual processes	*Inner sense, state consc., introspective, pre-reflexive*	
	2.4 Self-consciousness (4th OC)	Refers to perceiving subjects. Enables self-identification	*Self-consc., extended consc.*	
	2.5 Meta-self-consciousness (5th OC)	Refers to self-conscious subject. Enables abstract concept of self	*Symbolic, self-concept, recursive self-consciousness*	
Physiological States of consciousness	3.1 Wakeful states of consc. (WSCs)	Occur in physiologically normal wakefulness	*Normal state of waking consc. (NWS)*	**M1**
	3.2 Sleep-states of consc. (SlSCs)	Occur in physiologically normal sleep	*REM-consc., NREM-consc.*	
	3.3 Impaired states of consc. (ISCs)	Occur in neurological and psychological disorders of varied aetiology	*Minimal, blurred, epileptic stupor, delirium, etc.*	
	3.4 Altered states of consciousness (ASCs)	Occur in non-standard conditions that cause qualitative changes	*Hypnosis, trance, meditation, drug intoxication, OBE, NDE…*	

Criteria	Varieties of consciousness	Description	Examples	Basic meanings involved
Pragmatic Types of consciousness	4.1 Source-defined types of consc. (SoTCs)	Distinguished according to originating receptor type or sensory system	*Visual, auditory, olfactory, gustatory, tactile, proprioceptive*	**M1 M2**
	4.2 Use-defined types of consc. (UTCs)	Distinguished according to type of situation (aim and context) in which it is used	*Emotional, social, face, language, motor-skill…*	
	4.3 System-defined types of consc. (SysTCs)	Distinguished according to type of cognitive system (subject) in which it occurs	*Animal, human, machine, artificial, Martian, etc.*	

Table 1. The four-fold taxonomy of consciousness.

Conclusion

The four-fold taxonomy set out here aims to serve as a theoretical framework for further investigations into consciousness: consciously applied, it should make the concept clearer and considerably more unified. It is hoped that even if consciousness turns out not to be a fully unified phenomenon, the taxonomy proposed here will still be useful as a tool for clarification, possibly enabling a range of philosophers and neurologists to specify their subject of enquiry more exactly: that is, it could also serve to map out the relationships between *different* phenomena (in the absence of an argument for them being unified) in a theoretically useful way.[30] On the other hand, the taxonomy itself makes a substantial case for the notion that the distinct varieties of consciousness introduced by scientists in fact refer to a single underlying natural phenomenon analysed under four major aspects. If that is so, then the basic criteria applicable within the science of consciousness studies are just the following: epistemic access to consciousness, the semantics of conscious information, the physiological underpinnings of the entire process involved in a subject's exhibiting consciousness and, finally, the pragmatic relations holding between a given subject and information of which he or she may be said to be conscious.

[30] I owe this remark to an anonymous referee of this article.

Is the taxonomy complete? Does it exhaust the concept of consciousness as it appears in the philosophy of mind, cognitive neuroscience, clinical psychology, and other related areas? It does seem that almost every conceivable example of consciousness — along the lines of those mentioned in the introduction, for example — could be fitted into the taxonomy somewhere. However, in fact there are a few conceptions that cannot be. One of these is *embodied consciousness*. Even so, embodiment, unlike other relevant notions, points to certain meta-theoretical assumptions of an explanatory-methodological character, rather than to any particular aspects of the phenomenon of consciousness itself, such as might count as distinct from those included in the taxonomy here.[31] That is why embodied consciousness does not, in truth, form another variety.[32] One need not doubt that a few more examples of this sort are, indeed, to be found — *quantum consciousness*, for instance, could be another candidate. What is certain, though, is that issues like this, together with other important consequences and questions raised by the taxonomy presented, call for a separate discussion — to be pursued on another occasion.[33]

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[31] The general aim of the 'embodiment movement', roughly speaking, is to pull *explanations* of consciousness 'out of the head', towards the body and environmental interactions.

[32] It seems, however, that a unified concept of consciousness, such as might eventually turn out to be based on this four-fold taxonomy, would in fact be closely attuned to the general meta-theoretical assumptions informing the notion of embodied consciousness.

[33] The issues in question are discussed in the present author's 'The Four-fold Concept of Consciousness' (forthcoming).

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