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Nondual awareness: consciousness-as-such as non-representational reflexivity

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Abstract

I introduce arguments toward a non-representational reflexivity theory of consciousness-as-such to address one of the key issues in the science of consciousness today: lack of understanding of the nature of consciousness itself. An expanded map of consciousness is outlined, which includes, in addition to the well-known contents of awareness and levels of arousal, the indeterminate substrate and consciousness-as-such or nondual awareness. The central idea presented is that consciousness-as-such is a non-conceptual nondual awareness, whose essential property is non-representational reflexivity. This property makes consciousness-as-such phenomenally, functionally and neurobiologically a unique kind, different from and irreducible to any contents, functions and states, including the indeterminate substrate. Our previous hypothesis on the precuneus network for nondual awareness is further discussed in relation to non-representational reflexivity, and in the light of other hypotheses on the neural correlates of consciousness-as-such.

Introduction

Motivation

One of the major impasses in advancing scientific understanding of consciousness stems from focusing exclusively on phenomenal contents and global states of arousal, instead of also on consciousness itself, or consciousness-as-such (Josipovic, 2014; Josipovic and Baars, 2015). Whereas consciousness in general can be seen as the capacity for experience and knowledge, consisting of global states and phenomenal contents, consciousness-as-such is its foundational aspect, a non-conceptual nondual awareness, in itself empty of all other phenomenal content, yet reflexively self-aware (Dunne, 2015; Josipovic, 2014; Rabjam, 2007).

The central idea proposed here is that consciousness-as-such knows itself to be conscious or aware, directly, unmediated by conceptual or symbolic representations or re-representations, and without needing to structure this knowing as subject-object duality. This non-representational reflexivity is the essential property of consciousness-as-such, that makes it what it is. It is this that fundamentally differentiates consciousness-as-such from all other perceptual, affective and cognitive processes. It makes consciousness-as-such a unique kind, sui generis, and irreducible.

On the other hand, consciousness as ordinarily experienced is based on mental representations, such as concepts and symbols, that operate within the dualistic structure of subject vs. object (Josipovic, 2014). Its reflexivity operates via conceptual representations as well, and can be regarded as an indirect reflexivity, a reflection of the inherent non-conceptual reflexivity of consciousness-as-such in the conceptual processes. This conceptual reflexivity is, likewise, the main property of ordinary consciousness (Peters, 2013).

The idea presented here is related to both the reflexivity theories as applied to ordinary representational consciousness, and the scientifically informed theories of consciousness-as-such (Peters, 2013; Metzinger, 2018). It thus differs from the theories of consciousness as qualia, or as metacognition (Block 2007; Kriegel and Williford, 2006; Lau and Rosenthal, 2011). Reflexivity theories are well known in the science of consciousness and philosophy of mind, but consciousness-as-such is not, and the implications of its non-representational reflexivity have not yet been explored (Peters, 2013). Conversely, there are recent scientific theories of consciousness-as-such that recognize its non-conceptual nature, but do not understand that reflexivity is its essential property (Metzinger, 2018).

Definition of terms and caveats

Consciousness as a general term refers in this chapter to the capacity for experience and knowledge, consisting of phenomenal contents, functions that create them, global states of arousal, the unconscious substrate and consciousness-as-such. This expanded map of consciousness is discussed in the section on phenomenology.

Consciousness-as-such, or nondual awareness, is the foundational aspect of consciousness, consciousness itself alone without any other phenomenal content, an empty awareness that is non-conceptual and without subject-object structuring, hence nondual. Numerous terms have been used to point to it by both traditional and contemporary sources, such as: pure consciousness, pure awareness, open awareness, clear light, Atman, Buddha nature, etc. (Dunne, 2015; Josipovic, 2014; Rabjam, 2007; Radhakrishnan, 1967). The terms nondual awareness and consciousness-as-such are here used interchangeably to point to this foundational consciousness when without other phenomenal contents. The term nondual awareness is also

used when discussing its being present with other phenomenal contents, in which case this will be explicitly stated.

Consciousness-as-such can be said to be a minimal phenomenal experience since there is something it is like for one to experience it (Metzinger, 2018). However, it is non-intentional as it is not about some content other than itself (Forman, 1998).

Reflexivity refers to the property of consciousness to know itself to be conscious. Reflexivity can be conceptual representational as in case of ordinary consciousness, or non-conceptual non-representational as in case of consciousness-as-such. The terms self-awareness, self-knowing and self-recognition are here used to refer to reflexivity, unlike their common use in psychology and neuroscience, where they indicate a meta-cognition of one's self.

Representation here means mental representation, such as categorizations, concepts, schemas and various semantic, iconic and numeric symbols (Hubbard, 2007). All concepts are mental representations whether concrete or abstract. Re-representations, metacognitions, and representations of representational capacity are likewise mental representations.

Non-representational processes are more direct ways of knowing and experiencing that do not rely on representations (Freeman and Skarda, 1992; Gallese, 2005; Searle 1992; Varela et al., 2001). Here, this refers specifically to processes that do not use categorization and the subsequent conceptualizations, including the subject-object structuring (Thompson, 2014). Importantly, the non-representational reflexivity perspective presented here is not an anti-representational theory (Chemero, 2000; Kirchhoff, 2011). Concepts and conceptual-symbolic constructed processes do occur, and are necessary for normal functioning, but while one can mistake consciousness-as-such for such processes, they do not fundamentally affect it, nor do

they obscure it once its non-representational reflexivity is activated (Blackstone, 2007; Guenther, 1977; Ricard and Singer, 2017).

The term neural correlate is used broadly to avoid arguments about different meanings of causation.

The term network is used both in its narrow meaning given by informatics, and in the broader meaning as a dynamic system.

Synchronization among neurons and neuronal populations is here used in a broad sense without implying any specific mechanism, such as synchronization of spiking activity, an emergent phase synchronization or coherence in post-synaptic dendritic field potentials, or dynamics of travelling waves.

This chapter is organized into two main sections, the first one on phenomenology and philosophy, and the second one on neural correlates. It discusses consciousness without other phenomenal contents, consciousness-as-such, the isolated nondual awareness. Our previous research has been focused on nondual awareness with phenomenal contents during regular wakefulness (Josipovic et al, 2012; Josipovic, 2014). I will leave the further discussion of that aspect of nondual awareness for a later date, except in a few places where necessary for more precise understanding.

The present chapter focuses on phenomenology and neuroscience of consciousness-as-such, and will not explore epistemic, ontological and metaphysical issues. Likewise, it will not dwell on the soteriology or on the pedagogy of realizing nondual awareness. Considerable confusion can arise when conflating these different levels of discourse. This issue has been extensively explored elsewhere and will not be addressed here (Josipovic, 2016; Lutz et al. 2015;

Metzinger, 2018). For the record, the underlying view here is two-in-one nonduality, the brain and consciousness are two sides of the same one reality, like two sides of a coin, both same in being one, and different in being non-reducible to one another.

Language is necessarily linear with dualistic subject-object structuring, while nondual awareness is inherently holistic, so some descriptions will unavoidably sound paradoxical. For example, language demands for a statement to be expressed as 'one experiences nondual awareness without other phenomenal contents', but during such events there is no separate subject experiencing nondual awareness as if it were an object, there is only nondual awareness which knows itself inherently. Furthermore, the labeling of various features and processes of consciousness in general is descriptive and does not imply ontological reification.

Phenomenology and philosophy

A map of consciousness

Consciousness can be seen very broadly as the capacity to experience and know. As conscious experience, it is defined as either a content one is aware of, or as a level of arousal that gives it an overall state, such as being awake or dreaming (Tononi and Koch, 2015; Storm et al, 2017). The conscious - unconscious dichotomy can then be seen as the mode in which phenomenal contents and states of consciousness can appear. In the current perspective, this map can be further expanded as follows: contents of consciousness, functions that give rise to them, global states of arousal, the indeterminate unconscious substrate, and the consciousness-as-such or nondual awareness. Contents, functions, states and the substrate can then be regarded as modified consciousness, while nondual awareness is unmodified consciousness, or consciousness-as-such (Josipovic, 2016).

Contents and functions

Experiential contents are generated through interactions of mutually influencing perceptual, affective and cognitive processes. Contents are constructed from both pre-conceptual, anoetic, and conceptual-symbolic, noetic and autonoetic processes (Barrett, 2017; Metcalfe and Son, 2012; Vandekerchhove et al., 2014). Phenomenal contents can be conscious or unconscious. Conscious vs. unconscious contents and states usually have a well-defined boundary, accompanied by a varying degree of conscious access on one side of that boundary, and unconscious depth on the other (Baars, 2002; Bayne et al, 2016; Lamme, 2015). When conscious, contents form instances of unified experience or qualia in which various feature of experience are bound together into one unified whole (Tononi and Koch, 2015). Some early feature binding can occur pre-conceptually, attention selection can facilitate binding and initial categorization, followed by memory association, and more elaborate meta-cognition once contents are available in working memory (Raffone et al., 2018). How much of this process is pre-conceptual and how much of it is conceptual can vary. Likewise, contributions of the bottom-up feedforward processing, the local feedback and the non-local top-down predictions, to pre-conceptual and conceptual components, and to unconscious vs. conscious contents, can vary too (Lamme, 2015; Heeger, 2017). The result is that phenomenal contents are usually complex constructs made of present information, past memories and predictions about their future (Melloni, 2015).

Some aspects of cognitive functions involved in processing contents, such as attention, can become a part of conscious content at times, especially with specific training. For example, attention ordinarily appears vague and undefined, but those who practice focused attention style

of meditation can learn to distinguish fine details of its intensity, scope, stability and other phenomenal features (Namgyal, 2006).

Internal models or schemas for controlling and optimizing such functions, including the multi-layered conceptual self-world model, are themselves unconscious, but their appearance or disappearance can become introspectively available under special circumstances, such as in psychotherapy, or during contemplative practice (Safran, 2003; Dor-Ziderman et al., 2016).

Global States

States of arousal globally modify the processes that give rise to contents (Parvizi and Damasio, 2001). States can be either natural or altered. Naturally occurring states of consciousness are waking, dreaming, deep sleep, and, according to some traditions, orgasm and dying (Varela, 1997). Different minimally conscious states, such as vegetative states, coma, etc. caused by various brain injuries, can be similar to states occurring during natural dying (Giacino et al., 2018; Tagliazucchi et al., 2016). Altered states of consciousness are numerous and can be intentionally generated in a variety of ways, through specific behaviors, by ingestion of substances, or through cognitive and affective control strategies such as those used in contemplative practice (Tart, 1972). Similar to contents, states can be more or less conscious or unconscious, in other words, features of a state can themselves become contents of consciousness, as when, for example, one becomes aware of a change in alertness upon drinking coffee.

The substrate

The indeterminate substrate is neither conscious, nor entirely non-conscious (Traleg, 1993). It functions as a pervasive potential or matrix for structuring of experience (Germano and Waldron, 2006). When nondual awareness fails to recognize itself, when its non-representational

reflexivity is not activated, the substrate functions as dualistic subject-object structuring through which consciousness itself manifest as a tripartite representational process of knower-knowing-known (Nikhilananda, 1987; Trangu, 2001). In relation to contents, the substrate also serves as the matrix of essential qualities of experience as innate potentials (Guenther, 1984). Memory traces are distributed over this matrix and, when activated, contribute to shaping experience (Guenther, 1984). In that sense, the substrate has some similarities to psychodynamic notions of the unconscious (Jung, 1981; Berlin, 2011). It differs from the conscious-unconscious dichotomy in that it underlies, under ordinary circumstances, all conscious and unconscious contents.

The substrate is most evident, so to speak, in deep sleep, and in some meditative absorption states, as an absence of both phenomenal contents and of awareness (Guenther, 1977). It is retroactively reported as pleasant and restful. Some surface aspects of the substrate can be at times discerned during waking state, when it appears as a blank non-cognizant stupor, such as in states of heavy intoxication or in minimally conscious states (Metzinger, 2018). However, it is important to point out that the substrate is not merely a level of arousal, but a baseline potential for experiences to arise. Describing its various processes under one term as the substrate does not imply that it is an ontologically independent entity different from these processes. Nevertheless, introducing the notion of substrate here is relevant because nondual awareness is frequently confused with it (Rangdrol, 1990; Dunne, 2012). Contemplative traditions hold that meditating repeatedly through progressively decreased phenomenal contents all the way into the indeterminate substrate facilitates seeing the constructed nature of experience, and of one's self (Sayadaw, 1978; Dahl et al. 2015). But also, that this mere negation of reified constructs does not yet constitute the realization of the positive presence of consciousness-as-such, in other words, the activation of its non-representational reflexivity (Gyamtso, 2001).

Perhaps the most widespread conflation in various models of nondual awareness or consciousness-as-such is between it and the substrate (Lama, 2007; Radhakrishnan, 1995; Venkatesananda, 1984). This conflation is largely rooted in the phenomenology of moments of encounter with nondual awareness isolated from other phenomenal contents. On approaching nondual awareness through contemplative practice, or spontaneously, one can experience moments of deep relaxation and silent mind with much of the phenomenal content reduced or absent, but without nondual awareness self-recognized or being awake to itself. In such moments, nondual awareness still remains obscured by the substrate. After emerging from these experiences, one knows them retroactively (Guenther, 1977). Two mistaken inferences are then commonly made: one, that nondual awareness is a mere absence of phenomenal contents akin to deep sleep, the other, that nondual awareness can only be known retroactively through a subsequent cognition that takes that unconscious state as its object (Duckworth, 2008). Granted, following an event of isolated nondual awareness, even when not obscured by the substrate, conceptual thinking about it will reappear, at first quite subtle, so it can be easy to mistake those conceptual reflexive thoughts for the direct non-conceptual reflexivity of nondual awareness.

This conflation is made more difficult to untangle due to various contemplative philosophies that make too broad of an inference about nondual awareness. For example, if there is no phenomenal content, as in during deep sleep, then what is left must be only nondual awareness, often termed pure consciousness, since it underlies all experience. Conversely, if any awareness is present, then there is some however minimal phenomenal experience, therefore it is not entirely pure, so not nondual awareness (Radhakrishnan, 1967). Additionally, elevating the unconscious indeterminate substrate into the position of ultimate reality is sometimes done due

to the influence of theological assumptions that human beings cannot have direct access to the ultimate reality (Weinwright, 2017).

Nondual Awareness or Consciousness-as-such

Nondual awareness or consciousness-as-such is experienced as non-conceptual cognizance, in itself empty of content and without subject-object division. It is present, though ordinarily unnoticed, in the background of all experiences, including, according to some views, during deep sleep (Varela, 1997; Thompson, 2017). It can be discovered, that is, its reflexivity activated, spontaneously or intentionally, either when isolated from other phenomenal contents, or when present with phenomenal contents such as in ordinary waking experience, or in some altered states of consciousness (Lama, 2004).

Nondual awareness is most obviously evident when it occurs isolated from other phenomenal contents, and from the substrate, such as upon attaining full lucidity during deep sleep, or when its reflexivity activates during meditation-induced absorption with reduced or minimal phenomenal content (Chang, 1986; Thompson, 2017; Travis and Pearson, 2000). When sufficiently isolated and manifested clearly, nondual awareness appears as an empty cognizance, aware and present, but without any thoughts, emotions or perceptions, without a sense of body, space, orientation, time or the usual sense of self.

To a conceptual mind subsequently analyzing it, nondual awareness appears as a mere absence of all reifications. But to itself, it appears as singular awareness with self-evident properties (Gyamtso, 2001; Klostermair, 2007; Mipam, 2006). These are its inherent essential dimensions, they make it what it is. They can be described as:

1. Presence or Being – this is perhaps the most obvious of all dimensions of consciousness-as-such. It is self-evident existence. However, this is not a naïve essentialist implicit assumption of existence due to unconscious conceptual categorization, as such processes are absent in nondual awareness.

2. Emptiness – non-reification, ineffability. This is, both, an absence of any phenomenal content other than itself, and an absence of any categorizations or reification about itself. It is not a non-reification as an epistemic stance or an attitude, which is a construct or a belief. Its ineffability means that it cannot be grasped or reduced to a conceptual construct, while from its own side, it has no need or impulse to define itself in any way as it is self-evident to itself.

3. Non-representational reflexive cognizance – nondual awareness that knows itself to be conscious or aware directly, without relying on conceptual and symbolic representations, and without subject-object structuring. This direct unmediated reflexivity is what makes nondual awareness or consciousness-as-such what it is, and what makes it the unique kind that it is. It is its key dimension, and by extension, the key dimension of consciousness in general (Peters, 2013). Its knowing can appear entirely silent and without concepts or symbols of any kind. Even the very basic conceptual processes such as those that underlie the sense of agency or ownership, or the basic propositions like up, down, above or below, can be absent.

4. Luminosity or radiance – nondual awareness appears as if lit from within itself by its own clear transparent light. Clarity here refers to how unobscured by the substrate this awareness is.

5. Bliss – a silent contentment of being complete in itself; no sense of anything lacking in any way.

6. Nondual – without subject-object structuring; not taking itself as either subject or object of its knowing. Because of the absence of this structuring, it has been said that there is no phenomenal content or intentionality of any type in it. However, since it is accessed phenomenally, and not just as a concept or an idea, it is the minimal phenomenal experience or, more precisely, noumenon.

7. Infinite - nothing outside of it. This is not same as an energetic blurring of body boundary that can accompany breathing exercises or athletic activities, nor the affective sense of infinity caused by blurring of psychological boundaries that can occur in relational merging or inflation, and not a conceptual notion of infinity as in attempted measurement. Rather, it is experienced as infinite in that it does not have any boundaries or edges.

8. Singularity or unity – homogenous, unity of all dimensions; not constructed or created through altering mind or body but merely recognized or realized.

9. Continuous – unchanging self-sameness; upon clearly self-recognizing, it also recognizes itself as that awareness which was always present in all experiences.

10. Self – self as aware presence, singular and continuous. This is not a self in the usual sense of constructed self. It is neither a proto-conscious map of the body's homeostatic and allostatic processes, nor a core self as an agent or owner, nor an extended autobiographical, relational or social self. Yet, nondual awareness is not someone else' awareness, or an object fundamentally different from oneself. Rather, it is who one is, and has always been, as the conscious presence in all one's experiences, an intrinsic reflexive knowing.

Some of the above dimensions are similar to the axioms defining consciousness in the integrated information theory (Tononi and Koch, 2015). This is understandable since nondual

awareness is present in the background of all conscious experiences even when unrecognized, and thus every conscious experience to some extent reflects its dimensions. The terms used to describe them have been also used in contemplative traditions as metaphors to point to and facilitate the realization of nondual awareness (Glicksohn, 2001).

Although all dimensions are equally one within nondual awareness' singularity, different schools of contemplative philosophy emphasize one of the dimensions over others, some emphasizing more the being dimension of nondual awareness, others more its emptiness, still others its unity or self, and some, as I do here, its non-representational reflexivity (Deutsch, 1973; Rabjam, 2007).

As mentioned in the introduction, the present discourse concerns itself primarily with the nature of nondual awareness when isolated from other phenomenal contents. But because nondual awareness can be realized and present during waking experience with usual phenomenal contents, it merits briefly describing it in that situation.

When occurring during waking, nondual awareness knows itself as the unitary space-like context, the ground of being within which phenomenal contents unfold (Josipovic et al., 2012; Rabjam, 2001). Its manner of knowing phenomena can be compared to mere reflecting without categorization or further conceptual elaboration, without associating, evaluating, forming decisions or taking itself as a subject that knows phenomena as objects. Nondual awareness knows experience in a fresh unmediated way, as if seeing things for the first time (Sahn, 1976). From the perspective of nondual awareness all conceptual processes are parallel to its reality and do not touch it, unlike for ordinary consciousness for which conceptualization are deeply embedded in experience and control the construction of contents (Barrett, 2017). Since phenomena do not affect it in any way, nondual awareness can encompass and pervade any type

of content whether perceptual, affective or cognitive. It then knows phenomena as essentially not different from itself (Rabjam, 2007). That is, in addition to individual characteristics that make them appear the way they do, phenomena at that time also appear as having the same basic properties or dimensions as nondual awareness. They occur within the space of nondual awareness, and at the same time, appear as if made of nondual awareness, the way water in a glass is both the medium for ice cubes floating in it, and the substance they are made of.

Non-representational reflexivity

The non-representational reflexivity is the non-conceptual knowing inherent to nondual awareness that differentiates it from anoetic, noetic and autonoetic consciousness that are based on conceptual knowing (Dunne, 2015; Finningan, 2018; Rabjam 2001; Williams, 2000; Singh, 2003). It makes it similar, though not the same, to supranoetic consciousness in western neoplatonic mysticism, as the later can be saturated with imagination and affective states directed toward a deity (Laird, 2004). Anoetic consciousness is thought to be pre-linguistic, but from the perspective of nondual awareness, it is still conceptual, irrespective of how primitive those concepts are, as its contents are conditioned by the substrate (Vandekerckove et al., 2014).

Reflexivity of consciousness in general has been discussed extensively both in the context of nondual contemplative practices and in the western philosophy of mind (Dunne, 2015; Williams, 2000; Peters, 2013; Finnigin, 2018). In the Tibetan Buddhist tradition, the debate has been centered on whether reflexivity is innate to nondual awareness, or whether for awareness to know itself, a subsequent moment of cognition is necessary that takes that awareness as its object (Rabjam, 2007). Since such cognition is conceptual, on this second view, nondual awareness cannot be reflexive, and if it is, then it is not nondual awareness itself (Hopkins, 2002). In light

of recognition by the early Advaita Vedanta and Dzogchen traditions that the inherent non-conceptual reflexivity of nondual awareness necessarily implies a self, however different that self may be from the ordinary constructed self, this second view can be understood as a literal commitment to the no-self doctrine according to which all self is a constructed self (Garfield, 2006; MacKenzie, 2008; Metzinger, 2004).

In western perspectives, reflexivity is associated with autonoetic consciousness, and seen as either the introspective metacognitive ability dependent on re-representation, or as a more immediate sense of self-knowing that involves some type of recurrent processing of a cognitive state, for example, a semantic schema of a recursive regime that processes its own capacity to represent (Kriegel and Williford, 2006; Peters, 2010). These theories have several attractive features, the main being that the system is informing itself about its own state, here a capacity to represent, which is something we have suggested previously for nondual awareness (Josipovic, 2014). The main difference is that these models are schema-based representation models, even though the schemas are thought to represent the system's own representational capacity, rather than representations of contents. Nondual awareness, in contrast, is not a schema-based cognition. This situation is reminiscent of an old truism from contemplative traditions, which says that one needs the mind to look for nondual awareness but, in the end, has to let go of the mind to know it (Nikhilananda, 1987).

During moments of minimal phenomenal experience, one can get close to nondual awareness, and retroactively know that it was there, but without it reflexivity activating, without awareness recognizing itself. In such instances, although conceptual processes have quieted down, and the mind is silent, the substrate is still present, and nondual awareness has not yet encountered itself (Lama, 2007). But once the reflexivity of nondual awareness is activated,

nondual awareness cannot go back and un-know itself. Once it has self-recognized clearly, this knowing is direct and non-conceptual, by which it knows itself as that which is aware. Such self-recognition of nondual awareness by itself has been regarded as a special type of intuitive insight, in which nondual awareness recognizes by itself its own face (Rabjam, 1979).

For nondual awareness to know itself, for its auto-knowing to activate, it does not depend on whether any specific phenomenal contents are present or absent, or, given sufficient arousal, whether some specific or special altered state of consciousness has been generated or not (Ricard & Singer, 2017; Manjusrimitra, 2001).

Furthermore, although introspective attention can be used to approach nondual awareness, reflexivity of nondual awareness does not require introspective attention, as nondual awareness is self-evident to itself (Dunne, 2015; Metzinger, 2018). Thus, no epistemic agent as a subject that is experiencing nondual awareness as an object is necessary. This self-evidencing of non-representational reflexivity is also why nondual awareness, though non-conceptual and non-reify-able, is not phenomenally indeterminate to itself, even as it has no need or impulse to define itself in any way. Similarly, an analyzing mind can have mistaken cognitions about nondual awareness, but nondual awareness cannot have a mistaken knowing about itself, since its reflexivity is inherent to it and not a separate intentional act (MacKenzie, 2008; Rabjam, 1998; Williams, 2000;).

Neural correlates

Theories and hypotheses

Neuroimaging studies of nondual awareness, either isolated from other phenomenal contents, or with contents during waking state, are still relatively rare and done almost

exclusively using experienced meditation practitioners as subjects (Dahl et al., 2015; Tang et al., 2015; Travis and Pearson, 2000). Consequently, it can be difficult to differentiate the neural signatures of nondual awareness itself from the neural signatures of meditation techniques used to access it (Josipovic, 2014; Lutz et al. 2015). Despite these and other challenges, several theories and hypotheses on the neural correlates of nondual awareness have been proposed so far, related to the major current theories of consciousness (Josipovic, 2014; Metzinger, 2018; Rafone and Srinivasan, 2009; Ricard and Singer, 2017; Travis, 1994). The paucity of research, as well as the issues affecting meditation research in general, by necessity mean that such theories are somewhat speculative in nature.

The first group of theories and hypotheses are centered on alpha band oscillations in the prefrontal cortex and on the role of nonspecific nuclei of thalamus in generating them (Buzsaki, 2006; Travis, 1994). The thalamo-cortical alpha rhythms are thought to be involved in global states of arousal and in organization of cortical networks related to various functions of consciousness (Buzsaki, 2006; Buzsaki et al., 2012; Plava and Palva, 2007, 2011; vanRulen & Koch, 2003). The spread of alpha oscillations from posterior to frontal channels and the increase of coherence between prefrontal electrodes, found during Transcendental Meditation, has been proposed as the signature of nondual awareness, a.k.a. pure consciousness (Arenander and Travis, 2004). The prefrontal alpha coherence, specific to area BA10, was also hypothesized to act as an adaptive coding net that regulates global workspace, and with it the access to consciousness (Raffone and Srinivasan, 2009). When sustained in meditation, the BA10 coherent alpha is thought to indicate an experience of nondual awareness or pure consciousness as an ongoing meta-cognitive awareness of awareness (Raffone and Srinivasan 2009). Similarly, Baars (2013) proposed that the neural signatures of silent consciousness are increased power in theta

and alpha bands throughout cortex, accompanied by reduced power in higher frequencies, especially gamma band, reflecting decreased contents. Setting aside the issue of whether nondual awareness is actually self-recognized during these meditation experiments, such alpha signatures can be also interpreted as reflecting an overall inhibition of phenomenal contents, or a top-down prediction related to contents (Aru et al., 2016; Klimesch et al., 2006). The finding of increased prefrontal alpha coherence during anesthesia may be problematic for the prefrontal alpha theory of pure consciousness (Vijayan et al., 2013). In light of these, it is more likely that such alpha signature is indicative of the substrate. A very speculative interpretations could then be made that the prefrontal alpha during anesthesia may indicate that despite the disruption of conscious content formation by the anesthetic, some aspect of consciousness remains, and that the inability to report anything at all upon emerging from anesthesia, could be, depending on a depth of anesthesia, attributed primarily to the action of anesthetic in disrupting memory formation, rather than in abolishing all consciousness (Radek et al., 2018).

In the second group are theories and hypotheses on the neural correlates of nondual awareness based primarily on the global workspace theory and the information integration theory (Baars et al., 2013; Dehaene et al., 2017; Tononi and Koch, 2015). According to this view, conscious, in contrast to unconscious, contents result from the integration and global broadcast of information by a dynamic adaptive thalamo-cortical network. Originally, a fronto-parietal network of areas, involved in voluntary attention, working memory and cognitive control, was identified as the global workspace capable of flexibly recruiting content specific local modules involved in parallel but unconscious processing (Dehaene et al., 2006). More recently, several networks have been identified that could flexibly function as the global workspace to broadcast contents (Michel and Koenig, 2017). The long range synchronization in gamma band has been

regarded in this model as the primary neural mechanism enabling the broadcast of conscious contents (Melloni and Singer, 2010; Ricard and Singer, 2017). Neural activity hierarchically organized via cross-frequency coupling, at theta-gamma or alpha-gamma bands has been proposed as signature of thalamo-cortical or hippocampal-cortical integration (Baars et al., 2013). Only one global workspace can operate at any given time, broadcasting one unified content, at the rate of approximately ten such broadcasts per second, that is in alpha range, further supporting the idea that the thalamocortical alpha binds contents (Kozma and Freeman, 2017). The integration of information within the global workspace that makes contents conscious also involves progressively increased conceptual abstraction, and binding by semantic schemas (Ricard and Singer, 2017). It has also been equated with holding something in one's mind in order to think about it, or decide on how to respond to it, in other words, with functions of working memory and metacognition (Dehaene et al, 2017). However, as recently pointed out, the integration of information by itself may not be sufficient for consciousness; rather, it is the integration of the brain as a system that allows for it (Edelman et al., 2011; Storm et al, 2017; Tononi and Edelman, 1998; Tononi and Koch, 2015).

Nondual awareness from this perspective has been hypothesized to be mediated by the global workspace that is mainly representing itself, while being at the same time enlarged and emptied of most of other contents (Ricard and Singer, 2017). This is an attractive idea, which we too have advocated in the past, as it corresponds to some key features of phenomenology, such as an increased unity of experience of internal and external environment, accompanied by a reduced mental elaborations, reflected in the increased functional integration of intrinsic and extrinsic networks (Josipovic et al., 2012; Josipovic, 2014).

However, the global workspace as understood above cannot be the neural correlate of nondual awareness, for a couple of reasons. First, to the extent that the integration and broadcast in the global workspace, including the workspace representing itself, depend on semantic schemas, such global workspace cannot be the neural correlate of nondual awareness, as nondual awareness is not in itself a conceptual semantic representation. The same holds for working memory and meta-cognition. However, if a minimal phenomenal experience is equivalent to the working memory capacity emptied of content via deafferenting of its inputs, this might work, provided that, in those moments, this capacity can be non-representationally reflexive (LeDoux, 2015).

The second issue with global workspace as the neural correlate of nondual awareness is the necessity of attentional engagement for maintaining neuronal coherence in the global workspace and thus consciousness. However, as we have discussed above, presence of nondual awareness does not depend on attending, or monitoring.

The third group of theories are based on hierarchical predictive coding (Egner and Summerfield, 2013). These theories see the primary brain function as generating predictive models, usually Markov or Bayesian, for the purpose of enabling internal control (Friston et al., 2012; Webb and Graziano, 2015; Metzinger, 2018). In Graziano's (2015) attention schema model, consciousness as awareness is equated with the internal predictive model or schema of attention, which is thought to have evolved for optimizing attention control. While this theory does not address consciousness-as-such, it focuses on awareness as a relatively basic aspect of consciousness. The theory starts from an assessment of attention as phenomenally undefined and nebulous, and in need of a schema-based internal control mechanism, akin to one existing for

body and motor system (Webb and Graziano, 2015). It proposes that awareness is what the internal schema of oneself being in the process of attending to an object feels like.

However, attention schema is not likely to be the mechanism underlying nondual awareness. Aside from the obvious issue of being a representation, such schema is more likely to be experienced as monitoring, rather than as an awareness that is the ground level of consciousness. Attending and monitoring imply goal-directed subject-object intentional structures, whereas nondual awareness is free of such structuring (Josipovic, 2010; Dunne 2015). Also, if one has a sense that one is manipulating nondual awareness in some way, directing it here or there, expanding or contracting it, this is definitely not nondual awareness, but one's attention (Kelly, 2015).

Metzinger (2018) in his newly proposed ARAS model theory, sees nondual awareness or consciousness-as-such, as a minimal phenomenal experience which he defines as the content-less wakefulness, such as occurring in lucidity during deep sleep. His theory has a number of excellent points, among them the recognition that consciousness-as-such is non-conceptual, that it can be phenomenally accessible, and that its neural correlate needs to be a mechanism that can underlie any type of content in the brain. But its perhaps most brilliant insight is that when nondual awareness is opaque to itself, when its reflexivity is not activated, it will by necessity appear as representation. Minimal phenomenal experience will then be a virtual model of the brain's global state of arousal, a schema of its minimal representational capacity (Metzinger, 2018).

It is possible that such an internal model exists in the brain to regulate the arousal level, but such model, even if non-conceptual, is not likely to be consciousness-as-such or nondual awareness. First, nondual awareness is different and independent from states of arousal, both

natural and altered, akin to the way a mirror's capacity to reflect is innate to the mirror itself, and not created by controlling the level of illumination in the room. Of course, some minimal amount of illumination is necessary for the mirror's reflectance to be possible, just as some minimal level of arousal in the brain is necessary for nondual awareness to be present. But nondual awareness can be present and reflexive with a wide range of different levels of arousal. Lucidity during deep sleep is an example of a state of minimal arousal. So are similar absorption states generated through meditation methods designed to isolate nondual awareness from other phenomenal contents. On the other end of the spectrum, nondual awareness can be present during wakefulness with high levels of arousal, such as those found in tantric deity and kundalini meditations, in ecstatic chanting or, on occasion, under influence of psychedelics (Griffits et al. 2011). Conversely, all those levels of arousal can and do occur, without nondual awareness ever being realized. In other words, arousal level by itself does not determine whether nondual awareness will be present or not, though in the right context it may facilitate the emergence of its reflexivity.

Unlike the constructed self-world model that relies on extensive predictive processes to control outcomes, nondual awareness, and the neural mechanisms underlying it, are not as concerned with prediction (Metzinger, 2004). Some of the traditional adjectives used to describe nondual awareness point to why this is so. Nondual awareness is described as ever-fresh, indicating that it is not recollected from a previous memory of itself; as self-originated complete in itself, indicating that it is not constructed over time; and, as choice-less, indicating that it has no concern with its past or future, nor with the past or future of any contents that may or may not appear in it (Rabjam, 1998, 2007). However, monitoring and the related vigilance, have an

optimizing direction, and likely rely on such predictive estimates, and can be easily mistaken for nondual awareness (Rabjam, 1998; Dunne 2015).

To regard nondual awareness primarily as a minimal phenomenal experience, rather than as a unique kind sui generis, means that it is still seen as a content of sorts, which leads to an excessive concern over how minimal the minimal phenomenal experience is. In practice, reducing phenomenal contents is done to allow nondual awareness to emerge from underneath the substrate, so to speak, and for its reflexivity to activate, so it can recognize itself. The degree of phenomenal content reduction can vary with the degree of absorption, but the activation of reflexivity can, in principle, occur with any amount of phenomenal content. This becomes evident once nondual awareness self-recognizes within ordinary daily experience.

To the extent that hippocampal-cortical associations are formed through any repeated experience, it is likely that some conceptual memory schemas related to nondual awareness and to events surrounding it, will be formed and become triggered during a future occasion of nondual awareness. While nondual awareness itself is not a re-construct from memory, its presence does not interfere with memory functions. Thus, in practice, repeated experiences of nondual awareness are often a mix of actual nondual awareness and some constructed processes (Metzinger, 2018). This can make differentiating the neural signatures of its non-representational reflexivity from those that underlie other conceptual processes that much more challenging.

The majority of internal predictive model theories of consciousness subscribe to the idea that the brain is a computer-like device that ‘lives in the dark’ about the body and the external environment, separated from them by the skull, and that the only way it can know them is by guessing, by creating virtual representation-based models and comparing their predictions to inputs it is receiving to assess errors (Barrett, 2017; Kirchhoff, 2018). However, the brain is an

integral part of the body and so, it also knows the body and the external environment in a much more direct and intimate way, as its own lived reality, in which the internal and external environment are one unified non-representational experiencing (Varela et al. 1991).

The central precuneus network for nondual awareness

We have previously proposed that a dynamic functional network with its main node in the central area of precuneus, and its main axis with node in dorso-lateral prefrontal cortex, is the likely neural correlate of nondual awareness (Josipovic, 2014).

The precuneus has emerged in recent research as one of the key areas involved in the global organization of the brain, as the central node of default mode network (DMN), and perhaps the most connected hub in the cortex (Bruckner et al., 2008; Cavana, 2007; Pedro-Pereira and Bruner, 2016; Tomasi and Volkow, 2011; Utevsky et al., 2014). It is a dynamic area of the brain, involved in a number of perceptual, motor, affective and cognitive functions, such as, episodic memory retrieval and metacognition, spatial mapping, integrating perceptions, guiding motor responses, mental imagery, theory of mind, self-awareness and consciousness (Andrews-Hanna et al., 2010; Boly et al., 2012; Cavana and Trimble, 2006; Fletcher et al., 1995).

The precuneus, together with the areas of the prefrontal cortex it is connected to, has the necessary organizational complexity and flexibility, including the capacity for both local and global recursive feedback, to function as a central organizing node involved in processing most of conscious experiences. When its outputs are implicit features of experience, such as basic pre-reflective for-me-ness, the signatures of its functioning can be hidden in the background brain

activity (vandenHeuvel and Sporns, 2013; Zahavi, 2019; but see Quadt et al., 2018 for the contribution of areas involved in interception).

Functional specialization has been found in the four major areas of precuneus: dorsal-anterior for somato-motor processing; dorsal-posterior for visual-spatial, ventral posterior for episodic memory, and central for cognitive associative processes (Zhang and Lee, 2012; Margulies et al, 2009). The precuneus is involved in self-related aspects of experience, in particular, its ventral posterior portion together with the posterior cingulate cortex (PCC) and the areas of medial temporal lobe (MTL) forms the ventral section DMN thought to be involved in episodic memory-based self. Not all of the areas of the precuneus subserve this function, notably its dorsal areas are part of the extrinsic system involved in task processing (Andrews-Hanna et al., 2010).

The precuneus participates in integrating information from internal and external environments through co-registering of spatial, bodily and self-related maps or frames of reference (Blanke et al., 2015; Kim, 2018; Zeahle et al., 2006), and can integrate affective and cognitive aspects of emotion (Sato et al., 2015). One of the central roles for consciousness has been postulated to be that of unifying various features of experience, which may further indicate the key role that the precuneus plays in consciousness (Kjaer and Lou, 2000; Koch et al., 2016). The presence of nondual awareness together with phenomenal contents during wakeful state is reported to have an effect of increasing the apparent unity of perceptual, affective and cognitive aspects of experience, or as traditionally expressed, of unifying body, heart and mind (Dorje, 2016; Josipovic 2014). Nondual awareness can be then hypothesized to function as a background context-frame which, when included in the global workspace, provides further unifying of contents.

When present, nondual awareness is experienced as invariant, remaining basically the same regardless of what type of phenomenal content occurs with it or is subtracted from it (Ricard and Singer, 2017). This may indicate an involvement of a dedicated network that can maintain itself in a specific state or a range of activity. Of course, given the brain's general many-to-many network organization and the pervasive neuronal degeneracy, there could be considerable variation in the network's topology and other features. Still, in principle, the network should be definable both in spatial and in temporal terms.

We have proposed that the cognitive associative central precuneus network, linking the central precuneus with the dorsolateral prefrontal cortex (dlPFC), the dorsal anterior cingulate (dACC) and the angular gyrus (r/l-Ang), is the neural correlate of nondual awareness (Josipovic 2014). The associative central precuneus network is involved in a number cognitive function (Margulies et al., 2009). Therefore, the neural correlate of nondual awareness is likely to be only a subset of its neurons, but with the capacity of recruiting other neurons into their function. In terms of the overall functioning of the precuneus, it could be hypothesized that during nondual awareness, especially when isolated from other contents, its activity gravitates toward its central region, away from both the ventral portion related to episodic memory, and the dorsal visuo-motor stream for processing stimuli in external environment. Likewise, similar functional centrality shift may be postulated for the lateral prefrontal cortex.

The central precuneus network, like other cortical networks, is connected to subcortical areas of the reticular activating system that supply arousal, and to the thalamic nuclei that enable its organization (Tomasi and Volkow, 2011). These subcortical areas are necessary but not sufficient for generating nondual awareness. Two sources of gamma range signals in the precuneus are commonly encountered as, the ascending inputs from the reticular activating

system that arrive into medial parietal cortex via thalamus, more directly to PCC and more indirectly into precuneus (Garcia-Rill et al., 2012; Vogt and Laureys, 2005), and the content driven gamma related to attentional and visuo-spatial processing, among other functions, which modulate the ongoing spontaneous activity (Buzsaki, 2006). The third type of gamma signal would be present in the precuneus network during nondual awareness.

Increases in amplitude and synchrony in gamma range involving areas of parietal lobe have been found during nondual or non-referential meditations (Lutz et al., 2004; Schoenberg et al., 2018), while decreases in parietal gamma were found during mindfulness meditation (Berkovich-Ohana et al., 2014), in accord with the postulated difference between the neural mechanisms for nondual awareness and attention (Josipovic et al., 2012; Josipovic, 2014). In light of these findings, increased amplitude of EEG signals in low gamma range in parietal and occipital channels found during deep sleep, in long-term meditation practitioners, could be interpreted as the background presence, however faint, of nondual awareness (Ferrareli et al., 2013).

While changes in the alpha band signal may be present, indicating thalamo-cortical reorganization of the network and the brain as a whole, alpha signal alone is likely too slow to mediate the reflexivity and vividness of nondual awareness. Changes in the alpha band should also have a different profile during nondual awareness compared to focused attention or open monitoring as the reticular nucleus of thalamus may be differentially engaged (Saggar et al., 2014).

It is possible that when nondual awareness is isolated from all contents, the neural activity related to it is restricted to the precuneus and its neighboring areas. In other words, one may be deeply absorbed in a ground state of awareness with minimal phenomenal content, but

that state might not yet be broadcast as conscious, therefore not fully realized. Thus, the reflexivity of nondual awareness may not fully activate without some involvement of the areas in the dorso-lateral prefrontal cortex. The dlPFC may then add the necessary amplitude and persistence to the precuneus activity. Finding of the increased functional connectivity between the precuneus and the dorso-lateral prefrontal cortex during propofol sedation accompanied by a loss of conscious content and responsivity can be alternatively interpreted, as a background activity in the network for awareness emerging while the louder neural signatures of conscious contents subside and progress into a dream like imagery (Liu et al., 2014). Studies of lucidity during REM dreaming indicate just such increase in the precuneus and other nodes upon attaining lucidity while dreaming is still going (Dressler et al., 2014).

Neural mechanisms of non-representational reflexivity

The key question for the current hypothesis is whether neurons or a subset of neurons in the central precuneus network can function non-representationally, and if so, in what way is this instantiated. To subserve non-representational reflexivity, neurons in the precuneus and in other nodes in its network would need to have at least three capacities: first, a high local within-area and global across-areas structural and functional connectivity allowing neurons to form synchronized assemblies; second, enough local metabolic and population resources for some neurons to be dedicated to non-representational processing; and third, an ability to flexibly adjust and at times reverse the habitual direction of effective connectivity between its key nodes, for example, from the one primarily driven by dlPFC to one primarily driven by the precuneus. Such re-entrant network would need to be able to sustain and stabilize its own endogenously generated synchronized excitation, in which cortical neurons signal to each other their own excitation as

availability to process information, without processing specific contents. This would then correspond to open-ended cognizance without any other content, in other words, to nondual awareness. Such reentrant activation is most likely carried out in low gamma range 40-60 Hz (Llinas and Pare, 1991). Gamma amplitude signal changes detected during studies of nondual states among advanced mediators maybe indicative of such ongoing re-entrant excitation (Ferrareli 2013; Lutz 2004; Schoenberg et al, 2018). Details of how such controlled resonance might be achieved during nondual awareness are not yet known, in particular, what types of synapses are primarily involved, and what might be the relationship of local and global field potentials to spiking rates during this state (Buzsaki and Wang, 2012; Panagiataropoulos et al., 2014). The cortico-thalamo-cortical and cortico-cortical circuits proposed to underlie the dynamic core appear to be the most likely neurophysiological candidates for enabling such resonant activity (Edelman and Tononi 1998; Edelman et al., 2011).

Nondual awareness knows itself as the self-same, that is, it knows its own continuum, even though its presence is a timeless now-ness, which means that neurons in this network can retain the information about their own state without needing to rely on neurons in medial temporal lobe to store conceptual schemas of it. In this way nondual awareness remembers itself, so to speak, without relying on the usual mechanisms of conceptual memory in the brain. Such decrease of involvement of usual memory areas has been found with open monitoring meditation as well (Fujino, 2018). As it has been universally reported that, upon being realized clearly, nondual awareness knows itself to have been present all along in all one's experiences even though unrecognized, it can be speculated, in line with the nondual contemplative philosophies, that this network state exists in the adult human brain as an innate neurobiological potential.

The proposed synchronized activity underlying nondual awareness is autotelic for neurons, but also energy costly, in contrast to processing of contents via conceptual predictions where energy can be conserved by minimizing prediction errors (Friston et al., 2012; Barrett, 2017). Even though nondual awareness is experienced as effortless compared to more effortful monitoring and focused attention, discovering and sustaining it can take a large investment of energy. It may also, at times, require significant disruptions of allostasis. This is so because initially it requires a de-construction of the self-world model, a change that is resisted by the system due to the function of self-world model in survival (Dahl et al. 2015). Hence the evolutionary benefits of sustaining such state, are not immediately evident and may be of a different kind.

In relation to global workspace for conscious contents, the precuneus network most likely functions as a context-frame that is incorporated into each instance of the broadcast, providing, under ordinary conditions, the substrate's subject-object structuring of experience, and, when nondual awareness is realized, the unified all-encompassing space of nondual awareness within which contents manifest. The difference between dynamic core and global workspace is significant here. Whereas global workspace broadcasts are micro-states or snapshots of the dynamic core's activity, the dynamic core itself is a more enduring background organization out of which they emerge (Edelman et al, 2011; Michel and Koenig, 2017). Conscious contents are thought to emerge as phase transitions from the background state characterized by higher entropy, into a state with lower entropy characterized by global amplitude modulation patterns synchronized in beta and gamma range (Kozma and Freeman, 2017). The background state, with the ongoing dynamic core, is in a state of meta-stable criticality that enables rapid emergence of organized patterns. In that sense, it is the likely neural correlate of the unconscious, though not

non-conscious, substrate. Increases in entropy found in altered states of consciousness, where the well-defined subject-object structuring of ordinary waking experience is attenuated but the nondual awareness has not yet been realized, can be regarded as an indirect evidence toward this idea (Carhart-Harris, 2018).

The synchronized re-entrant excitation of neurons in the central precuneus network during reflexive nondual awareness will create changes in the organization of both the background dynamic core and the global workspace, in form of functional and effective connectivity changes and/or amplitude modulations. Thus, testing whether specific content is conscious or not, or whether it is available to working memory for further processing, is not in itself an indicator of nondual awareness. The signature of nondual awareness, or consciousness-as-such, is not in the difference between the conscious and the unconscious content, but within dynamic patterns that are common to both.

Conclusion

This paper advances a view that the main property of consciousness-as-such, or nondual awareness, is its non-representational non-conceptual reflexivity, knowing itself to be conscious or aware, directly, without relying on conceptual and symbolic representations. This property is what makes nondual awareness, phenomenally, cognitively and neurobiologically a unique kind, sui generis, irreducible to other processes such as qualia, attention, arousal or conceptual metacognition.

Future research could explore changes in the dynamics and scope of the central precuneus network with the objective of specifying the neuronal population subset related to nondual awareness, and more specifically to its different dimensions. Bi-stability studies could

look for the signatures of nondual awareness that are common to both seen and unseen periods. Once specified, the changes in this network could be tracked under graded anesthesia and related to the persistence, disappearance and reappearance of nondual awareness and its various dimensions.

For a conceptual mind attempting to analyze it, nondual awareness, consciousness-as-such, can be frustratingly paradoxical. It is no wonder researchers, even when curious, have tended to stay away from it. However, given that, realized or unrealized, it underlies all human experiencing, it is highly likely that its neural signature contributes significantly to canonical computations and global dynamics in the brain, and thus deserves to be known. For that, however, we would need to adjust our research focus to include nondual awareness, consciousness-as-such.

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