The Sphere Model of Consciousness: From Geometrical to Neuro-Psycho-Educational Perspectives

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Abstract. The present article addresses the logic of the sphere, or the Sphere Model of Consciousness (SMC) developed by Patrizio Paoletti over three decades of research (Paoletti in Flussi, territori, luogo (Flows, territories, place). M.E.D. Ed., 2002; Flussi, territori, luogo II (Flows, territories, place II). M.E.D. Ed., 2002; Fare il punto nave (Taking a bearing point). M.E.D. Ed., 2005; In: Proceedings conference at Leslie and Susan Gonda Multidisciplinary Brain Research Center. Bar Ilan University. Faculty of Neuroscience, Israel, 2007; Osservazione—Quaderni di Pedagogia per il Terzo Millennio (Observation: educational notebooks on pedagogy for the third millennium), Ed. 3P, 2011; Mediazione—Quaderni di Pedagogia per il Terzo Millennio (Mediation: educational notebooks on pedagogy for the third millennium), Ed. 3P, 2011). The SMC model has been experimentally applied in the educational field and lies at the base of neuroscientific and psychoeducational research conducted by the Paoletti Foundation. In recent years, it has been studied by several researchers in the field of neuroscience. Following a logical-mathematical introduction regarding the properties of the spherical shape, we illustrate for the first time the structuring of the model and its neural foundations. We emphasize the central space of the sphere, defined by the geometric model and highlight its descriptive and heuristic properties in relation to the study of consciousness. Finally, we present educational applications of the model, particularly with respect to the center of the sphere, defined in the current context as the “place of pre-existence.”

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1. Introduction: Thinking by Images

Wittgenstein notes that “we make ourselves images of facts” (Tractatus 2.1) and the image we make of the world is in turn a fact, but a fact of a particular type, which must have something in common with what it represents (Tractatus 2.16), i.e. the logical form. “What every image, whatever its form, must have in common with reality, to be able to portray it—correctly or falsely—is the logical form, that is the form of reality” (Tractatus 2.18). Making an image of the world means knowing the world through its logical structure.

R. Corvi [22]

The use of visual representations is a long-standing tradition in the history of the word as an expression of logic. It is perhaps as old as the word itself, if not older, as suggested by the claim that arbitrary signs would have emerged initially from gestures, which are more adaptable to iconic representations [3, 79]. In addition, according to the *embodied cognition* [107] and *embodied language* [32, 35] theories, the cognitive and linguistic systems are similar to the motor system in both the structures they employ and their organizational characteristics. This perspective suggests that linguistic understanding is rooted in action and uses the same brain areas that are activated during the execution of movement. Psychophysiological and neuroimaging studies have indeed shown that understanding nouns involving the manipulation of objects (i.e., instruments) activates the same motor systems activated during both actual manipulation and observation of manipulation of such objects [61].

These neuroscientific findings provide a physiological foundation for the practice of visual representation, a practice as old as human culture, and encourage the use of visual tools in different fields research. Based on this perspective, we propose that the Sphere Model of Consciousness, through use of the geometrical figure of the sphere, is a heuristically effective logical model that can be applied to the neuroscientific investigation of consciousness and to the field of education.

2. Law of the Sphere

2.1. Mathematical Perspective

The Sphere Model of Consciousness arose from the studies of Patrizio Paoletti [71–76]. It was developed over more than three decades of educational activity and lies at the base of the neuroscientific and psychopedagogical research conducted by the Paoletti Foundation since 2002. It aims to synthetically but exhaustively describe the coordinates of the possible experiences of consciousness through graphic representation. The shape of the sphere is specifically suited to describing consciousness as a phenomenon that is omnipresent and transversal to different areas, fields, and functions of experience, since it can be considered the most effective icon of the ideas of balance and harmony. In fact, in the pythagorean school, the sphere was considered the material shape

of harmony and it was believed that the human soul was produced by the harmony between the different body components [86]. The value of a paradigmatic definition embodied in a geometric form will be highlighted below.

To understand how the shape of the sphere lends itself exceptionally to describing the phenomenology of human consciousness, one should consider some of the unique properties of this shape, as described by David Hilbert and Stephan Cohn-Vossen in their classic manual “Geometry and the Imagination” [34]. In particular, in the current context, specific attention should be given to the following exclusive properties of this shape:

1. All points of the sphere are the same distance from a fixed point.
2. The contours and flat sections of the sphere are circular.
3. All points of the sphere are “umbilical,” or locally spherical, meaning that, in these points, the normal curvature is the same in all directions. Therefore, the principal curvatures are identical and each tangent vector represents a main direction.
4. Among solids of the same volume, the sphere is the one with the smallest surface, and among those with the same surface area, the sphere is the one with the largest volume.
5. The rotation of a sphere along the x , y , or z axis also reproduces its shape, such that each rotation transforms the sphere into itself.

The properties briefly mentioned above indicate the resilient character of the spherical shape, which is exploited in the field of engineering by systems such as “ball bearings.” Indeed, the sphere can redistribute pressure, through the five characteristics indicated above, and particularly 1, 3, 4, and 5. It is possible to assert that these characteristics determine a physically “empty” center. The fixed point mentioned in characteristic 1, the classic geometric definition of the shape, is an undefined point without measures, as exemplified by the “empty” inside of a ping-pong or tennis ball.

3. The Sphere Model of Consciousness

In accordance with these characteristics of the sphere, in the construction of the Sphere Model of Consciousness, the empty center is called *the Place*. This is to indicate the receptive and originally undifferentiated features of the phenomenon of consciousness with reference to all the internal and external solicitations on the individual. In the model, the three ideal axes described in characteristic 5 represent three lines of force passing through the central ideal point, such that their intersection determines the division of the axis into two sections, as in Fig. 1.

The model uses the axes with the relative intersection to represent the unfolding and polarity of experiencing. Specifically, with reference to the spatial coordinates (Fig. 1), (1) the left-right axis represents the strength-weakness emotional polarities (X axis), (2) the vertical low-high axis represents the aspiration-root dimensions (Y axis), and (3) the back-forward axis represents the past-future temporal unfolding (Z axis) (Fig. 2).

FIGURE 1. One place with three forces passing through the central ideal point of the sphere (the place) in the Sphere Model of Consciousness. Source: Adapted from [71]

This identification between spatial coordinates and dimensions of experience is in accordance with the common conceptualization of the past as behind, the future ahead, and the present here, with reference to body representation. Behavioral research suggests that, from this point of view, arbitrary conventions are not entirely such [49], since time seems to be thought of in terms of space. Consequently, the central point of the sphere represents the space of consciousness *before* experience characterized by the dimensions indicated by the x, y, and z axes. If the sphere is seen as divided by axes passing through its center, it is possible to see a division into eight segments of equal size (Fig. 2).

Figure 2 illustrates the construction of the “logic of the sphere,” in accordance with the four main meanings of the classical Greek word *logos*: relationship, language, reason, and science [13]. The geometric characteristics of the shape determine specific relationships that give rise to a particular language, specific principles, and knowledge. Moreover, the fact that the Sphere Model of Consciousness—a mathematical-geometric model—is effective in visually representing neurophysiological evidence and in fostering new findings, supports further study of the arbitrary or natural character of a specific logical model, as illustrated by Paoletti et al. [80]:

Our thoughts can be considered part of nature, a position that could have been reinforced by a neuroscientist establishing a relationship between thought and brain activity. The wife of Boole, Mary Everest Boole, a gifted child teacher wrote many books, among them *Philosophy and Fun of Algebra*, where she says:

Arithmetic means dealing logically with facts which we know (about questions of number). ‘Logically’; that is to say, in accordance with the “Logos” or hidden wisdom, i.e. the law of the human mind and the law of the king there is no use in ordering people, no logos, no

FIGURE 2. The Sphere Model of Consciousness uses the intersecting axes to represent the unfolding and polarity of experience. Source: Adapted from [71]

logos, no logos. [16, p. 1]. (M.E. Boole, *Philosophy & fun of algebra*, C.W. Daniel, London [16]).

But we can not decide, independently of any Parliament or God, according to our rules, we will decide according to which rules we will play chess? Is mathematics, often considered as the highest form of reasoning, not a game for which we can set the rules? (pp. 127–128)

Below, we will highlight the descriptive value of the specific relations determined by the geometric shape of the sphere with regards to the descriptive capacity of a visual model of consciousness. Following the description of each axis (Sects. 3.1–3.3) and some of its scientific foundation, the descriptive value of this representation with respect to the phenomena of consciousness experienced in meditation practices will be discussed (Sect. 3.4).

3.1. The Time Axis

Having introduced the Sphere Model of Consciousness, we can now describe its connections with current knowledge on brain functioning. From the cognitive perspective, autobiographical knowledge is known to be hierarchically structured, as follows: (1) specific knowledge of the event, which is a synthesis of the sensory-perceptive-conceptual-affective elaboration derived from working memory, re-describes itself mostly in the form of visual images (e.g., memory of the parthenon); (2) specific knowledge of the context is then contextualized within a general event (e.g., during a trip to Greece); (3) the general event, in turn, is associated with one or more periods of life that place the most

FIGURE 3. The time axis meets the pleasant/unpleasant polarization

specific knowledge within the autobiographical memory of the individual (e.g., that was the time when I used to study classical art) [9,19,20]. According to [20], the common thread in all the levels of autobiographical memory is the phenomenal sensation of memory:

The sensation signals the state in an experiential way. The experience recalled, the sense of self in the past and the episodic image that accompanies that sense, indicate to those who remember that those are indeed memories and not dreams, fantasies or some other state of non-memory. (p. 614)

It is therefore suggested that memories are a layering of perceptions, and that these perceptions are stratified through molecular processes that have been investigated only partially [15,47,58,60]. Molecular research suggests that the formation of memories in the mammalian brain is mediated, at least in part, by a calcium-dependent phenomenon of the SC-CA1 synapse, but also that this process is then modulated by neurotransmitters, such as dopamine, serotonin, acetylcholine, and endocannabinoids, which are involved in a variety of processes related to, among others, mood and memory [59]. The action of these substances modulates long-term potentiation (LTP) [59]. In the context of the graphic representation of the Sphere Model of Consciousness, these processes can be metaphorically represented by the meeting between the time line, or the past, and pleasant/unpleasant emotions of different intensities (Fig. 3). All memories have a certain “emotional coloring,” which is mediated by the aforementioned mood-related neurotransmitters.

It is known, however, not only that memories are necessarily recordings of a subjective, partial point of view of experience, but also that this perception is constantly mediated by interpretation [14,33,90]. This is further supported by the time lag between sensory perception and consciousness of a stimulus, which in some cases can last up to half a second [11,30,55]. It is also known that memories are used by the brain for the purpose of unceasing predictive activity—the *proactive mind* [6]—and that this predictive activity also influences perception. Perception is not a passive, uniquely receptive process, and if the layering of memories constitutes the past, projection represents the future. As the experience moves away in time and space, its content becomes increasingly abstract and subject to further elaboration [33,38,42,88]. With this greater level of abstraction comes greater variability in the possible interpretations of the experience. Consequently, there is a time axis with two

FIGURE 4. The two axes, time and emotion, meet at the central point

directions (past-future) and a central point that will be further discussed below. Ultimately, the experience of the layered past is projected so that the future is shaped as a result of past experiences (Fig. 4).

3.2. The Emotion Axis

It is now possible to deepen our discussion of the emotion axis. Autobiographical experiences do not exist as a neutral recording of a set of perceptions, nor does the brain normally produce emotionally neutral predictions. Rather, these recordings and projections inevitably have a certain emotional coloring [7,9,25,51,69,104]. Even in the case of emotions, there is a crucial interpretative function. Several models have been proposed in the literature, all of which converge in the conclusion of an interpretative process, cognitive in nature, that is integral to emotional experience. Thus, in his model [25], distinguished between emotions and feelings, with “emotion” indicating a sensory change that takes place in the internal and visceral environment of the subject and “feeling” denoting the mental image of this sensory process. According to [51], each emotional state is determined by the combination of two factors: readiness for bodily action and its representation, and evaluative description. Readiness for action involves the activation of certain brain and body systems in response to stimuli (essentially the limbic, autonomous, hormonal system and components of the skeletal nervous system). Evaluative description comprises self-representation, or the way in which one’s self was influenced by the event. This interpretative process, in the case of emotions, represents a double polarization: emotions are pleasant or unpleasant and, from the psychological point of view, are associated with the reward/punishment spectrum (Fig. 5). In fact, both reward and punishment can reinforce behavior and perception.

A specific set of brain structures and neuronal pathways are responsible for reward-related cognition, which generally includes associative learning (mainly classical conditioning and operant reinforcement), incentive centrality (i.e., motivation and desire), and positive emotions, particularly those involving pleasure. The brain structures involved include the mesolimbic dopaminergic system and others, generally referred to as the reward system, that constitute the stimulating circuit between the cerebellum and basal ganglia [12] (Shulze 1995). This system functions as an interface between the midbrain and diencephalon and penetrates deeply to frontal regions where, in accordance

FIGURE 5. The intersection of the time and emotion axes, which produces a two-dimensional, circular life

with the strength of the stimulus received, a certain amount of dopamine is released, triggering the urgent desire to perceive a stimulation (not yet characterized). The dopamine system then is continuously activated until an effect occurs. In this mechanism, punishment can be seen as an event that imposes unintended consequences in order to stop unwanted behavior. Behavior can be punished in two different ways: removal of positive reinforcement or introduction of negative reinforcement. The second creates difficulty or discomfort. If removal tends to strengthen a desired behavior, by contrast, punishment suppresses temporal behavior without orienting towards a desired behavior. Experiential avoidance is that set of strategies that is implemented with the aim of controlling and/or altering our internal experiences (thoughts, emotions, sensations, or memories) (Shultz 2015).

3.3. Inserting the Third Axis: From a Flat Plain to a Spherical Being

The intersection of the two axes—time and emotion—produces a two-dimensional and circular life, or a “flat life,” in which the repetition of experience cycles is determined by the interaction between emotional memories and projective experiences; that is, a circuit that moves between dependence and the need for gratification (Fig. 5).

When we insert in the vertical axis Y into the diagram, it can have two different functions. With respect to the diagram in Fig. 5, the vertical axis can be regarded as a graduated scale of awareness. In this case, the lowest point will represent minimal experiential access to awareness, while the opposite end will represent maximal access. In this way, the sphere structure represents variation in degree of awareness, but does not represent the “empty” state in the center (Fig. 6).

At this level, we still see a bi-dimensional surface deeply different from the possible experience of emptiness, or “consciousness without contents.”

The situation changes only when we consider the third axis in relation to high-low self-determination, because it results in a different interpretative capacity. The idea of aspiration, or intentionality aimed at the pursuit of a predetermined result, enables the implementation of interpretative capacity. The vertical axis refers to the capacity for self-determination, understood as the presence of an autonomous or intrinsic motivation [26], or the undertaking of an activity that is satisfactory in itself for its own benefit, as opposed to

FIGURE 6. The vertical axis with respect to the “flat life.” Here, the axis represents a graduated scale of access to awareness

the execution of an activity in view of an external result (dependent or extrinsic motivation). Studies have identified different degrees of internalization of motivation, where the process of internalization refers to the efforts made by the subject to transform an external motivation into an intrinsic value [24]. Self-determining activity is expressed in a correlation between autonomy and improvement of self-regulation, through the generation of more “energy” and “vitality” [65–67], which may be expressed neuronally in the correlation between error-related negativity (ERN) in the anterior cingulate cortex and self-regulatory mechanisms of performance [53]. Studies show that greater autonomy of motivation is associated with better ability to understand and use negative feedback in executing an activity. Clearly, this too is an interpretative process. While interpretation is an unavoidable trait of the perceptual process described above, it can occur without the conscious knowledge of the individual, through the reiteration of memories, or intentionally, as a product of the tension associated with change. The same process will happen in the dimension that the model defines as the root; that is, the dimension of value and of the foundations of behavior, which is capable of soliciting interpretations that conflict with the mere reiteration of memories and, in turn, changing behavior [10]. The mechanical process of “circular life,” dominated by the reward-punishment mechanism, is interrupted by the generation of an intense aspiration or by questioning the founding values of the world view. In this case, the intentional exercise of the interpretative capacity, with a purpose, can modify automatic mnemonic layering. The evaluative function, which includes the “sacred” values of the individual, involves different neural areas than that

of the reward-punishment mechanism. In the former, the left temporo-parietal junction and the left lateral-lateral prefrontal cortex are involved, while the abovementioned areas of the reward system are not activated [10]. The insertion of the vertical, high-low dimension therefore extends the representation of experience into a “spherical life.” Here, the logical mathematical value of this form, an ideal paradigmatic model, is understood.

As noted above, the third characteristic of the geometric shape is as follows: “All points of the sphere are ‘umbilical,’ or locally spherical, meaning that, in these points, the normal curvature is the same in all directions. Therefore, the principal curvatures are identical, and each tangent vector represents a main direction.” Hence, the logic of the sphere is a logic of equitable redistribution of forces. Each pressure that reaches the sphere from one of the six directions of space, which are represented in the model as polarizations of time, emotion, and self-determination, are redistributed throughout the structure without creating deformations, as long as the center of the sphere remains “empty.”

3.4. The Center of the Sphere and the Consciousness

The Sphere Model of Consciousness places the point of maximum awareness in the center of the system, equidistant from all possible interactions with the dimensions of experience.

With respect to the distance from this center, the model is thought of as a set of stratifications, like concentric spheres, each of which corresponds, from a psychopedagogical point of view, to the seven levels of the theoretical development model of the “I” [70,77,78]. However, examination of the neurophysiological correlates of the theoretical development of the “I” from the “environmental” to the “ideal” is still at an early stage. As such, we will refer only to the distinction between the non-conceptual Minimal Self and Narrative Self, which dates back to William James, in relation to which we will add a further level to represent the phenomenology of the experiences of possible “consciousness without content.” In the case of the Minimal Self, proprioception, in which bodily sensory inputs are predominant and self-reflexivity is low. However, these sensory stimuli are known to be pre-conditioned by memories, which are themselves interpretations. In the case of the Narrative Self, there is reflective content, within which there are representations of the past and the future, including mental representations of emotion as negative or positive.

The correspondence between (a) the neural activity underlying the minimal self and the narrative self and (b) the related brain areas has been specifically reported by Berkovich-Ohana and Glicksohn [9]. Research evidence has shown that circumscribed brain regions are involved in the two types of sense of self [18,54]. The neural networks that support the Narrative Self and the Minimal Self can be associated with the organization of the cortex in two global and often antagonistic systems [31,37,95,101]. Berkovich-Ohana and Glicksohn [9] suggest that the neural space responsible for the activity of the Narrative Self is the *default mode network* (DMN). The DMN is inward-oriented, inhibited during tasks, and associated with self-referentiality and

mind-wandering [39,84]. The DMN consists of the medial fronto-parietal cortex (PFC), the posterior cingulate cortex, the inferior parietal lobule, and the medial temporal lobe, including the hippocampus and the lateral temporal cortex [17]. In contrast, it has been proposed that the Minimal Self relies on the sensory-motor attentional network, which includes the dorsal attention network, including the frontal ocular fields, the ventral premotor cortex, the supplementary motor area, the superior parietal lobule, the intraparietal sulcus, and the medium temporal area sensitive to movement [9,21]. Between the Narrative Self and the Minimal Self is interposed an intermediate network, the fronto-parietal network, which can be broken down into the “executive control network” (dorsolateral PFC and anterior inferior parietal lobe) and the saliency system (anterior insula and ACC), with the latter also specifically identified as the switch between the intrinsic and extrinsic systems [62,91]. The intermediate network cooperates with the typically antagonistic Narrative and Minimal Self systems, making one of them dominant in each state, and possibly integrating information from and choosing between the two potentially competing systems [9,94,96]. As indicated by the research discussed above, the two systems related to the two Selves are often in conflict [9]. The immediate bodily experience of the Minimal Self contrasts with the abstract narration elaborated at the level of Narrative Self. It has been shown that meditation practices can produce a harmonizing effect between these two dimensions, with great significance for the consciousness of the individual.

We will now consider a possible representation of the processes of “consciousness without content,” recorded in studies on meditation through the characteristics of the central space of the sphere, with the addition of a new dimension of the self that has not previously been considered. This central Place in the sphere can provide a logical structure, corresponding to the concept of emptiness as a dimension of experience not conditioned by subjective memories, and witnessed within the context of different contemplative practices. In the central place, yesterday and tomorrow meet, while love and power, height and depth, cancel one another out because they are all equally present. That point, equidistant from all the others, is metaphorically named the “place of pre-existence.”

3.4.1. Emptiness of the Center of the Sphere: A Neuro-Psycho-Educational Perspective. The shape of the sphere, which so effectively represents the dimensions of our experience, finds its most complete meaning in the function carried out by the central point, a nucleus that is experienced as a *void*. Based on the mathematical laws of the sphere, this void could be understood not as the absence of references to consciousness, but as a relationship of equidistance from all the simultaneously present references, with no dimension prevailing over the others. Let us continue developing this representation, its correlates and possible directions, for future research.

With regard to the Sphere Model of Consciousness, it is possible to assume an inner place that exists before the stratifications produced by experience. According to this representation, the center of the sphere represents

the state of maximum receptivity of the conscience, available in equal measure to all the dimensions of experience. It can therefore be assumed that meditation practices can lead to an experience of consciousness that can de-automate Pavlovian conditioning [29, 40, 41, 92], regenerating the subjective memories in their conditioning effect. Due to the possibility of experiencing of regenerating memories, we have metaphorically called the central point of the sphere the *place of pre-existence*, as it represents (Fig. 2) a state of consciousness free from the stratification of memories in the subjective chronology. This denomination also indicates a suggestive affinity, particularly effective from a developmental point of view. It has been observed that, especially during the last three months of gestation, the fetal brain, which is in a state very similar to sensory deprivation, mainly produces the low-frequency waves that are also typical of deep meditative states [89, 100].

The state of emptiness overlaps with the idea of consciousness in itself [44, 85, 103] or consciousness without content [64, 83]. The Sphere Model Specifically highlights the equidistant character of the experience. In observing different meditative practices, the common neurological characteristics make psychological correspondences more significant. For example, there is often cortical inhibition, as evidenced by theta EEG waves. Several investigations have revealed increased theta activity following different meditation practices, such as Sahaja Yoga, yoga nidra, Zen breath counting, and Qi Gong [2, 48, 50, 68].

Theta activity was further found to be associated with a positive emotional state (Aftanas and Golocheikine [1] for Sahaja yoga) and with a lost sense of executive control or desire for action (Kjaer et al. [48] for yoga nidra; Lou et al. [57] for yoga nidra). In yoga nidra, which also includes visualization, theta was associated with accentuated sensory images [48]. Relaxed concentration and decreased activity of the sympathetic nervous system during theta activity has also been observed (Kubota et al. [50], for Zen breath counting). This cortical inhibition would explain the absence of thoughts, emotions, body awareness, and sense of self at deep levels. This interpretation had previously been considered contradictory in the literature, because EEG theta was associated with the imaginative activity preceding sleeping states. A distinction is now made between low-range theta (4–6 Hz), which is associated with daydreaming, and theta (5–7 Hz), which, in the area of the frontal cortex, is associated with loss of executive control. Theta, in general, reflects massive cortical inhibition [97]. It has also been proposed [4] that increased theta and alpha (8–12 Hz) may reflect decreased contents in consciousness.

Further studies suggest cortical inhibition or filtering (gating) of auditory sensation (Liu et al. [56], for Qi Gong), increases in neural order or coherence (Khare and Nigam [46], for yoga and transcendental meditation), and reduced complexity (defined as the number of activated cell groups, an indicator of the complexity of neuronal calculations in the brain; Aftanas and Golocheikine [2], for Sahaja yoga). Reduction in complexity may be due to the switching off of neural connections in order to reduce incoming information and therefore maintain an internal attentional focus [2].

Expansion of the receptive capacity, achieved through greater availability determined by the balance between emotional factors (interruption of the reward-punishment mechanism), temporal factors (focus on the present), and self-determination (balance between intrinsic and extrinsic motivation), creates a dimension of self-consciousness that we refer to as “Overcoming of the Self.” These concepts can be operationalized, as detailed in the second part of 2.4.

3.4.2. Overcoming of the Self. We suggest that it is necessary to define a dimension, different from the Minimal and Narrative Selves, which we call “Overcoming of the Self.” Studies related to meditative experiences provide psychopedagogical evidence that people can reach a deep state of silence, in which they become able to reconsider their past memories and experience a deep sense of self-efficacy [79]. In this state of emptiness, in which we are in the center of the sphere and assume a state of consciousness “with all contents,” or reference points. We denote to reference points as conscious and unconscious contents that are related to awareness through the global workspace, according to GWS and information integration theory [5, 28, 102]. Contents in one’s awareness—no matter how minimal—or the underlying mechanisms cannot be equated to awareness itself, or to an awareness-in-itself correlate, because that equation would lead to a tautological explanation. As [44] recently noted,

To regard nondual awareness primarily as a minimal phenomenal experience, rather than as a unique kind of *sui generis*, means that it is still seen as content of sorts, which leads to an excessive concern over how minimal the minimal phenomenal experience is. (p. 14)

If it is possible to observe something like awareness in itself, it has to be isolated from any content and/or related level of arousal. According to [44], nondual awareness is not concerned with prediction [63] or with memories, even non-specific memories. Some memories could be associated with awareness itself, such that those memories could present themselves during awareness experiences [64, 81, 82]. When we argue that the sphere presents its own logic, we suggest that it is a specific kind of intelligence. The relationships presented in the model indicate that awareness in the central place is equidistant from other dimensions. The other dimensions are not missing. Equidistance implies a total independence from those dimensions. We cannot identify awareness in the attentional schema [45, 105], nor with fronto-parietal networks engaged in intentional pursuit of a predefined goal [27]. In the Sphere Model, these networks would be related to the self-determination axis. However, the central place of the sphere, exactly as traditional spiritual accounts report, implies a lack of extrinsic intentionality. It is the classical Eastern “non-doing.” Indeed, expression of intentionality would activate areas, such as the basal ganglia and mechanisms related to the “reward system” [12] (Shulze 1995).

The hypothesis we wish to present here is that sensory deprivation is one way to produce meditative absorption [36, 52, 87, 99]. We present here a speculative hypothesis based on current empirical evidences on “consciousness without contents” and its correlates. The sensory dimension, widened through

the direction of widespread attention, becomes more receptive and consequently may overcome the sensory coding determined in subjective autobiography, that is to say the code that determines the characteristics of the Minimal Self. The increased sensory receptivity may suspend the Narrative Self and, as a consequence, enables the restructuring of experiential memories. It can be claimed that as consciousness dilates, becoming able to perceive every content, the contents vanish. When consciousness is focalized on widening peripheral attention to the necessary extent, identification with the content of this or that awareness melts away, and the individual enters into what we have defined as “the place of pre-existence.” We have chosen this name because the space represents the possibility of living before perceptions—and thus re-processing auto-biographical memories—“pre-exists” perceptual experience. The experience of “pre-existence” implies that individuals come out of absorption in a neutral relationship with their own memories, without losing any of them. Thus, researches on sensory deprivation should show a correlation between the effort to integrate the information coming from the environment on one side and a state of “consciousness without contents” on other side. The sensory deprivation’s environment could stimulate the enlargement of the senses in the effort to produce a representation. This effort could lead to the state of “emptiness”. A research recently conducted on the OVO sensory deprivation chamber, based on the Sphere Model presented here [8] provided supporting evidence of the involvement of the insula, which plays a role in the experience of bodily self-awareness, sense of action, and sense of body possession [23], in addition to transmitting homeostatic information that enables sensory integration [106, 108]. It is also involved in the salience network, which deals with environmental monitoring, response selection, and musculoskeletal body orientation [98]. The enhanced activity, in particular the beta, with a peak in the insula, might suggest increased effort for interoceptive sensory integration signals, which are particularly necessary when an external environment is difficult to integrate, as in the OVO-WBPD chamber.

These findings and the current hypotheses support the need for further electrophysiological inquiry in the directions. More specifically additional studies could benefit through a shared investigation which would take into consideration proposed Raffone and Srinivasan’s hypothesis concerning the role of coherence [83]; Ricard and Singer’s hypothesis [85], concerning global workspace as a mediator of awareness, while representing itself reflexively, widened, and emptied of other contents; Metzinger’s theory [64], according to which awareness in itself is a virtual model of the general state of arousal in the brain; and Josipovic’s hypothesis [44, 45], which gives a determining role to a dynamic functional network with a main node in the central area of the precuneus, and a main axis with a node in the dorso-lateral prefrontal cortex.

4. In Summary

We started from a geometrical description of the properties of the sphere as a model for consciousness’ phenomenology. We illustrated here for the first time

the consecutive steps for the construction of the model with their neurophysiological correlates. We provided a model sufficient to describe fundamental dimensions of human experience with consciousness such as time, emotion and self-determination. In the final and most important part of the article, we proposed a speculative hypothesis about “consciousness without contents” as it is experienced in meditative practices. It has been shown how the Sphere model could give account for the experience of “emptiness” through the center of this unique geometrical shape. We hypothesized that the spherical form suggests that emptiness is not the absence of contents, but every content, and that one can experience this state under specific condition, such as when the senses are saturated like in sensory deprivation..

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