



# A Novel Subject-Object Model of Consciousness

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## ABSTRACT

The nature of the subjective aspect of consciousness is elusive and hence, there has been a lot of debate on how to quantify the subjective experience of a human in comparison to other living systems. Here, the primary concern lies with the question of the presence of consciousness in other living systems, and if so, how distinct could the experience be when compared to humans. Firstly, to probe such investigations, our current theories fall short in having an absolute definition for consciousness and whatever we observe and experience as a human brings about our present notion/definition. Failures in capturing the non-deterministic nature of living/biological entities with our reductionist and deterministic models call for a new holistic science and synergistic theories of consciousness. In this regard, present paper tries to propose a novel consciousness model; Subject-Object Model (SOM), based on the degree of subjectivity/subjectiveness a living species would naturally embrace. It propounds consciousness as a kind of evolutionary trait and thereon claims it as an emergent property resulting from the parsimony of indexing quantities. Accordingly, it conjectures; the development of certain degree and level of complexity in a living system during the process of evolution calls for an emergence of a qualitative property (like consciousness) for better survival and optimal functioning. This provides a scale to estimate the level of consciousness and the extent of subjective experience of life across the wide living spectra.

**Key Words:** subjective consciousness, the self, objective consciousness, self-awareness, living systems

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## Introduction

When we experience the enigmatic phenomenon called 'Life,' one can be sure of experiencing it from the subjective standpoint (having the first-person perspective) and also objectively as a third-person with the sense of self-awareness. Experiences resulting from both these perspectives combine to create a unique experience of life (Hodgson, 1898; Chalmers, 1996, 2002, 2004; Velmans, 2000, 2009; Zeman, 2005; Leontyev, 2009; Pereira & Reddy, 2016b, c, e). Even though we take the subjective experience of life as granted (identifying it as the

very nature of a living entity), mechanisms involved in the construction of such phenomenon called 'Self' looks mysterious and puzzling to modern science (Cleeremans, 2005; Feinberg and Keenan, 2005; Greenfield and Collins, 2005; Grandpierre *et al.*, 2013; Noel *et al.*, 2015; Fabbro *et al.*, 2015; Feinberg & Mallatt, 2016; Reddy & Pereira, 2016b, c, e). We are not only short of understanding the underlying mechanisms that results in feeling of the sense of self (a grounded experience), but also not certain about the location or place in the physical body from where one perceives the self and surroundings (Feinberg and Keenan, 2005; Morin, 2011; Alsmith and Longo, 2014; Noel *et al.*, 2015; Fabbro *et al.*, 2015). When we probe such investigations, we usually assume consciousness to be grounded or rooted in the physical fabric and hence associate it with constituents of the body like the brain, looking for localized theories that could address the concept of self.

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But, few recent studies in experimental neuropsychology revealed that such a notion of bodily-self grounded in the physical fabric may not be true since one can also have the sense of self (or feeling of self-identification) outside one's physical body (Blanke & Metzinger, 2009; Blanke, 2012; Ananthaswamy, 2015; Noel *et al.*, 2015). The concept of 'Peripersonal Space (PPS)' could help us in understanding the non-local roots of consciousness in the brain. The PPS is an encapsulating space in the immediate vicinity of the body; which acts as an interface between the body and environmental interactions (Blanke & Metzinger, 2009; Blanke, 2012; Noel *et al.*, 2015; Serino *et al.*, 2015). Though it is a multi-sensory representation constructed by the brain, here, the interesting question would be, how can a localized compact (physical) structure like brain construct a dynamic, non-local (and non-physical) peripersonal space (PPS)? It is analogous to a magnet (compact but localized) and its non-local (and non-physical) magnetic field that envelopes and extends beyond its physical boundary. Each physical organ in the body has their own version of PPS called 'Receptive fields (RFs),' and PPS associated with the whole body is just an integrated or global version constructed from these individual ones (Duhamel *et al.*, 1998; Blanke, 2012; Serino *et al.*, 2015). So, even though PPS construct could be related to the activity of the specific multisensory neuronal regions in the brain (Blanke & Metzinger, 2009; Blanke, 2012; Noel *et al.*, 2015), it's not a phenomenal construction (of brain mechanisms alone). It is epiphenomenal resulting from the integration of respective RFs via specifically optimized pathways. Similarly, consciousness could in a way be related to brain and its activity having respective maps and correlates, but resulting localized theories (involving brain alone) may not capture entire phenomenon or roots of consciousness in its entirety. This is because consciousness could be resulting not from the activity of the brain alone but from certain informational processing and self-optimal mechanisms that are rooted in the whole system via defined pathways (Edelman & Tonon, 2000; Cleeremans, 2005; Greenfield & Collins, 2005; Tononi, 2005; Grandpierre *et al.*, 2013; Hankey, 2014, 2015; Webb & Graziano, 2015; Oizumi *et al.*, 2016; Tsuchiya *et al.*, 2016). Hence, consciousness could be thought of as a non-local and non-material property resulting from certain order and structure in the system with optimal self-reviving, self-organizing and

self-feeding properties. In this sense, it could also be seen as a higher order property resulting from certain specific states of matter (Tegmark, 2015). The model proposed in the present paper tries to address such issues associated with the theories of consciousness and accordingly scales the level of consciousness and subjective experience of a human compared to other living systems.

### **Levels of conscious experience: Based on the degree of Subjectivity/Subjectiveness**

The intensity and extent of any conscious experience of life would depend on the level of subjectiveness with which one perceives it (Hodgson, 1898; Chalmers, 1996, 2002, 2004; Zeman, 2005; Morin, 2006; Boly *et al.*, 2013; Fabbro *et al.*, 2015; Feinberg & Mallatt, 2016). Consequently, we come across three different levels of consciousness based on the degree of subjectiveness: 1) Objective consciousness 2) Subjective consciousness, and 3) Subjective self or the sense of self-awareness. Based on this, one can model one's conscious experience to be resulting from the integration of fragment experiences associated with the varying nature of experience at each of these levels (Hodgson, 1898; Velmans, 2000, 2009; Leontyev, 2009; Morin, 2006, 2011).

Objective consciousness gives the third-person perceptive of an experience; the sense of *how it would feel like* to be an entity having such experience in first-person. This is where all our empirical observations and investigations would point to. Every study aimed at understanding the nature of consciousness and its physical correlates would be indirectly addressing this aspect of consciousness. This is where the artificial intelligence (AI) systems and few other biological entities would fit in. Artificially designed robots and sensors with self-feedback, informational and other bio-mimicking properties are made to sense the surroundings making them objectively aware of the ambient. But they are always objectively bounded; they can't have a subjective experience of how it feels like to be called as living. This is the basis on which objective entities differ from biological/living entities (Trewavas & Baluska, 2011; Shanta, 2015, 2016; Feinberg & Mallatt, 2016; Reddy and Pereira, 2016b, c, e).

The other two aspects of consciousness are purely personal and subjective. They can neither be captured nor generalized; this signifies their unique nature. Subjective consciousness



results in the unique personal experience of the objective world or surroundings. It gives the taste of *how it feels like to experience it* as a first-person. The moment we try to report or investigate, it becomes third-person (Hodgson, 1898; Chalmers, 2002, 2004; Velmans, 2000, 2009; Reddy & Pereira, 2016 b, c, e). Most of the living entities would embrace the life experience from this part of consciousness. This is the level of consciousness we usually associate with different living species like birds, animals etc (Leontyev, 2009; Boly *et al.*, 2013; Fabbro *et al.*, 2015; Feinberg & Mallatt, 2013, 2016; Graziano & Webb, 2016b). The subjective self or the notion of self-awareness points to the subjective experience in first-person and spontaneously being aware of the self or agency to which it is happening (Hodgson, 1898; Morin, 2006, 2011; Leontyev, 2009; Fabbro *et al.*, 2015). One's experience at any point of time could, in turn, be related to any of these aspects.

A deeper understanding of consciousness comes from various neuropsychological disorders with the altered sense of experience resulting from conditions that perturb any of these aspects of consciousness (Feinberg, 1997, 2005b, 2010; Blanke & Metzinger, 2009; Ananthaswamy, 2015). Perturbations of objective consciousness correspond to problems like the spectrum of Autistic disorders and other specially challenged conditions etc. Synesthesia, Schizophrenia, Body integration identity disorder (BIID), Phantom limbs etc are disorders associated with the subjective aspect of consciousness. The altered experience of the subjective self or the aspect of self-awareness could be noticed in disorders like Doppelganger, Autoscopic phenomena, Ecstatic epilepsy etc (Blanke & Metzinger, 2009; Ananthaswamy, 2015). All though these disorders could have different sourcing mechanisms, it would be interesting to study various neurobiological, other physiological mechanisms and conditions that result in the construction of specific or each of these aspects of consciousness. In this regard, it is necessary for present science to develop various modalities by which one can estimate or understand the aspect of consciousness certain living species would naturally embrace. This, in turn, would have implications for understanding the fundamental nature and structure of consciousness and thereby unravels how evolution involving ecological consciousness works from this perspective.

## Subject-Object Model of Consciousness

Recent advancements in the medical field (mainly the possibility of organs transplantation) made it clear that consciousness or the sense of self of an individual is neither grounded nor rooted in any specific organ like the heart, liver or in the brain, etc. Even if that is the case, disorders like BIID, Phantom limbs show that the sense of identification of certain body parts (i.e. subjective experience of the bodily self) could be perturbed by disrupting respective maps in the brain (Feinberg, 1997, 2005a, b, 2010; Blanke & Metzinger, 2009; Blanke, 2012; Ananthaswamy, 2015; Noel *et al.*, 2015). From these conditions, one can conclude that consciousness and its subjective aspects are not specifically localized. If one still argues brain to be the seat of self and source of consciousness then does that mean a fetus in mother's womb is not a living entity, and can't be considered as a conscious being until few initial weeks of its development? Suddenly with the development of the brain and its constituents after a certain period of time, it turned conscious? If few important regions in the brain are considered to be the source of consciousness, then are they the first regions developed in the evolution of a being? Until this point is fetus only a kind of biosensor or biomechanism responding to the ambient environment? In this context, how best do the brain based models of consciousness explain the cases of Hydranencephaly (Pereira, 2016)?

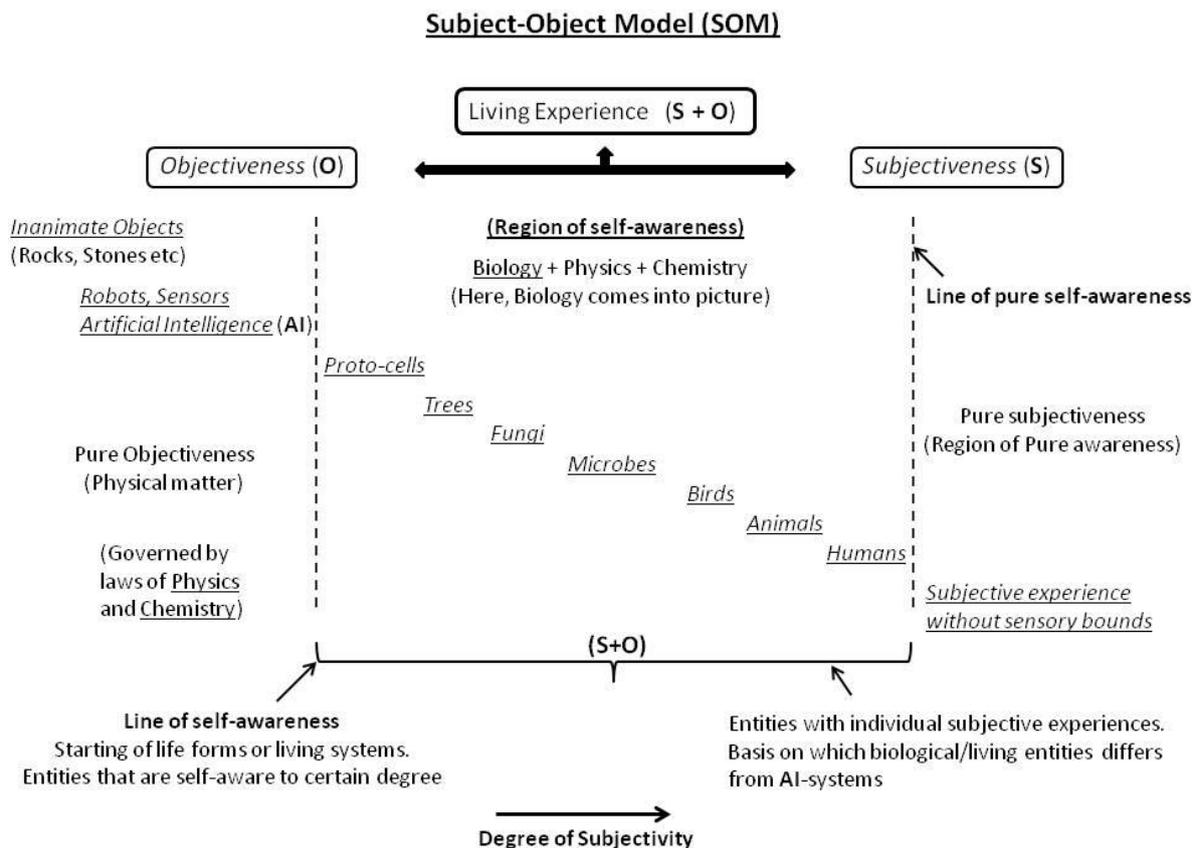
When we look at how as an individual we subjectively experience our own-selves, one can be certain about experiencing one's own self in the global/integrated sense (Chalmers, 1996, 2002, 2004; Velmans, 2000, 2009; Ananthaswamy, 2015; Reddy & Pereira, 2016b, c, e). We feel/experience our body and its constituents (as a first-person) with the sense of identification (thus constructing the bodily self). In the process, one can notice that we are not given access to the subjective experience of functioning of each and every organ or for say various biological mechanisms occurring under the sheath of our physical field or body. We only have global or integrated experience of the self. We are not consciously monitoring the system of mechanisms that are necessary for our functional and living purposes. They are guided and monitored automatically (using self-feedback mechanisms) at various functional levels, and only at the certain level of activity, the sense of awareness of its presence seem to pop out and felt. If we look for the reasons why we are not



given access to such experiences at these lower functional levels, we could understand better the nature and structure of consciousness.

To explain such phenomenon, one could come across two possibilities on the occurrence of consciousness. One relates the extent of conscious experience to our sensitivity levels and the other quotes the possibility of the emergence of consciousness only at certain level of activity (an epiphenomenal argument). The later possibility argues consciousness and its subjective aspect (or experience of the sense of self) to be epiphenomenal in nature and hence would arise only at a certain level of functioning of the system. This leads us to think of consciousness not as a localized phenomenon associated with specific parts of the brain or body but as a global construct resulting from certain functional order and level of activity. This is inherently communicated and encoded in specific pathways following which consciousness at a subjective level pops up (Edelman & Tonon, 2000; Cleeremans, 2005; Greenfield & Collins, 2005; Tononi, 2005; Feinberg & Mallatt, 2013; Grandpierre *et al.*, 2013; Webb & Graziano, 2015, 2016b; Reddy & Pereira, 2016d). To explain this possibility in detail a novel Subject-Object Model (SOM) of consciousness is developed (see Fig.1). The scale for this model is based on the 'degree of subjectivity' a living entity would naturally embrace. Since, one's experience results from the combination of both objective and subjective aspects of consciousness, this model tries to scale different life forms/living systems based on these aspects. Finally, it quotes how different a human experience (as a subject) could probably be in comparison to other living experiences (in agreement with Leontyev, 2009; Boly *et al.*, 2013; Fabbro *et al.*, 2015; Graziano & Webb, 2016b). Following this, we would have life forms with various degrees of subjectivity and objectiveness.

The present model hypothesizes consciousness to be the reflexive property that emerges from the biological/living system exhibiting parsimony of various indexing quantities (Edelman & Tonon, 2000; Cleeremans, 2005; Tononi, 2005; Janzen, 2008; Peters, 2013; Hankey, 2014, 2015; Tegmark, 2015; Webb & Graziano, 2015; Oizumi *et al.*, 2016; Reddy & Pereira, 2016d, e). Accordingly, the extent of subjective experience one develops would depend on factors like the degrees of freedom in various informational systems, orderliness in complex pathways (resulting in varying entropy), self-feeding and other self-sustaining mechanisms and global communication network etc (Edelman & Tonon, 2000; Cleeremans, 2005; Greenfield & Collins, 2005; Tononi, 2005; Hankey, 2014, 2015; Webb & Graziano, 2015; Oizumi *et al.*, 2016; Tsuchiya *et al.*, 2016). All these factors depend on morphological and other biological faculties that a living entity adapts during its evolution, which in turn depends on functional, ecological and environmental aspects (Cleeremans, 2005; Leontyev, 2009; Boly *et al.*, 2013; Fabbro *et al.*, 2015; Feinberg, 2013, 2016; Webb & Graziano, 2015, 2016a, b; Reddy & Pereira, 2016 b, c, d, e). For example, with increased morphological or biological complexity one requires maximum optimization of functional pathways, quickest feeding and informational systems with a wide communication network for better functioning. This optimal and survival necessity calls for an emergence of the subjective aspect of consciousness. Greater the subjectivity, greater is the index for the heightened level of functioning of any such complex biological entity. This theory explains why different living species with varying complexity both morphologically and functionally should have different levels and degree of subjectivity. Hence justifies why lower forms of life have a low degree of subjectiveness and subtler experiences of life.



**Figure 1.** Subject-Object Model (SOM) of Consciousness.

In the present context, a careful observation reveals that either during malfunctioning or rupture of functional organs or in the case of devastation, we are usually given access to subjectively experience certain subtle mechanisms which are in general inconspicuous while in normal working conditions. Also, we are designed with specific bio-faculties that filter out subjective experience below certain sensitivity level. This is the reason why we usually don't feel the pumping of the heart, blood flow and other dynamics etc. The functional pathways, in general, developed an advanced feeding mechanism and hence any malfunctioning would be immediately communicated with the increased intensity in localized subjective feeling usually associated with that organ. These pathways would involve maps respective to each and every important functional organ in the body. At the time of malfunction, it activates emergency feedback system that would take alternate pathways to support functioning. After certain duration, even these emergency pathways would rupture and tends to collapse completely with a discontinuity in the pathway network. Since consciousness emerged as a signature of a specific order in pathway systems, the moment these are destroyed the physical organ/body

can't keep up with its natural mechanisms and thereby loses its capability to hold or support consciousness. This results in a devastating condition of the specific organ/body and finally death. This could be the reason why malfunctioning/rupture of any specific organ could result in death. Here one could notice that the subjective aspect emerges as a property resulting from the parsimony of indexing quantities following certain constructal laws (Edelman & Tonon, 2000; Cleeremans, 2005; Greenfield & Collins, 2005; Tononi, 2005; Hankey, 2014, 2015; Webb & Graziano, 2015; Oizumi *et al.*, 2016; Tsuchiya *et al.*, 2016). In this regard, subjectivity is just another qualitatively emerged property seeding reflexive awareness which is needed for the better and proper functioning of the biological system.

The other possibility supports a layered structure of consciousness (scaled by the level of sensitivity) with functional interaction/communication happening via subtle mechanisms that are below our sensitivity levels. Just like a sensor is made to detect or sense within a specific range, we humans might also be designed to access only certain levels of sensitivity subjectively. Maybe those functional



mechanisms that occur below this level of sensitivity would not confront any subjective experience. This is very similar to the case of our sensory perception of reality (Reddy & Pereira, 2016a, b, c, e). We are in general limited in perception by the capabilities of different sensory faculties (thereby limiting our subjective experience of life). Therefore, any experience falling outside these limits won't confront any subjective experience at our level of awareness. In the process of evolution, each biological/living species has adopted various sensory faculties with different levels and degrees of sensitivity. Hence, no two species could perceive reality, in the same way, i.e. the extent and level of subjective experience vary from species to species. Similarly, each species could have adopted a different degree of subjectivity/the sense of self-awareness (or feeling of the sense of self) depending on various other factors. Just as limitations in the sensory capabilities limit us to the extent of perception of reality and outside world, similar analogs could decide the degree of self-awareness as well. This explains how humans and other living entities differ in the extent of subjective experience and degree of self-awareness. Various complex mechanisms and other morphological parameters that biological entities adapt in the process of evolution decide its place on the 'degree of subjectivity/self-awareness' scale.

Following this, a life form with zero degrees of subjectivity would be called as an object, say for example stones, rocks, and other material objects etc. These are categorized as the lowest in the scale corresponding to life forms devoid of both the objective and subjective aspects of consciousness. Life forms in the order of ascending degree of subjectivity include plant kingdom, fungi, various microbial systems, animals and humans respectively (see Fig.1). This way animals would have more degree of subjectivity (making them feel more alive) than lower life forms and these, in turn, are succeeded by humans that occupy next position in the evolutionary step. Accordingly, along with varying complexity in morphological and other biological parameters, each specimen/individual entity across wide living spectra also develops a selective degree of subjectivity (or levels of consciousness).

Both the above possibilities converge to the unique structural layout of consciousness and helps in scaling life forms/living systems either

based on the degree of subjectivity or the level of sensitivity. Though at the surface they look very distinct, coupled model would base the life forms in a single parameter. This basis could be claimed to serve as the complete model for consciousness even though necessary indexing parameters and other central networking pathways are to be studied in detail.

## Result

The model developed in the present paper provides a scale to estimate the level of consciousness and the extent of subjective experience of life across the wide living spectra. It scales different living species or life forms based on the degree of subjectivity/subjectiveness. It proposes that after the development of a certain degree of complexity in the biological system, the emergence of qualitative aspects which includes varying levels of consciousness is crucial for its survival. Accordingly, in the process of evolution, each species developed different degrees and levels of complexity associated with biological faculties for functional purposes. This requires respective levels of consciousness and subjective aspect resulting in the unique experience of life. Even though if consciousness is considered to be phenomenal and primary trait, embracing the various aspects associated with it decides the intensity and extent of subjective experience of life.

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