



## Consciousness, Time Perception and Spirituality From

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# Consciousness, TIME Perception and Spirituality from

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**Abstract.** The quest for consciousness has been driving humanity since the dawn of civilization. As the advent of culture unfolded and progressed in different time windows, the original philosophical inquiry transpired into a different knowledge domain. As Barnard Baars mentioned, consciousness was prominently circumvented in the golden era of consciousness from 1780 to 1910. After 1950, when artificial intelligence (AI) started unraveling to mimic human intelligence, prominent cognitive psychology experiments led to the progress of cognitive psychology. From quantum mechanics to cosmology, understanding the creation of the universe and fundamental laws of nature has been a long-term, perennial quest for physicists who seldom ponder whether it should include consciousness. Interestingly, the fortunate ones who can grasp the inner world consciousness transcendence practically themselves are not rare in numbers across countries and cultures. Is consciousness plausible to understand and explain without spirituality, which ordinary seekers have traditionally been able to bestow with the inner subjective world of self-realization? Is consciousness study thus endeavoring nothing left out at all? This paper intends to discuss the complexity of consciousness and at intersection of contemporary studies of time perception, albeit without being devoid of, among other things, spirituality.

**Keywords:** Consciousness, Spirituality, Time Perception, Transcendence, Subjective Experience, Levels and States.

## 1 Introduction

Since ancient times, consciousness has been traditional across cultures and communities. In the seventeenth century, mathematician Leibniz first stated that the mind is both for conscious and unconscious processing. In his working line in the nineteenth century, Fechner also theorized about the unconscious processing of the brain. In the paper in 1951, The Concepts of Levels of Consciousness, Margetts cited that the philosopher Paul Carus's theory of the unconscious was inspired perhaps by ancient Vedic thoughts that ascribe four states of consciousness [1]. As Sri Aurobindo mentions in verse seven of *Mandukya Upanishad*, "*The Unseen with whom there can be no pragmatic relations, unseizable, featureless, unthinkable, undesignable by name, whose substance is the certitude of Oneself, in whom world existence is stilled, who is all peace and bliss—that is the self, that is what must be known*" [2]. Historically, it is maintained among the spiritual seekers who have realized this fourth state and are kind enough to express that

pure consciousness is a privileged aspect that pervades everything. However, the level of consciousness plot vis-a-vis Contents of Consciousness in the cognitive neuroscience domain, as in Fig 1, is usually devoid of considering this, especially the fourth state, i.e., '*Chaturtham*.'

Stream of consciousness by William James [3] was postulated in the late nineteenth century. In *The Varieties of Religious Experience in 1902* [4], he specifically identified four main characteristics of powerful spiritual experiences found familiar and common to individuals from all religions, and he summarized them as follows:

*Ineffability, Noetic quality, Transience, and Passivity*, i.e., the experience of these events as a passive recipient, where one's own "*will is in abeyance*" and as if "*grasped and held by a superior power*" [5].

It is noteworthy to mention that as James postulated, continuity of consciousness without which it could not be called a stream had also cited Time Perception. He further mentioned a fanciful hypothesis: "*The knowledge of some other part of the stream, past or future, near or remote, is always mixed in with our knowledge of the present thing*" [6]. "Time perception from Principles of Psychology "*Where is it this present?*", however, is unlikely to be readily found in cognitive psychology and consciousness studies. Physicist Arthur Eddington, in the historical 1929 lectures at the University of Edinburgh, discussed human experience by closing eyes and looking into the inner world while explaining time extension vis-a-vis space extension without limiting space and physical time [7]. Therefore, the quest for correspondence between the objective outer world and the subjective inner world has historically remained an issue circumventing consciousness in one form or another. However, the endless nature of academic research debate keeps ongoing.

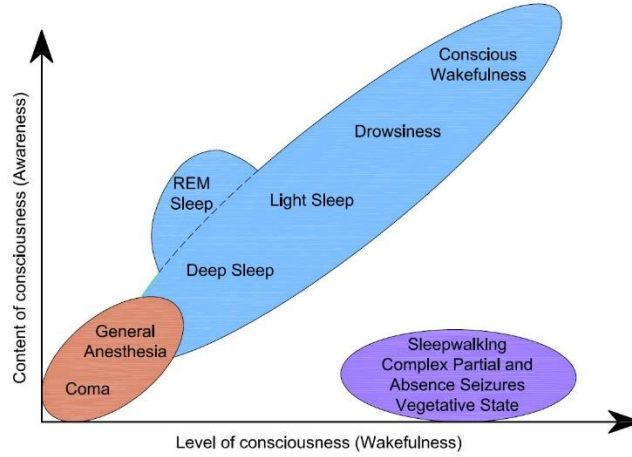
In modern perception, for the last few centuries, the mind-body problem has been examined from different dimensions. Earlier quest kept on hovering in the Physics and mathematics arena with stalwarts like Eddington and Einstein pondering area it surfaced; however, the development of external objective world scientific prowess perhaps the of late re-wrapped the consciousness study since the 1990s with David Chalmers coinage of Hard problems of consciousness [8]: scholars and academicians across the world gained momentum. Therefore, we are at an exciting juncture wherein scientific blooms are exponentially exploding; still, we view the mind-body problem, at least till the contemporary, far from unanimously. Multiple theories have been proposed to address this interdisciplinary subject, and efforts are underway for possible testing of this hypothesis. As many theories of consciousness are untested and untestable [9], the plausibility of generic acceptance of any or more is food for thought. George Miller (1962), who introduced the concept of the magical number seven plus or minus two in 1956 [10] and shaped the study of memory in psychology, noted, "Consciousness is a word worn smooth by a million tongues." Intriguingly, consciousness is what everyone possesses, but without knowing precisely what it is. Thomas Nagel, in his famous paper of 1974, "What is it Like to Be a Bat," argued for thoughtfully explaining consciousness from a bat, a fundamentally different creature in species in comparison to others, which is typically bestowed with the ability to hunt prey with ultra-sonic emission. They can

remarkably discern exact distinctions of distance, size, shape, motion, and texture, which involves hearing the reflections of their own quick, delicately varying, high-frequency screams from nearby objects. In human, it may be more complex to define what it is, as individual differences also play a role. In the book "*Understanding Consciousness*," hovering around the "*What is Consciousness*" chapter, Max Velmans posits the problem of consciousness as:

- i) What is consciousness, and where is it?
- ii) How can we comprehend the causal connections between matter and mind, particularly the interconnections between the brain and consciousness?
- iii) What is consciousness used for? How, for instance, does it affect how people process information?
- iv) Which materials are connected to consciousness? Specifically, what neuronal basis of consciousness are present in the brain of a human?
- v) Moreover, finally, how do we properly investigate awareness to learn about its nature? Which characteristics can we investigate in person? Techniques, what aspects call for third-party approaches, and how do first- and third-person observations connect?

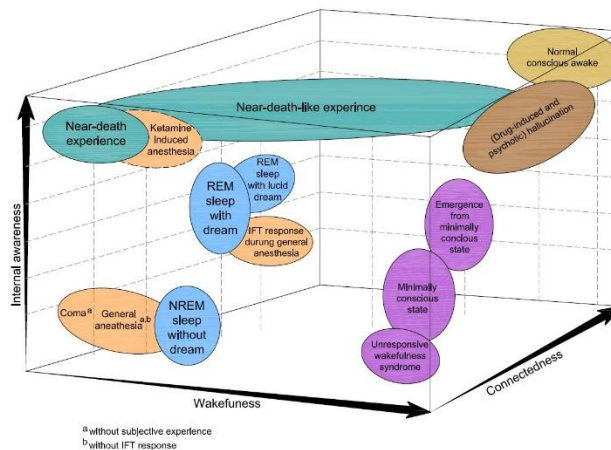
Subjective experience, also known as first-person experience, is now a big part of research that builds on consciousness study, especially research that comes after Chalmers's hard problems. Further, the problem is compounded when the unconscious part of the brain's functioning is solemnly roped in as the scope of consciousness spontaneously broadens. As Liftshitz et al. wonder, worldwide, shanons, sorcerers, and sadhus tend to experience absorption and transcendence, which is puzzling to rightly comprehend why only some people tend to experience [11]. While an acceptable definition is far away from being posed as possible candidates, it is not irrelevant that Cambridge Declaration of Consciousness, 2012, at Sir Francis Creek Memorial Conference, in the presence of eminent personalities from, among other things, neuroscience communities, including Stephen Hawking, stated:

*"The absence of a neocortex does not preclude an organism from experiencing affective states. Convergent evidence indicates that non-human animals have the neuro-anatomical, neurochemical, and neurophysiological substrates of conscious states, along with the capacity to exhibit intentional behaviors. Consequently, the weight of evidence indicates that humans are not unique in possessing the neurological substrates that generate consciousness. Non-human animals, including all mammals and birds, and many other creatures, including octopuses, also possess these neurological substrates."*



**Figure 1:** A graphical plot of the level of consciousness and Contents of consciousness[12]

Figure 1 is the 2-dimensional graphical representation of the content of consciousness, and level of consciousness, i.e., awareness and wakefulness are higher in the awakening state, gradually reducing almost in a linear trend of drowsiness, light sleep, and further deep sleep. In the extreme, this graph depicts that in a coma state, both are almost close to zero. In the rapid-eye movement (REM) state, the awareness is high; however, wakefulness is less, and in contrast, in the vegetative state, wakefulness is high, whereas awareness is minimal.



**Figure 2:** Illustration of Different States and Conditions Based on Wakefulness, Connectedness, and Internal Awareness

Martial et al. further produced the graph in Figure 2 [13] with another plane of connectedness considering Near Death Experience (NDE) research. They spatially transcended with a prosperous state of awareness, wakefulness, and connectedness of the vast reach of consciousness.

## 2 When Consciousness Supposedly First Transpired in Evolutionary History

Without delving into broader details of the origin of life, it would be unjustified to attract our attention toward the idea of understanding consciousness among other animatic beings. Though currently unknown wholly, in human consciousness falls within the hypothetically falsifiable paradigm level, content and self ideally social, after taking cognizance of individual. Therefore, without addressing whether or not consciousness is unique to human beings only, what appears to be relevant that different chronological events transpired when the origin of life in its current form appeared, a few aspects are worth pondering. Hence, without deviating from the topic path, we dive a bit into Life on Earth and its origin to attempt to assume when consciousness could first emerge into life. Darwin wrote to his friend in 1871, "*But if (and oh! what a big if!) we could conceive in some warm little pond, with all sorts of ammonia and phosphoric salts, light, heat, electricity, etc. present, that a protein compound was chemically formed ready to undergo still more complex changes . . .*"

Stoddart, M.D., MRCP, (1903), in a historical paper on the evolution of consciousness, discussed that "*CONSCIOUSNESS is the faculty or function by which we become aware of the existence of our surroundings.*" Further, he mentioned that no feelings are felt while one is in a deep sleep; awareness is suspended. Moreover, it is not novel to imply that an amoeba feels things. Numerous findings, particularly those by Carter and Romanes, imply that amoebas not only have feelings but also highly developed brain functions like memory and reasoning. However, at this point, all he wants to say about the amoeba is that it is conscious, has feelings, and feels. It is unthinkable for something to feel and not be aware that it is feeling [14].

Schrodinger, in his book 'What is Life' (1944), inculcating the relation between quantum phenomenon and life, put forward a structured framing of the physical basis of life, mind, and matter from different aspects and scientific development then till that point in time [15], [16]. About two decades back, Chalmers coinage of hard problems, moreover, it is worth pondering about Thomas Nagel, who stated in his paper [17], "*But no matter how the form may vary, the fact that an organism has conscious experience at all means that there is something it is like to be that organism.*"

The biological computation hierarchy encompasses subcellular activities and interactions among groups of multicellular animals. A few representative instances of the primary computational processes are given at each level of biological organization; it should be emphasized that the highest levels of biological computation integrate the lower ones [18]. For instance, neurons contain the string-writing mechanisms of fundamental protein translation and are incorporated into complex cognitive processes [19].

In the book "Structure of Evolution," [20](page 606) Gould argued when considering the duration of our lives, species deaths on geological scales are undoubtedly more

discrete and "momentary" than human deaths. Ryan Frank, in the book *Viroolution* [21] (pages 186 – 187), depicts an exciting aspect of the immunity system. *"We do know that it first appeared, and very abruptly it seems, with the evolutionary origins of the vertebrates, as represented by present-day bony fish. However, nothing ever appears from nowhere. So, the real question is this: how long ago, whether in the depths of the oceans or during the much earlier epoch of the first living cells, did immunity of any sort come into being, and how, from that primal spark, did the elaborate and rapidly responsive systems we humans enjoy come into being today?"* An extensive overview of the origins of our adaptive immunity was published by Luis Villarreal in 2009. In it, he looked at the interactions between viruses and hosts throughout the entire evolutionary history, starting with bacteria and continuing through the earliest animals, like invertebrates, which had fixed but still somewhat effective immune systems, to the vertebrates, where adaptive immunity was first modified by the emergence of mammals, then primates, and finally humans. The article was titled "The Source of self: Genetic Parasites and the origin of adaptive immunity" [22]. In his review, he persuasively argues that intricate evolutionary interactions between phage viruses and their host bacteria led to the emergence of a primitive form of immune identity and, consequently, the first genuine establishment of the concept of "self."

Figure 3 from *Encyclopedia Britannica* [23] depicts the chronological aspects of geological time-based era, period, and events. The 'Cambrian boom,' or the unexpected discovery of fossils, has puzzled and challenged scientists and biologists since the time of Darwin. Darwin wrote on the *Origin of Species* in it. He emphasized the belief that ancestors "lived much earlier" than their first fossil representatives. While he thought such a secret record was required to describe the complexity level at which early trilobite fossils could be seen, Darwin needed help figuring out why no related fossils of these older types existed. In chapter 9 of the book on the *Imperfection of the Origin*, He emphasized "the geological record." The poor state of our paleontological knowledge explicitly stated collections that "no entirely soft organism" be kept safe. Fortunately, lots have been found in the last 150 years, including several examples of Soft-bodied Cambrian and Precambrian fossils. We now understand that the abrupt fossil appearance in the Cambrian era, as in Fig 3 geological time, was 541-485 million years ago. And not the product of a flaw in the fossil evidence of rapid species diversification, animals evolved simultaneously as humans from shells with biomineralization [24].

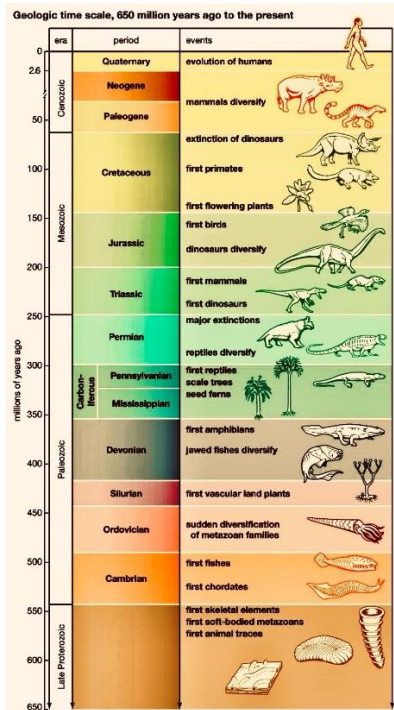


Figure 3: Evolution of species in Geological Time Scale

Though the detailed discussion on this fall outside the scope of this paper, the beginning time, as in Figure 3, i.e., 540 Ma, is noteworthy. A comparative view of various studies led by Borell, Holmes, Lambert, and the modern age's estimate of the Cambrian time scale is produced in Table 1, which closely matches Figure 3.



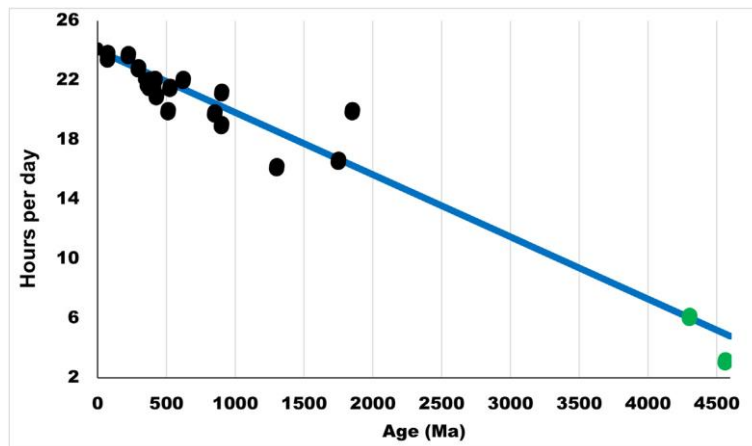
**Table 1:** Absolute scale of geological time in million years through different studies [25]

		<b>Barell (1917)</b>	<b>Holmes (1947)</b>	<b>Holmes (1960)</b>	<b>Lambert (1971)</b>	<b>Modern ages</b>
<b>Quaternary (Neozoic)</b>	Pleistocene	1 – 1.5	1	1		4
	<b>Tertiary (Cenozoic)</b>					
	Pleistocene	7-9	12-15	11	7	12
	Miocene	19-23	26-32	25	26	26
	Oligocene	35-39	37-47	40	38	37
	Paleocene	55-65	58-68	70	65	65
	Eocene					
<b>Secondary (Mesozoic)</b>	Cretaceous	120-150	127- 140	135	135	141
	Jurassic	155-195	152- 167	180	200	195
	Triassic	190-240	182- 196	225	280	280
<b>Primary (Paleozoic)</b>	Permian	215-280	203- 220	270	280	280
	Carboniferous	300-370	255- 275	350	370	345
	Devonian	350-420	313- 318	400	415	395
	Silurian	390-460	350	440	445	435
	Ordovician	480-490	430	500	515	500
	Cambrian	550-700	510	600	590	570

Puetz [26] cited the Equation 1 represents the linear relation of length of day (LOD) in hours with geological time:

$$h = 24 - 0.00417673 * t \tag{1}$$

Where h is the hours per day, and t is the time in million years (Ma).

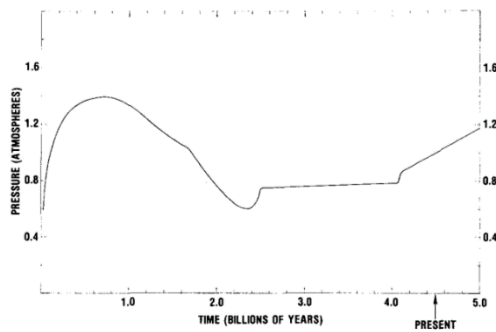


**Figure 4:** Hours per day on Earth as a function of time. Estimates determined from Eq 1

Comparing Fig 4 of hours per day, it reveals that the day duration circa 550 Ma was about 21.74 hours compared to 24 hours a day, for the Earth's rotation. We leave out to delve into the revolution period of the Earth, whether it was precisely 365 days in a year!

Researchers have found that the modern human life history profile first appeared either at the start of the hominin radiation (around 6 Ma), with the appearance of the genus *Homo* (around 2.5 Ma), or much later, possibly only with *H. sapiens* (about 200–100 Ka) [27]. Therefore, in the modern civilization that blossomed with awareness and maintaining time, the critical building block of today's where we are is a relative term. Perhaps we were not supposed to be at the same juncture at the beginning of the Cambrian era, given that all other conditions were the same as today, should the length of day be different!

Archeologically, the earliest indications of self-perception formation through reflection and mirror use, the interaction between humans and psychoactive plants at first, and the altered state of consciousness in shamanism are all somehow connected to consciousness and its evolution. Even though it is undoubtedly one of the most critical aspects of human development, the origin of the sense of Self is rarely the subject of explicit archaeological study. From an archaeological standpoint, there is no way to predict how, for example, the people who lived in the Blombos cave in Africa chronologically would have reacted to seeing their faces and bodies reflected on the mirror's surface [28]. However, the concept of Self, which is being researched about social, cultural, and similar settings, presumably surfaced since then, though exact time prediction appears impossible.



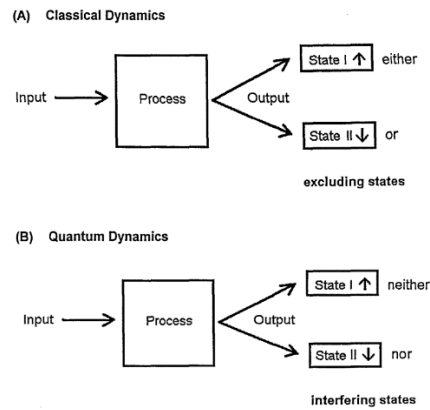
**Figure 5:** Atmospheric variation with geological scale

It has yet to be determined when consciousness transpired in humans since other prominent factors like atmosphere variation with geological time, as Figure 4 [29] depicts, also played their role. However, the above is indicative that it would be unwise to discard the idea that the length of day in hours did not play a role in evolution vis-à-vis consciousness. We intend to start here to relate the relevance of understanding time perception.

## 2.1 On Few Theories of Consciousness

In the modern scientific era, consciousness has historically intrigued many pioneering minds. Wondering upon "What kind of material process is directly associated with consciousness?" on the publication of Sir Charles Sherrington's *Significant Man on His Nature*, Schrödinger (1944) describes it as the sincere search for impartial proof of the interaction between mind and matter [15](page 121, mind and matter). Sir John Eccles received personal encouragement to explore the subject of consciousness from his mentor, Charles Sherrington. "Does your colleague Popper take any interest in that borderland between psychology and physiology, which I used to be attracted to?" Sherrington wrote during Popper's visit to Eccles. (1977, Eccles and Gibson) [30]. Historically, it is no surprise that consciousness attracted the attention of Nobel laureates as well, viz Sir Roger Penrose[31], Sir Francis Crick[32], Gerald Edelman[33], Sir John Eccles[34], Sir Charles Sherrington[35].

Beck and Eccles (deceased) elucidated the idea about the epistemological question of quantum processing in the brain, dating back decades [36]. Their corresponding Figure 5 provides a simplistic view of Quantum processing of the brain surface for its criteria since it relates to the wave equation, which eventually leads to the Schrödinger equation, which is both time-independent and time-dependent. Simply put, for sensory-driven inputs that invariably have a time component inherent in them, a role of time, and thus perception, is irrefutable in the consciousness domain. Nonetheless, recent observed quantum vibrations in the brain have opened another interesting albeit thoughtful direction in the study.



**Figure 6:** Diagram showing the evolutions of quantum and classical systems. The same preparations yield varying results: (A) leaving out states, (B) states that interfere.

Tononi, while proposing integrated information theory (IIT), postulated that, ultimately, it's critical to recognize that conscious experience develops on a distinct spatiotemporal scale [37]. It cannot be significantly faster or slower than its characteristic speed, for example, as it moves through time.

In ORCH OR theory, Penrose and Hameroff posit that their reasons suggest that the threshold of quantum gravity for self-collapse is relevant to consciousness because

individual macroscopic superposed quantum states have different spacetime geometries. Although these geometries are also superposed and "separated," the superposition of spacetime geometries becomes increasingly unstable and simplifies to a single universe state when enough separation occurs. The bounds of the instability are determined by quantum gravity; we argue that Nature's actual choice of state is non-computable. Consequently, every Orch OR event is a self-selection of spacetime geometry connected to the brain by biomolecules such as microtubules [31, 38, 39]. Baars Global Workspace theory, the theatre analogy, does indeed consider unconsciousness processing. According to the global workspace theory's theatre analogy, the conscious and unconscious brain functions are based on the theatre stage, audience, players, and back-stage areas [40]. SPHERE MODEL of consciousness posits that given that working memory and focused attention (FA) are both linked to the Narrative Self, we propose that the two processes will be electro-physiologically related to FA meditation [41].

Afrasiabi et al. demonstrate that intricate interactions between posterior parietal and deep brain areas are essential for supporting consciousness using neural activity in these various regions and a computational technique. In addition to reliably indicating the distinction between awake, sleep, and anesthesia, posterior parietal and deep brain regions can also detect minute shifts in consciousness brought on by deep brain stimulation [42]. However, Chalmers quickly notes that it has been demonstrated that a few quantifiable estimates of its quantitative measurements correlate with consciousness level. Furthermore, integrated in-formation spatiotemporal patterns (which roughly correspond to IIT's qualitative measures) have been extracted from brain regions and associated with the information contained in conscious perceptions of faces and other objects. They will treat IIT as a possible empirical explanation of consciousness in any scenario [43].

### 3 Time Perception and Spirituality, two rightful sublime facets

Understanding time perception lets us revisit what time is all about, the way it is meant by hundreds of years of civilizations. The definition of time as in the Cambridge dictionary:

*"the part of existence that is measured in minutes, days, years, etc., or this process considered as a whole".*

National Institute of Standards and Technology (NIST) states:

*"Time is the most measured quantity on Earth. It tells us when to wake and sleep, when to plant and harvest crops, and when buses, trains, and planes will arrive. It helps organize our lives and coordinate our activities. Scientists use time to measure and better understand countless things in our world."*

Bureau of Standards, Paris, states:

*“The second, symbol  $s$ , is the SI unit of time. It is defined by taking the fixed numerical value of the cesium frequency  $\Delta\nu_{\text{Cs}}$ , the unperturbed ground-state hyperfine transition frequency of the caesium-133 atom, to be 9 192 631 770 when expressed in the unit Hz, which is equal to  $s^{-1}$ .”*

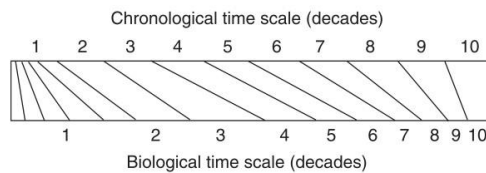
Therefore, if we consider time as a measure of frequency, the construct is the length, i.e., duration, and is often considered correspondingly as a continuum of events in memory. From a psychological perspective, rarely does anyone tend to perceive time as the root cause of the Earth's rotation and revolution, let alone the atomic level frequency! As evident from the above figures and tables, the duration of time in respect of day has never been constant!

Time perception is the mental representational outcome of objective world events happening in the course of physical time flow. Often, timelessness in qualitative terms is used to describe serenity. However, the perception of time perception is the continuum of events that is nurtured in the memory framework. In contemporary times, it is the duration of rotation of the Earth, roughly twenty-four hours a day. Since the beginning of the creation of the Earth, the length of day, i.e., the day duration, has never been constant, as shown in Fig 4 [44], wherein the plot of duration in hours per day is plotted against the age of the Earth, which is considered as estimated 4.5 billion years. Green dots represent angular velocity estimates from gravitational constraints; black dots are derived from paleontological data; and blue line is the linear least squares fit, with the y-intercept set to 24 hours per day. The civilization's history is several thousand years compared to the astronomical quantum of the age of the Earth. Nonetheless, at least for a few thousand years, it is twenty-four hours a day, leaving away the leap year period. With time, what transpired in us is rhythms such as circadian and circannual ones contributed by the Earth's rotation and revelation that led to a profound biological effect over time.

Though early research in the psychology of time perception remained a distinct place till 1949, individual differences remain a crucial factor for limiting the research in the arena. Nonetheless, the relationship between physical time and the growth of subjective duration has been, by and large, limited to the focused areas. Time perception, whether good or bad, Matthews identified three key challenges, i.e., (1) Individual differences in the mechanisms and substrates of interval timing; (2) the sensitivity of time perception to the particular circumstances in which the time interval is experienced; and (3) the fact that the stimuli and tasks used in most interval timing experiments are far less complex and dynamic than the "real world." [45]. However, these are primarily psychological cognition bases that are temporal relation-oriented.

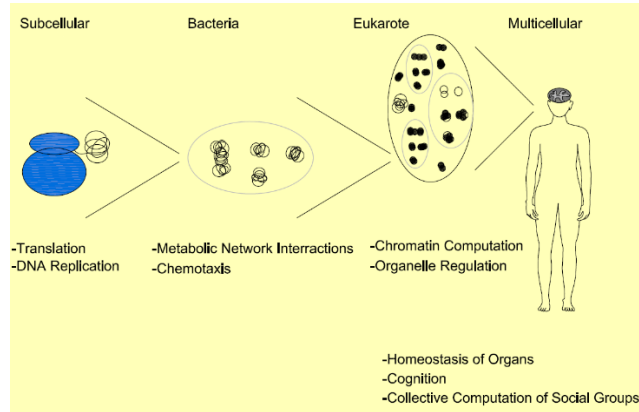
Vierordt's Law proposed by Vierordt (1868), research on psychological time dates back to who found that the same rule applies whether the time period is seconds or years: judgments with small intervals are lengthened, and those with large intervals are reduced. [46]. James [6] wrote that *“the practically cognized present is no knife-edge, but a saddle-back, with a certain breadth of its own on which we sit perched, and from which we look into two directions into time”* (p. 609). He added that people *“are constantly conscious of a certain duration—the specious present—varying in length from*

*a few seconds to probably not more than a minute”* (p. 642). It has been discovered through research that the brain can compare and analyze relatively recent high-density memories in working memory within this time range of roughly 3 to, potentially, 7 seconds. Block et al. reviewed the works on time perception judiciously. Different time scales for sensory, perceptual, attentional, and memory activities are necessary for psychological time. From milliseconds to seconds, minutes, hours, and lifetimes, these are all possible. Many various factors, including attentional processes and environmental changes, influence psychological time [47]. Schroots, in his paper *Time: Perceptions and Concepts*, described in detail distinguishing various times, viz. biological time, physical time, social time, psychological time, time perception and time perspective, as well as intrinsic time. In Figure 7, he describes that the early decades of life contain more biological activity, such as metabolic activity, than later decades. As a result, the biological measuring rod's early portion appears longer than the corresponding portion of the chronological measuring rod. On the other end of the spectrum, the relationship is the opposite [48]. Stroop (1935) proposed the ability of cognitive interference as a measure with function of time known later as the Stroop test. Endeavoring Eddington's lecture in 1929 on time perception, Lehman (1967), in 'time and psychopathology,' being a trained psychiatrist, proposed distinguishing between external and internal time [49]. He further elaborated that time outside of our body is absolute, universal, and objective. It is the actual clock time as expressed within a conceptual framework and measured by instruments. Internal time is individualized, relative, and subjective. It is the idea that endures.



**Figure 7:** Comparing the biological and chronological time scales schematically

Further, we do not intend to omit another prominent criterion in the origin of life thus consciousness, i.e., gravity. Gravity is a well-known but little-understood physical force. Its intensity and direction have been constant throughout evolutionary history on Earth, making it difficult to understand what role, if any, this vector force may have on life as we know it [50]. Gravity is the only fundamental force that has stayed the same throughout Earth's history, so all living things have changed to be able to handle it. The physiology, structure, function, and behavior of organisms, including plants 2,3,4,5,6, are fundamentally altered by any change from Earth's gravity (1 g) to either hypergravity or hypogravity. "Hypergravity," often written as "more than one g," is when the force of gravity is more vital than the Earth's. Hypergravity can be made by making special centrifuges that can precisely control accelerations that are higher than 1 g [51].

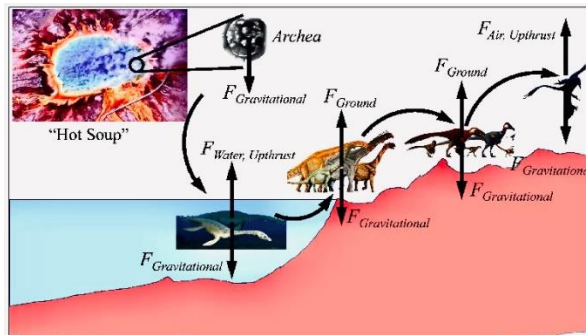


**Figure 8:** The biological computation hierarchy encompasses subcellular activities and interactions among groups of multicellular animals

Figure 8 [19] depicts a few representative instances of the primary computational processes given at each level of biological organization; it should be emphasized that the highest levels of biological computation integrate the lower ones [18]. For instance, neurons contain the string-writing mechanisms of fundamental protein translation and are incorporated into complex cognitive processes. However, at some point in time, consciousness transpired into humans, whether that is concurrent with the time of development of cognition as in Figure 8 in the evolutionary process, which is another aspect that is not entirely irrelevant. It could be reasonable to assume that carbon serves as the foundation for life on Earth and, if so, that life exists elsewhere in the solar system due to the atomic structure of carbon [52]. Further, in the thermodynamics of life, activation Energy and homeostasis are also factors in the gradual development of the concept of the Self and social group, i.e., Self, which are also other aspects of the biological processes that ultimately led to what we are today, and correspondingly in consciousness study in the paradigm of level, content, and Self [53]. Citing Chyba, Grady noted [52] that it is likely that at this stage of Earth's history, an atmosphere formed and was repeatedly stripped away in a cycle of increasing stability interspersed with bombardment episodes. However, over time, the Earth's atmosphere was retained, the oceans formed, the inner solar system grew more passive, and the conditions were right for life to arise. However, there is little that is known for sure about this period, which is the interface between the Earth's biological and geological histories.

Though not wholly essential, however, we intend to encroach very briefly on gravity to ensure that we are speaking on the track by introducing time perception in consciousness study. In microgravity, neither humans nor inanimate objects experience any sense of weight. When astronauts and items float in space, the consequences of microgravity become apparent. There are different ways to feel the effects of microgravity. *Microgravity is when the effects of gravity are so minor that they can be ignored.* They can float within their spaceship or go on a spacewalk while in microgravity. Heavier things are easier to move around. For instance, astronauts can manipulate hundreds of pounds of equipment with just the tips of their fingers [54].

Endothelial cells (ECs), which line the inside of blood vessels, are essential for keeping the integrity of blood vessels and the balance of tissues. They control how blood flows in different areas and other physiological processes. High mechanical sensitivity includes hypergravity and microgravity for ECs. They change morphologically and functionally in response to variations in gravity [55]. Research has been ongoing for quite some time to look into how gravity affects the transmission of signals from the cytoskeleton to the nucleus [56][57].



**Figure 9:** Gravity played a crucial role in the evolution of species

Typically, four forces act on a flying object, i.e., gravity, lift, thrust, and drag, which is also the concept used in aircraft mechanical design. As in Figure 9 [58], gravity plays a role in the evolution of life for flying animatic beings. Understanding the effects of hypergravity, which are gravitational forces more substantial than those on the Earth's surface, is becoming increasingly important as we try to figure out how to use modern aircraft technology and space travel to our advantage. The nematode *Caenorhabditis elegans* has shown to be an effective model for analyzing the impacts of different gravity regimes and has shown outstanding resistance to spaceflight. The study looks at how short-term and controlled exposure to hypergravity affects how *C. elegans* moves, how many babies it has, how fast its pharynx pumps, and how long it lives. The results of this study add to the growing body of research on how different gravity patterns affect life on Earth. They also help us learn more about how *C. elegans* reacts to shorter periods of exposure to more important gravitational forces [59].



**Table 2:** Estimated Length of Day in different geological eras and corresponding estimated evolution events

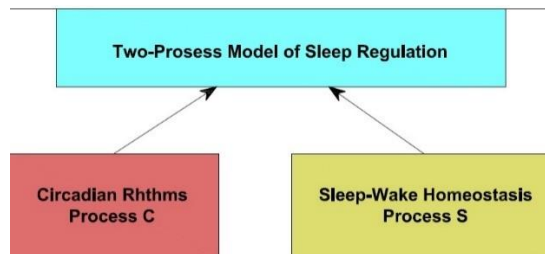
Time (Ma)	LOD(Hours)	Era	Period	Events
2.6	<b>23.98914</b>	<b>Cenozoic</b>	<b>Quar ternary</b>	<b>Evolution of Humans</b>
<b>50</b>	23.79116		Neogene	
<b>60</b>	23.7494		<i>Paleogene</i>	<i>Mammals Diversify</i>
100	<b>23.58233</b>	<b>Mesozoic</b>	<b>Cretaceous</b>	<b>Extinction of Dinosaurs</b>
<b>120</b>	23.49879			First Primates
<b>140</b>	23.41526			First Flowering Plants
<b>150</b>	23.37349		Jurassic	First Birds
<b>180</b>	<b>23.24819</b>			<b><i>Dinosaurs Diversify</i></b>
<b>200</b>	23.16465		Triassic	First Mammals
<b>225</b>	23.06024			First Dinosaurs
250	<b>22.95582</b>	<b>Paleozoic</b>	<b>Permian</b>	<b>Major Extinctions</b>
<b>275</b>	22.8514			<i>Reptiles Diversify</i>
			Carboniferous -	
<b>300</b>	22.74698		Pennsylvanian	First Reptiles
			Carboniferous -	
<b>350</b>	22.53814		Messapian	Scale Trees, Seed Ferns
<b>400</b>	22.32931		Devonian	First Amphibians
<b>425</b>	22.22489			Jawed Fishes Diversify
<b>450</b>	22.12047		Silurian	First Vascular Land Plants
				<b><i>Suden Diversification of Metazoan families</i></b>
490	<b>21.9534</b>		<b><i>Ordovician</i></b>	
<b>500</b>	21.91164		Cambrian	
<b>550</b>	21.7028			
		Late Pro- terozoic		
<b>600</b>	21.49396			
<b>625</b>	21.38954		First Skeletal Elements	
<b>650</b>	21.28513		First Soft body Metazoans	
			First Animal Traces	

The evolution of species suggests two large-scale aspects: the period in billions of years of age of the Earth and the evolution of species' present shape. Again, two things are important, i.e., pattern and rhythm. A recent study assesses dinosaurs' disappearance as associated with, most likely, the fine dust released into Earth's atmosphere after the collision, which was more likely caused by pulverized rock dust. For over significant years, plants could not photosynthesize, a biological process essential to existence, because of the sun's partial blockage caused by this dust [60]. However, it is unlikely that the event was widespread throughout the globe, given that the globe was a supercontinent then. Our contending assumption is that the role of the Earth's length of day, which in turn impacts the corresponding length of a year, is unlikely to rule out a role played for the gross disappearance of dinosaurs throughout the planet.

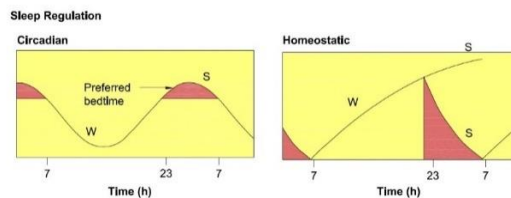
Combining with Figure 3 and based on equation 1 that leads to the graph in Figure 4, table 2 provides a tabular form of geological time scale era-based evolution of corresponding species and the length of day in hours. However, it is interesting to note that Table 2 reveals, *prima facie*, that biological events and geological events are not purely unrelated, viz. for the length of day (LOD) less about 22 hours, Ordovician

*period Sudden Diversification of Metazoan families happened, for the length of day (LOD) less about 23 hours, Permian period major extinctions occurred, about for length of day (LOD) about 23.5 hours dinosaurs disappeared, and quaternary period evolution of humans occurred when for length of day (LOD) is about 24 hours. Nonetheless, we will not encroach upon this further deviating from the current topic.*

The rotation of Earth coupled with, among other things, energy from sunlight caused rhythms in species; according to the Two-Process Model for Sleep-Wake Regulation, Process S, the homeostatic sleep drive increases along with the corresponding feeling of drowsiness during the waking state, during the day into the evening. Interaction between Process S and Process C of the circadian rhythms occurs when the evening transitions from light to dark, indicating a rhythmic shift towards sleep. As a result, in the evening, Process C's circadian arousal drive decreases and, in concert with Process S's homeostatic sleep drive, sleep commences. That basic process is inverted in the morning because Process S's sleep drive has significantly decreased since Process C's circadian cycles and sleep communicate arousal or awake [40]. Borbély (1982) proposed the Two-Process Model of Sleep Regulation Figure 9, which states that sleep is controlled by a mix of sleep-wake homeostatic mechanisms (Process S, depicted in the yellow box) and circadian rhythms (Process C, shown in the grey box). In its original form, Figure 10 Borbély's (1982) description of sleep regulation involved the interplay of two groups of activities. Process C (left panel): As nightfall draws in, circadian rhythms indicate when to sleep. These rhythms are shaded orange. Process S, seen in the right panel, causes homeostatic processes to raise sleep debt during the day, reaching a maximum at night when circadian rhythms signal to sleep.



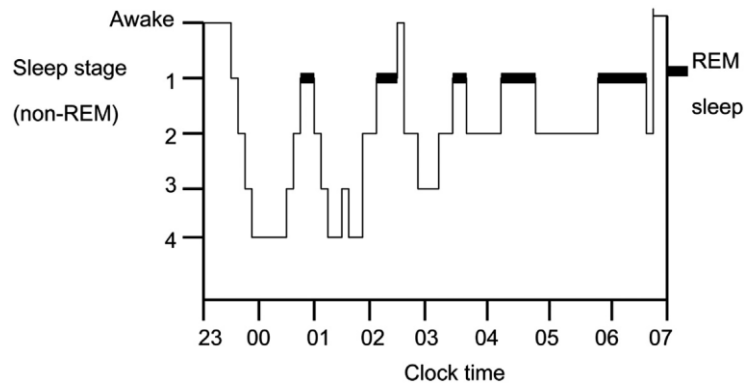
**Figure 10:** Two-Process Model of Sleep Regulation



**Figure 11:** Description of sleep regulation

Figure 10 [40] represents a sleep stage hypnogram for a young adult in good health. The sleep stage is shown by the vertical y-axis on the left side of the picture, which runs

from Awake to Stages I–IV (also known as Stages 1–4). The sleep duration is displayed on the horizontal x-axis, which starts at 11 p.m. or 23 h. On the right side of the picture, the vertical y-axis represents rapid eye movement (REM) sleep, which is indicated in solid black on the hypnogram. REM sleep predominates in the latter hours of sleep, while nonrapid eye movement (NREM) sleep dominates the early hours of sleep.



**Figure 12:** A healthy young adult's sleep stages hypnogram

For most species, rhythmic changes in behavior and physiology are determined by the daily cycle of light and dark. According to studies, a biological clock that regulates these alterations in animals resides in two brain regions known as the suprachiasmatic nuclei. The rhythms of circadian determined by this clock occur all over nature and last roughly 24 times [61]. Circadian and Circannual rhythms in humans are biological rhythms. Any recurrent endogenous cycle (behavioral or physiological) that persists in constant conditions in the absence of geophysical or environmental temporal cues. Circadian rhythm: Endogenous rhythm that is approximately one day in length. Circannual rhythm is an endogenous rhythm that is approximately one year long [62]. The timeframe of an ultradian rhythm is brief (seconds, minutes, or hours), whereas the span of a circadian rhythm is roughly one day. Two well-studied examples are the 40-minute ultradian cycle of cellular respiration in yeast and the mammalian master circadian clock in the brain. Circadian rhythm disruptions are significant in cancer, sleep disorders, and mental health. At the molecular level, ultradian and circadian clocks have similar components [63].

*Because of this, circadian rhythms can be found in almost all ways to measure how tired we are and how well our brain and body are working. This explains why people are less awake in the morning or at night, even after getting enough sleep the night before. Different things, like posture and background noise, can make it hard to see the circadian rhythm profile of neurobehavioral performance. This is why studying this rhythmicity in carefully controlled laboratory settings is essential. Also, the system that controls neurobehavioral activities during waking has several masking factors, such as sensory stimuli and body movement [64].*

The brain's suprachiasmatic nucleus controls both types of rhythms (SCN). Understanding the molecular and endocrine processes that underlie biological rhythms is essential for basic research and more extensive environmental and medical applications [65]. Both these effects are remarkably reflected in the shape observed. From horizontal

posture to vertical posture. In doing so, what is the primary effect that counteracted? Nonetheless, the gravity. From Figures 10, 11, and 12, the circadian and circannual rhythms in 24 days and 365 days culminated in the present human daily neurobiological cycle. As we see that LOD has been different in different geological time scales, an invisible relation with time appears irrefutable to dispense.

### 3.1 Anthropological notion of time

Whorf, in 1956, in the book *Language, Thought and Reality*, mentioned time as a "smooth flowing continuum in which everything proceeds at an equal rate" [66]. In an anthropological wondering, Barbara Adam in *Perception of Time* [67] brilliantly notes time perception, how we understand and interpret that experience differs throughout cultures, historical eras and settings, individuals within communities, and an individual's age, gender, and social hierarchy. In contrast to the fluctuating cycles of nature, the unchanging, accurate measurement is a human invention. In our society, this artificial time has taken on such dominance that we frequently refer to it as time in and of itself, as though there were no other times [68]. In the reality of the physical world, in real-time dynamics, neither the objective world is static nor even our psycho-somatic physical Self, which comprises many motions throughout the body.

In contrast to reversibility from the Physics approach, in terms of the social lives of humans, we can say that certain things happen repeatedly, seemingly invariantly, and irreversibly. Instead, time is created, entailed, and enacted in cultural life; time is involved in sequence, duration, intensity, passage, and irreversible direction. It also generates a new past and future [68].

*"The meaning of time, on the other hand, is encapsulated neither in the oscillations nor the number system."*

The laws of classical mechanics govern the operation of the clock. A pendulum monitors time. However, the oscillations and the number system need to capture the essence of time [68] adequately. In the biological setting of the experimental set-up, the electric signals in different body parts are measurable, like EEG, MEG, ECG, ECOG, EOCG, EMG, EGG, Polysomnography corresponding to different motions within ourselves albeit in the current 24 hours a day scale. In this setting, we view time perception for the consciousness study as it justifies delving deeper apart from the psychological or neuroscientific approach of time as a machine-based usable tool to understand computational or processing capabilities of brain functioning.

### 3.1 Psychological Research on Time Perception

Significant works in the psychological paradigm of time perception have been done since Gibbon's scalar expectation theory of memory timing on animatic beings about the temporal perception of information processing [69]. Church studied it is preferable to look at how animals perform in a variety of processes with varying qualities in order to characterize the properties of functioning animal parts rather than procedure properties. Three procedures have been used in the majority of research conducted in our lab:

the bisection, peak, and temporal generalization procedures [70]. Hinze, in his Real-time perception, perceptual mechanisms depict a complete chronology at any given moment rather than just one particular time. In this timeline, reconstructive mechanisms change how we see things after the fact when predictions do not come true, and predictive systems make predictions ahead of time to make up for delays in sensory input [71]. Thones et al. studied rigged (accelerated or decelerated) external clocks can effectively induce altered time perception; second, most participants are oblivious to these clock-speed manipulations; and third, several psychological, cognitive, behavioral, and physiological variables can be impacted, such as pain perception, hunger, and weariness [72]. Sandrine et al., in a study, used the Beck Depression Inventory (BDI) to measure each participant's depression symptoms in order to look at how changes in time perception relate to those symptoms. In a temporal bisection test, the participants had to classify a signal duration ranging from 400 to 1600 ms as long or short. According to the findings, there was a change in the bisection function towards the right, and the depressive participants had a more significant point of subjective equality than the non-depressive participants [73]. Research, both phenomenological and experimental, demonstrates that individuals with depression experience time flow more slowly and tend to overestimate durations of time. Those with depression often exhibit a greater preoccupation with previous experiences and a decreased emphasis on current and future events when compared to those in control conditions [74]. Time perception from a psychological perspective is different in different states. In an altered state, it slows down, whereas in a manic state, it speeds up compared to the expected timing. All these studies are more or less based on time, i.e., the machine as a physical keeper of time and their corresponding neurobiological impacts. It is noteworthy that perceiving time is unlike physical world stimulant-driven objective assessment. While the archaeological endeavor of time perception delves into cultural signatures that races across the world leave behind during various historical periods, criticizing time perception through the lens of the machine is remarkable to distinguish the generic concept that we, over generations, keep bearing in the modern world.

### 3.2 Spirituality

Like consciousness, a definition is far from agreement, though it is a part of life; even enlightened souls describe the whole life as Yoga. In Indian culture and tradition, Yoga and spirituality have existed since ancient times.

*'The way forward is to think of spirituality in terms of its relevance and importance to individuals in their everyday existence' (McSherry, 2000).*

*'Understanding these meanings without rendering them meaningless through de-contextualized analysis can provide a seedbed for systematic study and the further development of practice and theory. Common meanings become apparent when narrative accounts of diverse clinical situations are given with the intentions, content, and meanings intact.' Benner (1984)*

Here, inevitably, justifiable rationality surfaces for including the context of spirituality. However, similar to the difficulty in defining consciousness, spirituality also

arises in this case. Wixwat et al., in a paper 'Being Spiritual but not Religious' noted, in a qualitative investigation into the common understanding of spirituality, the participants linked spirituality to God and activities meant to foster a relationship with him, such as formal religion and unique, mystical experiences (for those open to such experiences). Participants in another study provided a similar definition of spirituality, with 36% defining it as the sense of being connected to God, Christ, a higher power, transcendent reality, or nature, and another 34% defining it in terms of belief and faith in a way that was generally consistent with theism [75].

Margot Grey (1984) and others have reported commonalities in spiritual experiences and NDE states. Though disconnected consciousness studies through NDE have gained momentum, we need to be mindful that during NDE state flat EEG reading [76], [77], [78], albeit vivid memories described by the subjects are worth inculcating. Reports of two instances of NDE are tempting to without mentioning. A 30-year-old woman suffered a head injury that caused her to a comatose state, which doctors described as a Glasgow coma scale score of E1 V1 M2, perceived Om as the apparition of light during NDE [79]. In another report, Eben Alexander, a neurosurgeon, in his book *Proof of Heaven* during the NDE state, experienced perceiving OM and described it as omniscient and omnipotent, something beyond description [80]. Peyton, in the post-NDE transformation narrative, stated, "...I entered the same transcendent state of consciousness that I had entered a year before"[81]. At this juncture, it is perhaps not wholly unworthy to mention that a brain deprived of oxygen causes out-of-body (OBE) experiences [82]. Olaf Blanke elucidated that this aspect is not only reported in NDE; however, OBE in pilot and fighter aircraft also reportedly mentioned similar experiences [83]. OBE experience is neither new nor uncommon in spiritual experiences.

The fourth state is actually as vast expanses of spiritual extent historically ascribed. Therefore, without including this state, the quest for consciousness remains open without being closed. Contemplating the fourth state in one form or other for consciousness studies did not remain fully outside the area of inculcating, rather. Bernard Baars thoughtfully opined about silent consciousness. However, the consciousness quest remained primarily about the awakening states [84]. Paoletti Sphere model of consciousness entails analysis of self-awareness and consciousness using the neuro-phenomenological theoretical framework where the Focused Attention, Open Monitoring, and Non-Dual Meditation kinds hierarchical organization is mirrored in the hierarchy of the three states of the Self [41]. In both of these, the Vedic ascription of the fourth state is the critical fabric of stipulation. However, in the broader scope, time perception and spirituality-based endeavors are still far from the theory of consciousness and subsequent testing mechanism holistically. In the course of perceiving time through any earthly object-based regime, it may not be conducive to actually perceiving time on a real-time basis. Sensory input-based stimulant use is unlikely to be beneficial to a great extent. Inner visual and audible perception is much more intense and accurate than the corresponding sensory input-led representation of the objective world, only known to those who experienced in within.

#### 4 Discussion:

In light of the above, time, whatever way we define physical, chronological, biological, geological, psychological, and archaeological, being a candidate for crucial aspects of consciousness does not appear to be unrelated; hence, the rationality surfaces of time perception in consciousness study.

As Stoddart postulated, "*Without sensation, therefore, consciousness cannot exist; the essential basis of consciousness is sensation*" [14]. The contemporary consciousness studies, by and large, make this the bottom line, albeit the unconscious part is also considered. This is a crucial area where Vedantic ascription marked a distinct demarcation without putting up a complete stop. To realize consciousness, the state beyond deep sleep, therefore, remains outside the domain of contemporary consciousness study.

Spirituality, often around Yoga and meditation throughout the ages, has extensively been put up for research. However, we do not intend to encroach into that domain. As Lifshitz et al. state, "*One of the enduring puzzles in ethnography and history is that everywhere in the world we find spiritual experts—shamans, priests, sorcerers, and sadhus—and yet nowhere in the world is there a society in which all are experts. How do some people come to have vivid spiritual experiences, but not others?*" Our emphasis is to address the recent consciousness study that invoked through hard problems of '*how we experience*' is not an isolated regime from the spiritual state, i.e., the fourth state. However, this problem is solved through many theories of consciousness approaches through stimulant input only. We contend that the experimental regime must be broadened to accommodate beyond the deep sleep, which does not at all have characteristics of lesser awareness vis-à-vis lesser wakefulness. It is a different realm, having its pervasiveness, transcendence, and dimensions different from the objective world three dimension + time axes. The most challenging part is that people rarely have access to this state, which makes it most limiting to adopting a coherent approach. Even in the regime of hypothetically deductive approach, this happens to be made out of including in the research domain.

The earliest psychophysical researchers, like Fechner, Vierordt, conducted their experiments on themselves for their respective areas of interest. However, it was quickly realized that random control trials were required, and the stimuli should be presented in random order. A core reason surfaced then: according to researchers in Germany and the USA, expectations for the following distance may skew the perception of distances [85]. How is the idea of the interviewers or complacent person who experienced the fourth state with self-subjective experience scoped into the research experiment and the possibility of bias?

Is there any scope for the level of consciousness and contents of consciousness graph in Fig 1 to include the state of spirituality? It is noteworthy that Fig 2 did not keep the near-death state excluded in the three-dimensional representation.

Neuro-instruments-based probes or experiments are mostly stimulants and subsequently capture the reading. Apart from traditional stimulants, recent virtual and naturalistic stimulants are also being widely used for behavioral neuroscience in natural settings. However, designing innovative cognitive experiments encompassing time

perception and carefully creating an endeavor for overt attention is conducive to simulating the background for the consciousness probe. It is worth considering why designing cognitive experiments for understanding consciousness should not be framed around the fourth state.

It would not be irrelevant to mention that objective physical world constants are primarily of minimal values in magnitude that this universe is eventually made of on a cosmic scale. Extending a small quantity of imagination, should consciousness become discoverable using this quest at some point, what kind of magnitude could it be, small like these constants or astronomical figures comparable with the speed of light? Reaching consciousness therefore, introspection of when it transpired historically leads to how a plausible analytical or experimental endeavor should be framed given the complexity and interdisciplinary domains of intersection. Modern civilization has methodically progressed with the reference framing of clock time which historically depended upon as life by the rotation of Earth i.e., time as length of day among other things. However, consciousness is a fundamental characteristic, so it is paramount to take stock of how other disciplines view time perception. A synchronization of internal and external time is essential. The approach to the blurred boundary between intelligence i.e., information processing capability and consciousness compounds the complexity of problems since the concept of self is not necessarily limited to the neuroscientific objective of social grouping; the biological paradigm of the immunity system of defense is irrefutable to ignore. We must realize how the body organically functions and comprises also our physical and vital self. Therefore, the approach to understanding Consciousness by its merit needs to be widened without limiting it to a reductionist approach.

## 5 In the End

Schrodinger, who stirred a perennial whirl of thoughts with his hypothetical cat experiment, in his book (1944) “What is Life” [15], contemplates whether quantum mechanics related to life biological events and the possible extent thereof, in the ‘Epilogue on determinism and Freewill’ surmised the below context:

*“The earliest records, to my knowledge, date back some 2,500 years or more. From the early great Upanishads, the recognition ATHMAN = BRAHMAN (the personal self-equals, the omnipresent, all-comprehending eternal Self) was in Indian thought considered, far from being blasphemous, to represent the quintessence of deepest insight into the happenings of the world. The striving of all the scholars of Vedanta was, after having learned to pronounce with their lips, really to assimilate in their minds this grandest of all thoughts.”*

The enormity of the philosophical width and infiniteness of the spiritual arena is undoubtedly outside the purview of this paper. However, it discussed various features of the study of consciousness that span many domains, i.e., interdisciplinary areas. Moreover, this paper argues that the fourth state, which is indeed attainable in self-spiritual subjective experience as reported by enormous enlightened receptacles, is a



crucial aspect that must be brought into the research domain should the consciousness quest aimed at discovering the telltale signature [11]. A hypothesis was only considered vital if thorough research did not disprove it, not if there was evidence to the contrary [86]. Hypothesizing objectively identifiable paradigm without broadening the scope and excluding the fourth state will unlikely reach a breakeven point since this fourth state is not at all mere scripts embedded in ancient ages literature but rather the transcendental state of primordial infinitude, the objective assessment under the pursuit of scientific prowess yet to address. These are Truth subjectively attainable and by its own merit. Traditionally, seekers of Truth tend to keep this kind of experience within their ecstatic receptacle except seldom describes that if someone could be able to support themselves aware in a state of inner world journey such as sleep, at the intervening moment of reaching a threshold something magical happens which might be extremely difficult to express except the more than pleasant incomparable nature of this subjective experience of transcendence. A change in otherwise normal consciousness that prevails in daily and ordinary life perhaps waits to be self-discovered. Another world, different from the typical subjective experience, exists beyond the sensory stimulus input-driven objective world that transpired as a self-proof to the complacent seekers. Like all other states of consciousness, dreams, sleep, disorders, and even near-death experiences (NDE) are very much in the research domain; excluding spirituality in the broadness of scope of consciousness study is incomplete, though some researchers tend to include it, is like leaving a critical piece out of the most baffling oldest quest in humanity. Nonetheless, perceiving time and utilizing overtly covert attention in the research domain is a crucial aspect of reaching this gateway.

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