

## Consciousness: The Phenomenon of Being Part 1: Obstacles in the Measurement of Subjective States

Until recently the study of consciousness was relegated to the field of philosophy and regarded as too “taboo” for the likes of physical science. Those who wished to study it had to risk their academic careers and would almost certainly not be taken seriously by their peers. For it was feared that bringing consciousness into the dimension of material science would bring along with it metaphysical ideas and a lack of empirical study. This is because historically the idea of consciousness or “subjective experience” itself had been equated to the existence of a soul - something seen as an unscientific reminder of pre-renaissance theology and barbarism. With all of the progress achieved through the objectivity of materialism it was feared that bringing consciousness (something that is subjective by its very nature) into this equation would be dangerous and counterproductive.

That being said, fear of academic derision is far from the only thing that has historically held back the study of consciousness. For one, the word itself is difficult to define let alone research. While casually consciousness is defined as the continuous stream of awareness that governs ones perceptions and thoughts (*i.e.* - *the term losing consciousness etc.*), this is not what really makes it interesting or unique. After all, researching the electrochemical neural processes responsible for maintaining a constant stream of awareness has already been studied in great detail and even relegated to several brain regions (*such as the Pons and Claustrum*). While vernacular uses of the term have certainly muddied the waters, consciousness at its core can be understood as the **subjectivity** associated with being aware rather than the mechanism behind the awareness itself. The interesting question of consciousness therefore becomes not what makes things aware, but what makes them subjective. Namely, what is it that causes segments of objective matter to develop their own subjective contexts inside of them?

Using this definition of “subjective context” as consciousness distinguishes it from other cognitive processes in a number of ways with the most significant being how it is analyzed. While other cognitive processes are generally analyzed through drug trials or imaging procedures, phenomenal subjectiveness proves too elusive for such techniques for the following reasons:

### 1. *Subjectivity cannot be objectively studied outside of oneself*

The first of these problems is that since one cannot escape the confines of their own subjectivity, objectively measuring the phenomenon in others is impossible. This is to say that ones view would always be inherently biased since they can only be subjectively themselves. For example, “I would only be able to understand the nature of your subjectivity by viewing the world subjectively as you. The problem is I can only view the world subjectively as me”. Therefore no matter what experiments are imagined, one can only ever evaluate his or her own subjectivity and it is that truth that hampers every potential study on human consciousness. This is to say that each theoretical experiment would have an upper limit of a sample size of  $n=1$  (the maximum amount of subjectivities one can ever measure), a size far too small for any respectable scientific experiment. To properly understand this constraint, one must realize the difference between trying to study phenomenal subjectivity and other capabilities of the human mind. For it can be contended that there are plenty of phenomena only viewable via first person accounts

that are still studied objectively, such as vision and hearing. Even though one cannot hear or see things as somebody else, they can still be objectively measured. While this may be true, there is a difference between understanding sensations objectively and consciousness. Take the example of a man who takes an eye exam to measure how well he can see. The optometrist provides him with certain images and asks him to do his best in describing the images based solely on his ability to see. How well he can then describe the images to the doctor is how his vision is then scored objectively. Now take the same man who goes to the audiologist to get a hearing exam. He is given headphones and asked to repeat certain sounds of varying frequencies. His hearing ability is then objectively scored based on how accurately he replicates the sounds coming from the speakers. Now this begs to question - is such an examination possible to measure consciousness?

### **The Easy Problem of Consciousness Demystified**

As mentioned earlier, trying to determine what causes the process of conscious awareness is much simpler than demystifying its phenomenal subjective aspects. If consciousness is simply the “confined stream of awareness that is able to perceive and judge stimuli” then an examination could be done similar to how one was done to test Vision and Hearing. For example, a physician could simply provide a sedative to a patient and then subsequently test the presence of how aware he or she is by seeing how well the patient is able to respond to stimuli. If consciousness is simply awareness then if the patient becomes sedated upon ingestion (*I.E - unconscious*) then it stands to reason that his or her consciousness can be measured as more “unconscious” and that the mechanism of action of the medication was somehow responsible for the patients “reduction” in consciousness. In fact, such experiments have been historically used as the basis for finding what are known as the “*Neural Correlates of Consciousness*” or the markers in the brain that indicate at least some responsibility for conscious awareness. First understanding these “correlates of consciousness” is important in eventually isolating its phenomenal qualities.

One such correlate involves the synchronization of neural activity. This is based off of findings that synchronization of neural firing in the brain has been shown to decrease when a patient is given anesthesia. This has led some to conclude that synchronicity of neural activity (or the amount of “communication” present between different networks of the brain) is a marker of consciousness. Intuitively this at least explains the cohesiveness of a consistent stream of awareness. If more parts of the brain are in communication with each other simultaneously it makes sense that the mind's facilities are able to gather and integrate all the sensations and information it needs to construct and maintain a consistent picture of themselves and the universe.

Another undeniable physiological feature that contributes to awareness is the measured frequency of neural activation. During deep sleep when there is no known awareness present (no dreams), if one were to measure the pattern of electrochemical activation on an EEG they would find high amplitude, low frequency patterns known as ‘Delta Waves’. This is opposed to the lower amplitude, higher frequency theta waves they would find during REM sleep (or during dreaming) and the highest frequency alpha, beta and gamma waves seen during wakefulness. The slowing of neural activity during non-aware states is intuitive as the neurons of the brain are

firing slower and more sparingly indicating that the real time requirements for a persistent stream of awareness cannot properly be met.

These two features (synchronicity and frequency) have often been combined in an attempt to explain how the brain is able to formulate clear perceptions. This means to say that not only is the amount of neural activity (frequency of action potentials) important in constructing perception but also the degree of synchronization between these oscillations in different distributed neural networks. This concept can be conveyed through the example of a well timed band. If the guitar player simply strums his chords quickly, the sound may be complex but also messy and not very clear to the listener. If however the guitar player strums the chords a little less quickly but at the same time in an orderly rhythm the sound then becomes more fluid and whole. If the band was only a single guitar player the sound while clear may be relatively one dimensional and not sound fully “alive”. However, if then the guitar player, singer bassist and drummer are all able to perform this way in rhythm with each other, the song not only becomes more clear and legible but also “extra-dimensional” in that the song itself sounds clear and complex at the same time without the ability for the listener to exactly pinpoint where each segment of sound is coming from. In other words, in unison the whole equals more than the sum of its parts. The brain works in a similar manner. If more action potentials are relayed through an individual neural circuit, then more information is able to be encoded and sent throughout that network. That being said, the *quality* of how that network is able to function is dependent on its individual rhythm of firing and oscillations. Moreover, when different networks of the brain become synchronized with each others firings, the information shared becomes “extra-dimensional” as different areas of the brain are each not only functioning in order individually but also in unison. This is hypothesized to create the “more than the sum of its parts” feeling of awareness and perception. A similar hypothesis entitled the “thalamocortical dialogue hypothesis for consciousness” by Neuroscientist Rodolfo Llinus posits that such synchronizations of neurons in the “gamma band frequency” (30-80 Hz) are responsible for the sensation of consciousness.

The final question then in solving the “easy problem” of consciousness involves figuring out which areas of the brain specifically are responsible for integrating the contributions of each distributed neural circuit into a whole cohesive function of perceptual awareness. This measuring of awareness has historically involved the use of FMRI and PET scans to determine the parts of the brain that are active during aware vs. unaware states. While obviously many different areas of the brain are involved in maintaining awareness, the Reticular Activating system which is a circuit of neurons that connect the Brain Stem to the Thalamus and Cortex has been shown in particular to play an integral role in coordinating base awareness with working memory and sensory integration. Experiments have shown that activations of the Reticular Activating System and Pons (an area of the brain stem) in particular are required for wakeful states. Additionally, Francis Crick who helped organize the structure of DNA and Neuroscientist Christof Koch have both expressed interest in the relationship between a part of the deep brain titled the “Clastrum” and consciousness. Experiments have shown that stimulating the Clastrum can turn on and off what is generally described as “consciousness” or awareness. In one instance in particular, when a 54 year old woman was implanted with electrodes in various parts of her brain to determine the cause of her Epilepsy, it was discovered that stimulation of the Clastrum interrupted her “consciousness”, since she was able to move and speak clearly up to

the point of when her Claustrum was stimulated when she began to stare blankly into space and stopped responding to any stimuli. When the Claustrum stopped being stimulated she returned to her regular patterns of consciousness with no recollection of having been unconscious. This indicates that the Claustrum could somehow be responsible for the activation of an aware state. Furthermore, the Claustrum has also been studied due to its  $\kappa$ -opioid receptors that become activated during psychoactive states induced by the plant Salvia. This is what is theorized to essentially give the experience of 'altered awareness' that occurs while ingesting the plant.

To summarize, the "easy problem" of consciousness while still unsolved seems to be a function of different networks of the brain firing in coordinated high frequency states with synchronous rhythmic oscillations. Like a band or orchestra, different parts of the brain such as the prefrontal cortex (responsible for working memory), cingulate cortex (involved in decision making), parietal cortex (involved in decoding sensations) and hippocampus (involved in encoding memory) all make up distributed complex neural networks that fire in unison with each other influencing the "whole as more than the sum of its parts" sensation of perception and "consciousness". Areas of the brain such as the brain stem and claustrum are thought to then act as potential "conductors" of this orchestra and on their own responsible for somehow integrating the actions of those distributed networks.

*(Note that, it has been suggested that patients who have their Corpus Callosum (the area of the brain that links communication between the left and right hemispheres) surgically severed experience 2 conscious states in that they experience the world as two separate awarenesses. This would seem to indicate that confined neural connectivity isolates the stream of awareness referred to as consciousness. While this phenomenon of "split personality" is interesting in theory its presence has also been disproven in more recent studies.)*

### **The Problem With Applying The Solution to the Easy Problem to the Hard Problem**

The trouble with all of the experiments mentioned above is that what is being measured is not the subjectivity of consciousness yet the integration of information in a way that allows the formation of a clear picture of the outside world as recognizable to an external observer. Take the example of the woman whose consciousness was "turned off" upon stimulation of her Claustrum. Did this really prove that she had no element of subjective being during that state? Firstly, let's suggest that her lack of memory of the event afterwards is proof of a lack of subjective being while her Claustrum was being stimulated. This is to say that maybe since she had no recollection of having subjective experiences during the supposed "unconscious" state that she didn't. The rebuttal here is simple as clearly this is not true since there are numerous instances where a person's ability to record memory is affected and disabled. This therefore does not prove anything about whether she was experiencing anything subjective at the time but more that the stimulation of her Claustrum somehow interfered with her ability to record memory. Secondly, let's suggest that the fact that she didn't seem to respond to any stimuli and instead just blankly stared into space proves that she wasn't experiencing anything. This is also problematic as it is more likely that her ability to "notice" stimuli and subsequently react to them was affected rather than her having no sense of subjective being at all. Sure, it is likely that while her claustrum was being stimulated, the woman lacked features of the "awareness" she generally possesses during conscious states, yet this says nothing about her level of subjective

existence. The real conclusion here is that while it is interesting that there may be a part of the brain that somehow interferes with the sensory, motor and memory centers of the brain all at once, there is no way to determine if the woman's sense of subjective experience was actually being affected since the only real means to observe another person's sense of true existence would be to experience things subjectively as them which is impossible.

Let's now take the example of someone who is asleep or unconscious. Don't experiments that show changes in the brain of a sleeping person (who isn't dreaming) or an unconscious person prove that consciousness is being measured? The answer again is that the person being unresponsive to their environment and having no recollection of their experience upon awakening, doesn't prove anything about their state of "subjective experience" while they were unconscious or asleep. Perhaps their memory centers were disabled along with their sensory and motor abilities which is why they appeared "unconscious" and subsequently lacked awareness.

The conclusion here should not be that such "correlates of consciousness" are not in fact contributors to the sensation of perceptual awareness, but rather that they are not correlates of the subjective context associated with such states. To explain this simply - just because we figured out how the orchestra was playing does not explain how the listener was listening or how there was a listener at all. In fact, the only way to prove that a "listener was or wasn't listening" would be to actually be that listener. This means that the only way to prove that a person doesn't have any subjective experience during unconscious states would be to experience the world as them in those states and then experience nothing (which is itself a paradox). Therefore, it can be summed up that the issue with measuring phenomenal subjectivity in the manner that perception is measured is that since subjectivity lacks clear externalities and objective indicators, its measurement as currently understood is impossible.

## *2. Measurement itself ruins the experiment*

The second problem with trying to measure subjectivity is that the act of measurement itself is something that relies on consciousness to take place. Therefore measuring consciousness would require one to be in a conscious state which by itself defeats the purpose of measuring it. To illustrate this concept one must first understand how perceptual measurement works on a physiological level.

When humans utilize the cognitive tools of measurement and analysis they do so using their neural facilities. This involves taking in sensations from the outside world and then forming perceptions based off of how those observations compare to a record of previously stored observations. For example, if one removes their eyeglass and notices a blurry image of the external world, they are then able to judge and measure that observation as being "blurry" due to comparing it to a record of sharper and higher resolution images of the outside world. This process of sensation (taking in an input), perception (translating that input) and then judgment (comparing that input to previous inputs) are all proven to be features of cognitive processes controlled by a suite of distributed neural circuits. This results from a multitude of experiments that show that each of these cognitive capabilities could be affected by changing the patterns of electrochemical activation in certain areas of the brain. Now understanding this as cognition, the

only reason that it is possible is because of the awareness that underlies it. This is to say that sensations, perceptions and judgments all require an awareness to make sense of that processed information (IE a sleeping person who is not dreaming cannot make any measurements). This awareness is also the result of different physiological attributes as discussed earlier (IE - neural synchronization, wave frequency patterns, Claustrum and ARE). It is thus difficult to analyze ones own awareness since analysis and measurement are cognitive patterns which by their very essence rely on awareness to take place. IE - If one does not have awareness, they cannot analyze or measure sensations which means they cannot measure their lack of awareness in that state. Therefore, in order for one to measure how aware they are they must already be aware which defeats the whole purpose of measuring it. Perhaps one can argue that there are levels to awareness and if one is feeling sleepy or confused they are LESS aware. Still the point stands that in order to measure, one must be aware and in order to measure ones own awareness one must at least be sufficiently aware to utilize the cognitive capabilities of measurement. Now one can ask- what is awareness reliant on? Well, in order for one to be aware, there must exist something to be aware. This something in the something that is aware essentially needs to be a subjective viewpoint that can be activated by awareness. It is this subjective viewpoint IE “Consciousness” that underlies all of experience. Now, just like it is impossible to measure ones awareness due to it being reliant on cognition, it is impossible for one to measure their own consciousness since it is reliant on both their own awareness and cognition. IE - This is to say that if someone were not conscious they would not be able to know how conscious they were since they must be aware and have their cognitive facilities in order to measure their consciousness. However, unlike awareness which could be argued to be progressive (more aware to less aware), consciousness is binary due to its subjective nature. Something can’t be more or less subjective, it can only exhibit subjective properties or not. This is to say that one is either conscious or not conscious. Since one must always be conscious to be aware and to measure, measuring consciousness would therefore be impossible without those resources which are by their very nature dependent on consciousness. If one were to measure their own consciousness they would always measure it as conscious since if they are able to measure at all they must already be conscious.

While we have established that it is likely impossible to ever “measure” subjectivity, there is a question of whether measuring it is necessary at all. One may argue that if the mechanism behind awareness and a “consistent stream of experience” is understood, then its phenomenal subjective qualities are irrelevant. Why is it not enough to just state that the body consists of distributed neural systems that create a centralized hub of information that is processed internally? Why does one need to even assume the additional component of “subjectivity” exists?

Firstly, a number of contemporary academics argue that explaining subjectivity is not needed and explaining “how things construct awareness” is enough in explaining the entire nature of consciousness. This school of thought would suggest that subjective awareness itself is a phenomenon that arises purely out of computation of information in the brain and does not rely on any other innate aspects. Others like the philosopher David Chalmers who famously separated the “easy problem of consciousness” as discussed earlier (explaining how the neural circuits of the brain construct awareness) and what he called the “hard problem” IE explaining

phenomenal subjectivity disagree and say that phenomenal subjectivity is necessary in explaining consciousness.

Like the latter, I would emphasize that the existence of subjective contexts alone that are able to be differentiated from the “whole” content of the universe requires an explanation. This is to say why does the universe whose content exists objectively have segments of subjective contexts in the form of consciousness? Furthermore, why is one's subjective context (the window from which they exist and interact with the world) always constant throughout their entire lives? It is not enough to state that biological brains evolved to develop the idea of subjective context, before which the universe existed in a purely objective state where it was never observed. There must be a mechanism for the subjective context of minds besides for the awareness and cognition that overlays it. There must be a mechanism behind why anything at all exists as separate from the whole universe. There must be a mechanism to not only each orchestra but each listener as well.

To illustrate an interesting application of the question of if explaining phenomenal subjectivity is necessary for explaining consciousness, imagine a baby. It is obvious that babies are less capable of constructing a consistent stream of experience due to their undeveloped neural facilities. They can't store memories as well and also can't internalize information or even “think” in the manner adults are used to. When babies cry because they are in pain they are not able to internalize what it means to be in pain like an adult does but instead just “feel” a base feeling of pain. Does all of this mean that babies are less aware and have a lesser “consistent stream of internalized information” than adults? Of course it does. However, does it still feel like something to be a baby? Do they still have their own subjective contexts from which they interact with the universe? Moreover, is there any less subjectivity associated with a babies experiences than an adults? An adult may feel and experience things more strongly and clearly, but what underlies that feeling and awareness is a base subjective entity capable of itself “feeling like something” and developing its own context that is subjective and separate from the rest of the world. Knowing this, does the baby have any less of a subjective context than the adult? While the baby may think and even experience the world less than an adult, it is still presumed equally subjective in its context, right? This of course is unless one believes that babies do not have a subjective context in the world at all until they develop the neural facilities necessary for a consistent stream of awareness. In fact, the correlates of consciousness have all been measured to be less present in babies than adults. Does this mean that babies lack or have less of a subjective context than adults?

Since there is no way to measure a babies phenomenal subjectivity as discussed in length earlier this question is impossible to answer. Furthermore, since one cannot prove that a baby is conscious, the question then becomes can it be proved that anyone else is conscious if consciousness could not be measured? The famous philosopher “Rene Descartes” once said “Cogito Ergo Sum” or “I think therefore I am” indicating that the only thing he could know for sure is his own existence because he has a mind. He never said anything about anybody else. We take for granted that other consciousnesses exist because they exhibit similar features as us in their interaction with the world, though the truth is as indicated earlier that since there is no way to measure what is phenomenally subjective and since we cannot actually “go inside” their consciousness, there is no way to prove it. This notion of oneself being the only conscious being

that exists is entitled “Solipsism” and is at least subjectively intuitive. There is also an opposite end of the spectrum entitled “Panpsychism” which is a school of thought that assumes that everything is conscious. A variation of this idea entitled the “Integrated Information Theory” argues that consciousness arises out of a system of integrated information and anything that exhibits more integrated information is more conscious. This would assume that computers could be conscious if they distribute enough of a degree of what panpsychists refer to as “psi” or integrated information. This essentially provides a mechanism for subjectivity as arising out of segments of integrated information. It therefore posits that context arising from integrated information is simply a property of the universe.

Now how are these different theories of subjectivity relevant practically? Firstly, if one believes that subjectivity itself is a property of only a distributed system of information such as seen in a brain, then what happened prior to the existence of a brain? According to panpsychists since there was always information there was always a degree of subjectivity. But what about according to materialists - was the entire universe simply objective with no observer, existing in a state of content with no context? If this is true and it existed in a state of purely objective content between the creation of the universe and the first brain, then this may actually go against the scientific method that is the basis of all empirical study. The reason for this is that since the universe has only ever been observed inside the existence of a subjective mind, then there is no proof that it exists while it is not inside a subjective mind. Put simply - every star, planet, place and idea has only existed in the subjective context of a mind. There has never once been a case of the universe existing outside of a subjective context that interacts with it. While it is assumed that the universe is the constant between all things since every consciousness experiences the same universe, it is also true that the universe only has ever been shown to exist inside of a consciousness. This is to say that there is no more evidence for the notion that a consciousness requires features of the universe (such as a brain) than there is evidence that the universe itself requires a consciousness to reside in. For this reason, the answer to the age old question of “if a tree falls in the forest is there anyone there to hear it?” is not a clear cut yes as most scientists have assumed for thousands of years. In fact there is just as much evidence that it is no. Now the purpose of this is not to attribute a mystical explanation for the existence of subjectivity, but to say that the answer is unsolved and for reasons explained earlier with our current knowledge impossible to test. As time goes on the development of theories and methodologies related to the essence of subjectivity and context is therefore imperative in understanding the nature of not just the universe but those that observe it.

The conclusion I’ll leave you with is this: explaining how each brain constructs perceptual awareness in the manner of synchronized neural orchestras is not sufficient in explaining the whole question of consciousness. One must also explain the mechanism of each listener.