Solving the Hard Problem of Consciousness by Asking the Right Questions

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The concept of consciousness contains a paradox. Everyone seems to understand what it is, but when it comes to concrete answers, everything fades into a fog of uncertainty. Perhaps, we should start by asking the right questions. The article formulates these questions as a start for the journey of building a theory of consciousness as an attempt to answer them.

Keywords: consciousness, mind, hard problem, explanatory gap, physical mechanism.

"Despite millennia of analyses, definitions, explanations and debates by philosophers and scientists, consciousness remains puzzling and controversial, being at once the most familiar and most mysterious aspect of our lives. Perhaps the only widely agreed notion about the topic is the intuition that it exists. Opinions differ about what exactly needs to be studied and explained as consciousness ... Today, it often includes some kind of experience, cognition, feeling or perception ... There might be different levels or orders of consciousness, or different kinds of consciousness, or just one kind with different features. Other questions include whether only humans are conscious or all animals or even the whole universe. The disparate range of research, notions and speculations raises doubts whether the right questions are being asked" (Wikipedia "Consciousness").

Here is how the International Dictionary of Psychology formulated the conundrum: "The term is impossible to define except in terms that are unintelligible without a grasp of what consciousness means ... Consciousness is a fascinating but elusive phenomenon: it is impossible to specify what it is, what it does, or why it has evolved. Nothing worth reading has been written on it." [1]

The science that is called the 'knowledge of the mind' (from Greek psyche-logos), which has many fields of research and millions of professionals who call themselves psychologists (the scholars of the mind), has nothing to say about the central object of its research. This sounds like a complete failure. There should be a reason for it. If we do not understand the reason, we cannot change our ways and move to success. We have to pay attention to the questions psychology asks and to what object of research it applies them. Making the object clear and asking the right kind of questions is a good start for any study.

Science in general aims to expand our knowledge about the world by creating models that describe phenomena of this world and explain them. Ideally, science should follow the simple rules of modeling reality: observe reality; make probable assumptions about its mechanisms; test these assumptions, refute or validate them; base explanations and predictions upon valid assumptions.

It does not matter what is the object of the research and whether it is complex or not. The questions remain the same and they are simple. *What is it? What does it do? Why does it do it? How does it do it?* These questions are usually called phenomenological, functional, teleological, and causal. We should not conflate them or pick out one and forget about the others. If a theory does not answer all of the above questions, it will not have explanatory and predictive power,

which is the ultimate goal of any model. It is impossible to say which question is the most important one as they represent facets of the same process of cognition. However, the question of *what* is the first one in any study. We need to identify and classify the object of the research first. That is why any branch of science starts with the phenomenological models.

We call consciousness an 'object of study' only in the sense that any phenomenon can be the object of scientific study, although it may actually be an object or a process. This is an important clarification because we must be careful with categories and avoid the millennia-old category error of thinking that consciousness is an immaterial entity (the soul) living in a material entity (the body). This dualistic error has many reasons, but what interests us here is that the error arose due to a lack of knowledge about the processes in the body which lead to phenomena that we combine with one word 'consciousness' (mind, psyche, soul).

If we use a noun to name a phenomenon it does not mean it is an object. We call a process in a river with a noun 'flow' but we do not think like our ancient ancestors that there is a special entity 'spirit of the river' that lives in the object 'river' and makes it move. But when it comes to consciousness, the objectification fallacy is still shared by millions of people, including psychologists who consider consciousness to be a separate entity. Other psychologists think of it as a process in the brain and do not separate the mind from the body. In any case, in psychology it does not matter whether you are a dualist or a monist, since psychology does not study the physical mechanisms behind the observed mental phenomena.

As mentioned by the author of the above-cited article in Wikipedia, consciousness consists of many features: perception, feeling, emotion, cognition, experience, attention, learning, memory, agency, self, etc. Thus, the answer to the question of *what* within psychology is easy: we just enumerate the known attributes and say that the mind is those mental phenomena combined. Psychology is not concerned that this is a tautological definition, according to which the mind is something mental. Oil is oily, isn't it? Psychology is not interested in the mechanism of consciousness, so the definition is purely phenomenological (descriptive). It does not bother with the brain as the substrate of the mind. For psychology, it does not matter what the substrate is, or whether it exists at all. However, this does not mean that a psychologist cannot say what consciousness does and why it evolved. There are millions of publications that deal with the questions. However, they do not in principle address the question of how consciousness works physically. It is interesting to note that the author of the dictionary article does not even mention this question of *how*. No wonder, the phenomenon remains elusive. We will not be able to grasp it if we do not even think about the mechanism that creates it.

Psychology has delegated the worries about the brain to neuroscience. However, neuroscience has its own problems with identifying the object of research and the questions that it asks. Many neuroscientists think of the mind in dualistic terms as a transcendent entity. They call it by various names. The most fashionable one is 'information.' Many theories of consciousness have this word in their name but they all come down to just stating that information exists in the brain and does this or that. They do not answer the question of how does it come into existence in the brain. For them, it might as well be downloaded from the heavenly 'cloud storage' or, as some of them claim, from conscious electromagnetic fields. It does not matter, whether they apply physical terminology. The essence remains the same as with the old notion of an intangible soul: it just does things in its unfathomable ways. However, this does not bother most of neuroscientists because they think that the object of their research is the substrate of the nervous system and the physiological processes in it. That is why this science has the word 'neuro' in its name, doesn't it? It doesn't deal with consciousness. If there is no problem of consciousness, there are no worries

about it. Moreover, the words 'consciousness' and 'mind' were taboo in the community for most of the previous century.

Thus, as in psychology, in neuroscience, it does not matter whether you are a monist or a dualist, whether you believe in an eternal and immaterial soul temporarily living in the body, or whether you think it is a physical phenomenon. Both sciences do not deal with the mind as a physical process. There is no such object of the research. Is it amazing? Yes. Is it surprising, then, that consciousness remains puzzling? No. It turns out that despite all the accumulated data, we are not moving towards solving the puzzle. There must be a reason for it. Shortly, we will see that the reason is exactly in the questions being asked and in the object of research to which they are addressed.

Neuroscience contains an implicit assumption that the questions about the mind have been addressed by psychology and what remains is to find so-called 'neuronal correlates of consciousness' (NCC). It means that the researchers take notions about the attributes of the mind as defined by psychology and try to show how the activity of certain neural populations correlates with the mental phenomena as observed from the outside or experienced subjectively. The overwhelming majority of experiments for many decades dealt with looking for NCC. The amount of accumulated data is enormous. However, we are walking in circles around the central issue. The problem was ill-defined from the start as it was based on studying correlation. This does not mean that neuroscientists do not understand that it is a logical fallacy to take correlation for causation. If we see that the brain produces mental phenomena, we do not have other choice but to try to check the correlation between its intrinsic activity and the resulting manifestations. Ideally, if we get rid of all the confounding variables, we might distinguish a direct correlation. It is an enormously hard task to associate independent and dependent variables in such a complex and dynamic system as the brain but this is not the major problem.

The problem is with the definition of the object of research and the questions. Everyone was looking for correlates of something that was not defined! It is like looking for a black cat in a dark room without knowing what a cat is. We can all agree that it exists but that does not solve the problem. The cat will remain elusive. If we do not have an answer to the question of what, we are going nowhere and only confuse ourselves about the rest of the questions. For example, the causal question of how was asked in the wrong way: how does what neurons do in particular (physiological activity) correlate with what they do in general (mental phenomena)? This is not a causal question. Physiological processes may correlate with the psychological manifestations but until we find the causal link by elucidating the physical mechanisms that work in this substrate to produce the mental, we lack an explanation of the mental in terms of the physical. The philosopher Joseph Levine called it an explanatory gap. [2] For most of the previous century, cognitive sciences did not mind the gap and were not even thinking about building a bridge. However, this could not last forever, as ignoring the problem does not abolish it.

Another philosopher, David Chalmers, reminded the neuroscientific community that finding neural correlates is an easy problem and the hard problem is to explain *how* the mind arises from the physical substrate. Here is his formulation of the problem: "It is undeniable that some organisms are subjects of experience. But the question of how it is that these systems are subjects of experience is perplexing. Why is it that when our cognitive systems engage in visual and auditory information-processing, we have visual or auditory experience: the quality of deep blue, the sensation of middle C? How can we explain why there is something it is like to entertain a mental image, or to experience an emotion? It is widely agreed that experience arises from a physical basis, but we have no good explanation of why and how it so arises. Why should physical

processing give rise to a rich inner life at all? It seems objectively unreasonable that it should, and yet it does. If any problem qualifies as the problem of consciousness, it is this one. In this central sense of "consciousness," an organism is conscious if there is something it is like to be that organism, and a mental state is conscious if there is something it is like to be in that state." [3]

When Chalmers formulated the problem in terms of *why* and *how*, the community was at first shocked by the revelation that the questions exist and then absorbed the shock by reformulating the problem to make it fall within the familiar phenomenological approach. There is an abundant number of publications that can be called 'making the hard problem easy.' Their mutual theme is that describing the neurophysiological processes is the solution to the problem. They seem to miss the point: it is exactly what Chalmers called an easy problem. He never said it was easy in the sense that there was no hard work involved. He just tried to make the community see that it is impossible to ignore the other questions if we want the explain the phenomenon that we call the mind. We cannot go on forever only describing the phenomenon. After all, the task is to explain. It is not an abstract philosophical issue but a pragmatic one. If we do not understand *how* the mechanism works, we cannot fix it. There is no wonder in the fact that with all the triumphs of phenomenological descriptions within neuroscience, psychology and psychiatry, not a single systemic mental pathology is currently curable.

In science, an open problem means that it can be accurately stated and it is assumed that it can have a verifiable solution but it has not yet been found. In other words, if we have not solved the problem, it is highly probable that we have not yet defined it well. The way Chalmers formulates the problem does not make it well-defined. This is exactly why many neuroscientists are skeptical about the philosopher's attempt. Moreover, this is why he gets into a dead-end and declares that the problem is not solvable by science in principle. We are back to the issue of the definition of the research object and the questions asked.

First, a definition of consciousness as 'something it is like to be in a mental state' cannot be called a good starting point for a study. In fact, it just leaves us in a tautological circle. Second, Chalmers conflates different questions into one question of *why*. This is also not a good start for solving any problem.

Chalmers notes that the question of why is not functional: "What makes the hard problem hard and almost unique is that it goes beyond problems about the performance of functions ... Why is the performance of these functions accompanied by experience? A simple explanation of the functions leaves this question open ... Why is it that when electromagnetic waveforms impinge on a retina and are discriminated and categorized by a visual system, this discrimination and categorization is experienced as a sensation of vivid red? We know that conscious experience does arise when these functions are performed, but the very fact that it arises is the central mystery ... To explain experience, we need a new approach." [3]

However, when taken as a teleological question, it is not unique as it is the fundamental question for any research object: why does it exist? It does not mean that we are asking 'why should anything exist at all?' Such a question is a pure philosophical and metaphysical issue. Science has a pragmatic task of modeling reality and is not concerned with the question of why this reality exists. Thus, the question of *why* in scientific discourse is related to the functional question but is not conflated with it. If there is some function performed the question is *for what purpose* it is performed.

In this light, the specific questions asked by Chalmers are not hard at all. Of course, the answers have to come from our knowledge accumulated at the phenomenological level of study. In fact, Chalmers asks them based on this knowledge. That is why they sound as rhetorical as they contain

the answer to the question about the purpose. Question: why is it that when electromagnetic waves of a certain frequency range are processed by the visual system, we experience a sensation of vivid red or deep blue? Answer: the part of the brain that we call the visual system has developed for processing light signals and encoding them into representations that we experience as a certain quality of those signals. Question: why is it that when sound waves of a certain frequency range are processed by the auditory system, we experience the sensation of middle C? Answer: the part of the brain that we call the auditory system has developed for processing sound signals and encoding them into representations that we experience as the sensation of a tone. We can call those sensations by different words (middle C, red, blue, etc.) because the part of the brain that is responsible for our speech has developed for making verbal representations so that we can exchange information with each other. Here comes the general question that perplexes Chalmers so much: why does this processing performed by the brain give rise to a rich inner life? Answer: signal processing performed by the brain creates a rich inner life for the purpose of adapting to a rich outer life. To survive in reality a living system must create a model of this reality. This is the general teleological explanation of the process that we call consciousness.

Of course, this sounds easy only in hindsight because we know quite a lot about the processes in the brain and the physical nature of signals of the world. This is what physics and neuroscience have done together so that the functional and teleological questions can be answered easily. What is the hard problem then? Even if go down to the finest details of the neurophysiology of our perception modalities or the functional role of specific neural populations, neurons or even molecules, without elucidating the mechanism by which they create the specific mental phenomena and the mind in general, we are in the abyss of an explanatory gap. This is the hard problem. But to solve it we should not conflate the causal question of *how* with functional and teleological questions. In this case, the above questions have to be reformulated so that the problem will be well defined.

How does our visual system create the experience of vivid red or deep blue when it performs the function of transducing electromagnetic waves received by the retina? How does our auditory system create the sensation of middle C when it performs the function of transducing sound waves received by the ears? How does the performance of the signal processing function give rise to a rich inner life? These questions are not so easy. But this means that we have not yet studied them well enough. We cannot answer them by phenomenological, functional, or teleological descriptions. We have to focus on the causal question of *how*. But this does not make the problem of consciousness unique. A scientific model of any phenomenon must answer this question. It must elucidate the mechanism that produces the phenomenon under study. This is not a new approach in science. It is only new for cognitive sciences. They avoided the question of *how* as long as they could for a simple reason: it is the hardest question in any research.

For example, elucidating the mechanism of fundamental interactions remains the ultimate task of theoretical physics though the phenomenological descriptions have been worked out to the finest detail. We describe interactions' phenomena with sufficient accuracy to account for many observations but we do not know how the mechanism works. That is why when we stumble upon observations that do not fit into the old descriptions we are at a loss and declare all sorts of 'dark forces' (dark matter, dark energy) and invent new virtual particles as carriers of interactions to make ends meet. We can even declare our descriptions to be some 'fundamental laws of nature' that do not need any explanation. However, these tricks mean that we are in the dark about the mechanism of the interaction, and our models do not offer correct explanations and do not have a predictive power.

Here is how Chalmers justifies the trick he takes from theoretical physics to apply to consciousness: "In physics, it occasionally happens that an entity has to be taken as fundamental. For example, in the nineteenth century, it turned out that electromagnetic processes could not be explained in terms of the wholly mechanical processes that previous physical theories appealed to, so Maxwell and others introduced electromagnetic charge and electromagnetic forces as new fundamental components of a physical theory." [3]

Maxwell's model was purely phenomenological and described the observables but did not explain the underlying mechanism. He had to use the concept of 'force' precisely for the lack of an explanation. It was the same as saying that there is a spirit behind the observed and it works in its unfathomable ways. He understood it perfectly well and, as a true scientist, was not too proud of the trick. He left the task of uncovering the mechanism for future generations.

Chalmers declares consciousness a fundamental property that "goes beyond what can be derived from physical theory" and is "over and above the properties invoked by physics." [3] He seems to forget his own words that "experience arises from a physical basis." [3] He calls his new approach naturalistic dualism. The term sounds new but rings an old bell. Classical dualists simply say that the Mind (Consciousness, Psyche, Soul) is a non-physical entity. 'Naturalistic dualists' say in a roundabout way that it is some fundamental entity that is beyond, over and above the physical. The philosopher insists that "the moral of all this is that you can't explain conscious experience on the cheap." [3]

However, the moral of all this is that declaring something fundamental to avoid the need for an explanation is a cheap way out. Moreover, the problem formulated as something that concerns non-physical is not solvable, cheaply or expensively, because it is ill-defined and not suitable for scientific study. Chalmers predicts that scientific methods "must fail." [3] But the simple truth is that they are not applicable to what is defined from the start as 'beyond' physical. Such a concept is an abstraction and is the concern of philosophy or theology. Consciousness (mind, psyche, soul) was looked at as an abstraction for millennia, this is why we are still in an explanatory gap. If we keep on defining it as something 'beyond,' we are doomed to stay in an eternal explanatory gap.

If we want to solve the problem, we should define it well. Chalmers gives it a try in another article: "Subjective experience seems to emerge from a physical process ... In this case, the laws must relate experience to elements of physical theory ... Rather the laws will serve as a bridge, specifying how experience depends on underlying physical processes. It is this bridge that will cross the explanatory gap." [4] This is a lot better. Scientific methods should not fail in solving this problem if applied correctly and consistently. If the object of research is a physical process and the question is how it works, it can be a base for constructing the bridge over the gap and for a scientific inquiry with testable assumptions.

This means that the objective of cognitive sciences is the *physical causes of consciousness* (PCC). It is a well-defined scientific task that requires experimental testing. If we have assumptions about physical mechanisms that produce mental phenomena, we can test causal links by manipulating independent variables (physical states) that are the cause of dependent variables (mental states). Here we need to make it clear: physical is not synonymous with physiological as the same physical process and the same physical mechanism can work in different substrates. Of course, without studying the specific substrate, we cannot understand the processes in it. But the ultimate goal is to explain the physical mechanism.

If we want to solve the problem of consciousness, the research questions should be asked about this process. The phenomenological question of *what* is not answered by just stating that the mind is a process. It is a lot better than an old objectification error still shared by billions of people that

the mind is some immaterial object living in a material body. If we get rid of this error and consider the mind to be a physical process in a physical substrate, the next question comes up: what kind of a process is it? When we answer this question, we can move on to describing the characteristics of the process. Thus, we will cover the phenomenological part. Next comes the teleological part: what purpose does this process serve? Next comes the functional part: what function does it perform in general and what functional roles have its various manifestations? We have to be careful not to conflate the questions about the substrate with the questions about the process in it. However, it does not mean that we should just forget our research on the substrate. On the contrary, the accumulated knowledge about the substrate makes the answers to the questions about the process a lot easier. Perhaps, when we focus on the process, we will be surprised how what we thought was a puzzling, controversial, elusive phenomenon and an unsolvable problem, will have a solution that was just waiting to be picked up.

This problem is not about something over and above physics. If it is above current mainstream theories of physics, this does not mean that science must fail. We just have to work out new explanations. When we answer the phenomenological, teleological, functional and causal questions we will have a true theory of consciousness. Here is how Chalmers described such a model: "A complete theory will have two components: physical laws, telling us about the behavior of physical systems from the infinitesimal to the cosmological, and what we might call psychophysical laws, telling us how some of those systems are associated with conscious experience. These two components will constitute a true theory of everything." [4]

The project called "Symphony of Matter and Mind" aims to be exactly such a theory and has two components: Theory of Energy Harmony as the model of all physical systems from micro to macro levels and Teleological Transduction Theory as the model of the process which we call the mind. [5-12] It covers phenomenological, functional, teleological and causal explanations supported by experimental data accumulated by different fields of science. We can rephrase the psychology dictionary: consciousness is a fascinating phenomenon and to explain it we need to specify what it is, why it has evolved, what it does, and how it does it. Something worth reading has been written about it.

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