Two Obstacles on the Way towards the Science of Consciousness

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ABSTRACT
The paper discusses two obstacles standing on the way towards the science of consciousness and several possible ways of removing them. The first obstacle reflects the tension between the hard problem of consciousness and limitation of physics, which prevents us from directly talking about conscious experiences in theory. The second obstacle is related with combination problem presented by panpsychism and removing this obstacle will help us figure out what kind of system can be conscious and how to make a conscious machine. It is impossible to move on towards the science of consciousness before these two obstacles have been thoroughly removed. In this paper, I propose several methods to clear these two obstacles.

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1. The First Obstacle: Hard Problem and the Limitation of Physics
Around 1995, Chalmers (1995) proposed his famous "hard problem" of consciousness which classified the problems of consciousness into easy problems and hard problems. In particular, the "hard problems" are referred to those directly related with conscious experiences. According to Chalmers' argument, the hard problems cannot be reduced to the problems of explaining structures, functions and dynamics, all of which can be finally expressed as relations between some entities. However, according to Russell's philosophy (1927) about physics, physics can only explain relations between objects other than what these objects really are and this actually sets the limitation of all physical theories. Combining these two views, we immediately find that we are in a very embarrassing situation: on the one hand, if we want to do some explanatory work about consciousness that is more than relations between objects, we have to resort to physics or some kind of theory; on the other hand, all theories can only deal with relations and cannot address things more than relations. Therefore, it seems that we have a deadlock here. This is the first obstacle we have to clear on the road to the science of consciousness.

The first obstacle is basically equivalent to the hard problem proposed by D. Chalmers (1995). The hard problem and the first obstacle described above seem to prevent us from directly talking about conscious experience. Nevertheless, if someone wants to set up a fundamental theory of consciousness, he (she) has to find some way to talk about conscious experience and there seems to be no way around it.

2. Hints from Quantum Mechanics – Removing the 1st Obstacle
In his famous work, Chalmers (1995) outlined a theory of consciousness and he asserted that we have to add conscious experiences as something fundamental into the theory of consciousness just as mass, space, time and charge fundamental to a physical theory. In this way, Chalmers believed that he has found a way to talk about conscious experience directly.

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However, there is a problem about this proposal. Obviously, fundamentals in physics such as mass, space and time are ontologically different from the fundamental thing of conscious experience. According to Barbour’s (2003) view, mass, space and time are merely relations between entities while conscious experience is not simply relations. Therefore, Chalmers (2003; 2011; 2012) later somehow abandoned this proposal and began to embrace panpsychism (Seager, 1995). However, although many variations of panpsychism have been proposed, we still do not know how to define conscious experience strictly in theory and the first obstacle is still present.

Maybe Wittgenstein’s philosophy (1922) has provided some useful clue to remove the first obstacle. Wittgenstein said “what can be said at all can be said clearly, and what we cannot talk about we must pass over in silence.” For consciousness, the easy problems are what can be said clearly and they can be structuralized while we should be silence about the hard problems or conscious experiences. But the problem is how to be silence and silence does not mean doing nothing. Maybe one can be silence by mapping what cannot be structuralized to some other entity and trying not to describe them.

On the other hand, some important facts about quantum mechanics may also give us some ideas about how to talk about conscious experiences. For a student who is learning quantum mechanics, he will be probably informed, in his first day of class, that wave functions or quantum states (|a>) themselves are actually not physical or observable, only the probabilities (such as $|\langle a | b \rangle|^2$) are physical. For physicists, non-physical is somehow a disaster, but for a scholar who are dreaming of cracking the hard problem of consciousness, non-physical is, instead, something precious and shall be treated seriously.

In a word, quantum states might be what scientists of consciousness are dreaming of: they contain structural ingredients as well as ingredients that cannot be structuralized (note that the density matrix, which is usually also deemed as ‘quantum state’ by physicists, should be excluded here because it actually expresses the relations between the state of the system and the state of the environment). Spanning of some quantum state on some basis actually corresponds to some kind of structure, whose modulus squared are the transition probability of the studied state to one of these base states and specify the relations between the state and these base states. But no one has ever specified what the instinct nature of this state is. Actually, the state itself cannot be structuralized and we can map it to some conscious experience. We believe this strategy may have provided a possible strategy to clear the first obstacle on the way to the science of consciousness, which is the reason why physics is still useful to solve the hard problem of the consciousness. However, we have to be careful here about the quantum states: they are not just some mathematical objects anymore, they themselves have something inside.

As you can see we have not tried to say about what are conscious experiences, instead we only map them to some other entities (quantum states). Also in the above strategy, we need not to invoke some other fundamentals to represent conscious experiences and we find that they have already been contained in quantum mechanics.

We have shown in detail how to define conscious experience in my previous quantum theory of consciousness (Li, 2013; Li, 2016).

3. The Second Obstacle: Panpsychism and the Combination Problem

The Logic of Panpsychism

If we admit that conscious experiences are produced by some existing matters then it is natural to assume that they are produced by some kind of properties of these matters in the end. Physical properties are actually some relations between matters and they cannot produce experiences. We can arbitrarily name these properties that generate conscious experiences. For example, we can name them inner properties or phenomenal properties. According to the principle of sufficient reason, if we have no sufficient reason to differentiate between these matters that can generate conscious experiences and other ordinary matters, then we are forced to admit that all matters should have phenomenal properties and phenomenal properties are all connected to some kind of conscious experiences. Therefore, everything are conscious and this is the logic of panpsychism (Seager, 1995; Chalmers, 2011).

Nevertheless, according to my theory of consciousness (Li, 2016) and many other people’s briefs, conscious experiences of ordinary matters are fragmented, and cannot form structuralized and meaningful experiences about the external
world. As a matter of fact, these fragmented experiences cannot even have a feeling about time flowing. Therefore, ordinary matters are effectively not conscious. But we emphasize that these fragmented experiences of ordinary matters have no instinct differences with the highly organized conscious experiences of our brain.

In a word, panpsychism firstly assumes that everything is conscious but it finally argues that ordinary matters are actually effectively not conscious in the end. The main difference between ordinary matter and the conscious system is that the experiences of a conscious system are highly structuralized to be able to form the time flowing.

**Combination Problem and the 2nd obstacle**

Panpsychism (Seager, 1995; Chalmers, 2011;2012) provides a very robust strategy to study consciousness. Nevertheless, it also has a serious problem. For panpsychism, everything have phenomenal or conscious properties. But how can these normally fragmented conscious properties be well organized and combined into a highly structuralized conscious experience stream is what panpsychism has to firstly answer. On the other hand, how can the physical functions realized by the system’s physical properties be consistent with the functions experienced by the system’s phenomenal properties is another aspect of the combination problem ((Seager, 1995; Stoljar, 2001; Chalmers, 2012). For example, one can wonder how to make a computer experience the process of computing ’1+1=2’ realized by its physical properties. These problems are usually referred to as combination problems of panpsychism.

Many people hope to solve the combination problem by simply organizing the physical properties of the system. They suppose that physical properties are just like handles of hidden conscious properties. They expect that when the handles are delicately organized and the conscious properties beneath the handles would be simultaneously organized. Nevertheless, no one has really proved this assumption and, on the contrary, some facts seem to be against this assumption. Take the above “1+1=2” for example again, although physical properties of the chip are highly organized, it is almost impossible the chip is really experiencing the process “1+1=2”.

By the way, the success of the integrative information theory (Tononi, 2004) of consciousness highly depends on the above assumption that physical properties and conscious properties can be easily made organized at the same time by only organizing the physical properties. The integrative information theory might be useful in promoting machines’ intelligence but it cannot solve combination problem of consciousness (Cerullo, 2015).

**4. A Solution to the Combination Problem**

In Chalmers’ paper (2012), he reviewed (or proposed) several strategies to solve the combination problem but it is not clear which one will succeed in the end.

Here, I propose a three-step strategy to solve the problem: (1) First clearly define, in theory, the consistency between physical properties and phenomenal properties, which can be accomplished in the framework of my quantum theory of consciousness (Li, 2016). (2) Second show that what kind of system can achieve this consistency. (3) Manage to stabilize this system. As to (1), readers are referred to my previous work (Li, 2016).

As to (2), my primary guess is that maybe only for the system composed of one elementary particle, its physical properties and phenomenal properties can be consistent or structurally matched. In addition, to make the system to generate time and intelligence, the elementary particle is forced to have an extraordinary inner freedom such as some dark-matter particle. However, this guess still awaits proofs in experiment.

Obviously, this guess amounts to one version of identity panpsychism (Chalmers 2012): dominant monad view which proposes that the subject of our experiences is a single localized fundamental entity: maybe it is just an electron. But generally people would simply reject this view by questioning its stability and its simplicity for our complex conscious experiences. For dark-matter particle, there is no simplicity problem and the stability problem can be solved as follow.

As to (3), I recently propose a mechanism, indistinguishable principle of temporarily identical particle, to stabilize the dark-matter particle by using an accompanied system that is composed of lots of entangled particles and is almost isolated from the external world (Li, 2016). The dark-matter particle and the composite-particle system are two conjugate systems, which are temporarily identical in physics. Therefore, the mechanism is as follow: the composite-particle system prepares the
physical structures for the dark-matter particle and the dark-matter particle 'experiences' the external world with its own phenomenal properties by forcing its physical structure to match that of the composite-particle system. During this process, the composite-particle system is absolutely isolated and but it can communicate with the external world afterwards; therefore, the dark-matter can also communicate with the external world through the composite-particle system.

As you can see, my solution has, in some sense, combined two versions of identity panpsychisms (Chalmers, 2012): dominant monad view for the dark-matter particle and quantum holism for the composite-particle system. I believe that my proposal will completely solve the combination problem if the above mechanism can be proved to be true in experiment in the future.

Many people might just don't like the idea the consciousness is produced by an elementary particle like dark-matter particles, which is not as cool as the idea of emergent consciousness from a bunch of molecules. Some even argues that because Nature would not use physical theory "more" than quantum mechanics to create life so she would not use the fancy dark-matter particle to generate consciousness. But my point is that there is no limitation for Nature to use physics to make things and she can even use physics that human would probably never discover to make things. No one can set a limitation for her. For example, before human developed electromagnetism Nature has already used the theory to help creatures see the external world. Therefore she can also use dark-matter particles to do things for her, such as letting the system "experience" the external world using the phenomenal properties of these dark-matter particles.

5. Summary
This paper has actually removed the first obstacle in theory or it has shown how to directly talk about conscious experiences by defining three types of properties (Li, 2016). As to the combination problem (the second obstacle), this paper hypothesizes that only elementary particle's physical properties and phenomenal properties can be consistent with each other. It further proposes that maybe Nature has used single dark-matter particle's phenomenal properties to experience the external world and the dark-matter particle can be stabilized by trillions of small accompanied composite-particle systems in our brain (Li, 2017). If the second obstacle is completely cleared in the future, then we can figure out what kind of system can be conscious.

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