# Emergence of qualia from brain activity or from an interaction of proto-consciousness with the brain: which one is the weirder? Available evidence and a research agenda

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**Published online:** 16 August 2016 (version 1)
**Cite as:** P. Tressoldi et al. 2016 (DOI: 10.14293/S2199-1006.1.SOR-SOCSCI.AY054B.v1)

**Reviewing status:** The review of this article was author-mediated. The ScienceOpen editorial office has verified and confirmed the identities of the reviewers. The endorsement statement and reviewers names are provided below. The article is also available for continuous post-publication peer review on its dedicated ScienceOpen homepage.

**Peer Review by Endorsement Statement:**
"*I have read this article, given feedback to the authors and now feel that it is of appropriate quality to be included in the scientific literature and be part of the open scientific discourse.*"

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**Primary Discipline:** Social & Behavioral Sciences
**Secondary Discipline:** Medicine, Psychology, Theoretical physics
**Keywords:** Qualia, Consciousness, Brain, Mind, Quantum Physics

## ABSTRACT

This contribution to the science of consciousness aims at comparing how two different theories can explain the emergence of different qualia experiences: meta-awareness, meta-cognition, the placebo effect, out-of-body experiences, cognitive therapy, meditation-induced brain changes, etc. The first theory postulates that qualia experiences derive from specific neural patterns, and the second one that qualia experiences derive from the interaction of a proto-consciousness with the brain's neural activity. From this comparison, it will be possible to judge which one seems to better explain the different qualia experiences and to offer a more promising research agenda.

## INTRODUCTION

Consciousness, mind, the whole psyche, and soul have been one of the most relevant and puzzling problems since the origin of philosophy and psychology. The speculations on their nature date back to pre-Socratic philosophers (like Pitagoras) in the West, as well as Veda tradition, Yoga, and Buddhism in the East.

A huge interest on consciousness has raised up in the last three decades, and a wealth of data on its neurophysiological, physical, molecular, psychological, and behavioral aspects is now available in the literature (e.g., Churchland, 2013; Cohen & Schooler, 2014; Dehaene, 2014). Consciousness is not a strictly medical topic but encompasses the fields of psychology, biology, physics, as well as epistemology and philosophy with an increasing need of interdisciplinary efforts and exchange of ideas.

The complexity of the problem and the width of involved fields of knowledge suggest the need for an open-minded approach, able to avoid any inadvertently prejudicial, dogmatic stance, based on one's formation and beliefs. It also prevents one to properly discuss the whole topic within the space of an article. Therefore, the aim here is only to compare the interpretation of a series of phenomena listed in Table 1, from two different theoretical approaches.

In this article, we will use the term "Qualia" (Q) as referring to the first-person conscious awareness of both physical and mental information, for example, "I see a red rose", "I feel happy" (Michael, 2015). These phenomenological reports can

Table 1. Local Q experiences.

| Q Experiences | Mind = Brain | Proto-consciousness (PC)↔Brain |
|---|---|---|
| 1. Cognitive therapy–induced brain changes (Messina, Sambin, Palmieri, & Viviani, 2013) | Brain correlates of therapist suggestions change brain correlates of emotional, behavioral, and other dysfunctions. | PC realizes Qs following the therapeutic suggestions changing their neural substrate |
| 2. Meditation-induced brain changes (Tang, Hölzel, & Posner, 2015; Tomasino & Fabbro, 2015) | Brain correlates of meditation status change its functional characteristics. | PC guides Qs to control mental activity and its neural substrate. |
| 3. Hypnosis (Cardeña, Jönsson, Terhune, & Marcusson-Clavertz, 2013) | Brain correlates of hypnotic suggestions change the associated brain functional characteristics. | PC guides Qs to follow the hypnotic suggestions. |
| 4. Placebo (Stewart-Williams, & Podd, 2004) | Brain correlates of expectations activate their brain and physiological correlates. | PC guides Qs to affect physiology as expected. |
| 5. Meta-awareness (Schooler, 2015) | The brain describes its contents to itself by an emerging recurrent feedback. | PC reflects on and monitors Qs. |
| 6. Feeling of personal ownership of one's mental states (Klein, 2015) | Brain damages and induced brain activity modifications affect Qs. | Brain damages and induced brain activity modifications affect how PC realizes Qs. |
| 7. Meta-cognition (Dunlosky & Metcalfe, 2008) | The brain can describe its contents to itself by an emerging recurrent feedback. | PC can reflect on and monitor Qs. |
| 8. Mind-wandering (Schooler et al., 2011) | The brain can describe its contents to itself by an emerging recurrent feedback. | PC can reflect on and monitor Qs. |
| 9. Awareness of flow of time (Block, 2014) | The brain can describe its contents to itself by an emerging recurrent feedback. | PC can reflect on and monitor Qs |
| 10. Lucid dreams (Gackenbach & LaBerge, 2012). | The brain can describe its dream content to itself by an emerging recurrent feedback. | PC-guided Qs can reflect on and monitor dream content. |
| 11. Free will (Bode at al., 2014; Haggard, 2008) | It emerges from nondeterministic patterns of brain activity. | PC is not bound by the causal chain of cognitive and motor processes. |
| 12. Bistable perceptions (Kim & Blake, 2005) | Qs differences correspond to different brain activity patterns. | PC realizes Qs differences by interpreting different brain activity patterns. |
| 13. Qs with a partial brain (Forsdyke, 2015; Muckli, Naumer, & Singer, 2009). | Cognitive functions reorganize their neural networks. | PC may realize Qs by using the partial brain. |
| 14. Left vs right hemisphere Qs differences in split-brain (Gazzaniga, 2005) | The left brain's specialization allows it to describe its own and the right brain's contents to itself. | PC realizes Qs by using the left hemisphere in split-brain patients. |
| 15. Nontraumatic or induced with specific brain stimulation out-of-body experiences (Carruthers, 2015) | They emerge from the activity of specific brain networks. | PC Qs are dissociated from the body, but not from the brain. |
| 16. Near-death experiences (Facco, Agrillo, & Greyson, 2015; Nelson, 2014) | Near-death experiences are a byproduct of the residual brain activity during and after cardiac arrest. | PC remains active even with a reduced and altered brain activity. |
| 17. Nontraumatic mystical experiences (Wulff, 2014). | They emerge from the activity of specific brain networks. | PC-guided Qs interact symbolically with its origin. |

also be nonverbal. We prefer Q instead of "Consciousness" because the term Consciousness is often used to define both an ontological state and a state of mind.

Independently of every philosophical point of view, regardless of scholarly philosophical theories positing that Qs are merely illusions and we are simply "zombies" (e.g., Wegner, 2004), there is no doubt that without Qs there cannot be any sort of overt (explicit) knowledge of the inner (mental) and outer worlds even if it is still possible to show very advanced adaptive behaviors like that observed in modern robots. Consequently, if an organism has explicit knowledge, then it is not possible that the it does not have Qualia. Qs hence became a necessary condition for explicit knowledge of mental and external events.

How is it possible to have experiences of this kind? In the following, we will compare two competing types of theories. The first one, based on physicalist metaphysics, postulates that Qs are nothing but (eliminative reductionism) or an emerging (constitutive reductionism) neural activity of brain activity triggered by external and internal processes (e.g., Schwartz, Lilienfeld, Meca, & Sauvigné, 2016). Eliminative reductionism, at its core, subsumes that all mental phenomena can be explained by the functioning of their neurological correlates, which will make superfluous any mental interpretation of all human and nonhuman behaviors. Differently, emerging reductionism postulates that at some level of complex interactions among the low-level brain components, higher level of brain functioning with different properties with

respect to their constituents, for example, motives, emotions, and personality traits, will come out which could also influence causally the underlying brain activity.

The second one, based on interactionist metaphysics, postulates that Qs arise by an interaction between a nonlocal proto-consciousness (PC) or proto-mind, which interacts as an "Interpreter" using Gazzaniga's terminology[1] (Gazzaniga, 2011; Roser & Gazzaniga, 2006), and a "Decision Maker" with the neural information produced by the brain activity. As PC we mean a mind-like primordial substance, the physical laws of which have yet to be investigated (see paragraph 3.1 PC Research Agenda), similar to the description put forward by Hameroff and Penrose (2014) and Beauregard (2014).

An alternative to an interactionist metaphysics, but which forecast the same effects as due to the primacy of a mental versus a material substrate, is the mental monism with all its variants, idealism, panpsychism, and the more recent non-physical realism (Staune, 2013) and dual-aspect monism (Atmanspacher, 2012) metaphysics.

These two competing theories are represented in Figure 1.

Interactive theories like this one are not new in the debate about mind–brain relationships (Zalta, 2013). We may cite Popper and Eccles's (2012; "The Self and Its Brain") theory as an example or the more recent Mario Beauregard's (2014) "Theory of Psychelementarity" (TOP). What is new in the present article is the presentation of a list of Q phenomena and how well each competing theory serves as an explanation for them.

At the end of this list, we will confine ourselves to outlining the gaps each theory must fill in order to shed light on how the different Q phenomena can be explained. We will leave it to the reader to choose which of the two theories is more plausible or, perhaps, just less weird.

It is important to point out that both theories have in common the fact that every Q experience is correlated to a specific and unique neural signature, elicited by the spatial–temporal patterns of brain activity which can be recorded with traditional means, for example, fMRI, EEG, MEG. The crucial difference concerns how Q phenomena relate to brain activity.

**Figure 1. Mind=Brain (left) and Proto-consciousness interacting with the brain (right) schematic representation.**

[1] Even if Gazzaniga's interpretation is that this role is an emerging property of the brain.

## DIFFERENT QUALIA PHENOMENA TO BE EXPLAINED

In Table 1, we will illustrate how the two competing theories try to explain different within the body (local) Q experiences. In Table 2, we will present how the two theories try to explain some Q experiences that are achieved beyond the range of sensory and motor organs (nonlocal). For each of these experiences, we will indicate some references selected in order to offer a more comprehensive explanation.

## THE RESEARCH AGENDA

These research agenda fit well with Chalmers' (2013) project 5 "Systematize the connection" between first-person data and third-person data for the construction of a science of consciousness.

3.1 Research agenda for the PC–Brain connection:

1 What is the physics and biology of the PC–Brain interaction?
2 How does the PC "interpret" brain activity to achieve the different Qs?
3 Is it possible to detect non-Q PC effects?
4 Which is the origin and nature of PC?

Regardless of what the PC is made of, it must exert a physical action on the brain, both for the realization of Qs based on the monitoring of cognitive activities like mind-wandering, meta-awareness, and by a process of interpretation of their specific neural correlates and also particularly for the Qs that involve a modification of brain activity (e.g., placebo and meditation). Using Beauregard's term, this relationship must imply a "Psychoneural Transduction Mechanism" (PTM).

A well-known candidate for this PTM is the Orch-OR (Orchestrated-Objective Reduction) theory as proposed by Penrose and Hameroff (Hameroff, 2007, 2012; Hameroff & Penrose, 2014), which postulates that Qs arise from quantum-like processes[2] of quantum superposition decoherence between proto-conscious information and the microtubules of brain neurons. A comprehensive description of this theory and its criticisms is beyond the scope of this article but is fully available in the cited references.

Another PTM candidate is the Schwartz, Stapp, and Beauregard's (2005) "Neurophysical Model of Mind." Like the Orch-OR theory, this model is also based on a quantum-like approach. In its essence, this approach is based on the "physics of the observer" as postulated by Von Neumann Wigner and others (Stapp, 2011), that is, on the active and essential role of conscious human choices in the definition of the status of observed (measured) physical properties of nature. The purported mind–brain connection is based on the Zeno effect[3]

[2] Interpreting some biological and mental phenomena like those observed in quantum physics.

[3] A series of observations after short periods of time affect the probability that the system will be in in a given state, for example, A rather than in state B. In quantum physics, the repeated observation prevents the transition of the system into the decay state.

Table 2. Nonlocal Q experiences.

| Q Experiences | Mind = Brain | Proto-consciousness (PC)↔Brain |
|---|---|---|
| 1. Nonlocal perception (Tressoldi, 2011) | Impossible | PC Qs express their nonlocal perceptual characteristics. |
| 2. Nonlocal interaction with physical targets (Bösch, Steinkamp, & Boller, 2006) | Impossible | Some PC Qs express their nonlocal interaction characteristics. |
| 3. Nonlocal interaction with biological targets (Roe, Sonnex, & Roxburgh 2014) | Impossible | Some PC Qs express their nonlocal interaction characteristics. |
| 4. Mediumship (Beischel, Boccuzzi, Biuso, & Rock, 2015) | Impossible | Some PC Qs survive to the brain. |
| 5. Witnessed OBEs (Parnia et al., 2014; van Lommel, van Wees, Meyers, & Elfferich, 2001) | Impossible | PC and brain might separate from each other. |

that permits "free choices" on the part of an observer to influence his or her brain (Stapp, 2009).

The puzzling neural phenomenon of the anticipation of the neural activity related to free choices with respect to their subjective experience (e.g., Libet, 2006; Soon, He, Bode, & Haynes, 2013; Soon, Brass, Heinze, & Haynes, 2008) could be interpreted as a sign of the PTM which requires some time to elicit a Q from the interaction with neural activity.

The attempt to explain some psychological phenomena by referring to the theoretical, mathematical, and statistical tools of quantum physics has already been quite successful in the research field known as "Quantum Cognition" (Bruza, Wang, and Busemeyer, 2015; Pothos & Busemeyer, 2013). This approach has already proven to be more precise than the classical probability approach in the explanations of some cognitive functions in the reasoning, decision-making, and perception domains.

With respect to the nonlocal Qs, it is quite obvious that the PC too must express nonlocal characteristics—that is, characteristics devoid of space and time boundaries. Is there evidence of a reality where space and time are not absolute and the properties of space- and/or time-separated physical objects may be correlated? This is the apparently weird world of quantum physics, the characteristics of which are not only described at a theoretical level (even if the interpretations are still hotly debated) but supported by overwhelming experimental and technological evidence (e.g., Greenberger, Reiter, & Zeilinger, 2013; Vedral, 2014)

Is it possible to postulate not only local but also nonlocal quantum-like biological and mental phenomena? This is the frontier of the theoretical and empirical investigation for any PC–brain interaction hypothesis. Fortunately, there are already some contributions of this type to start with. For example, nonlocal spatial and temporal correlations between mental, physical, and biological systems are expected within the Generalized Quantum Theory (Walach & Römer, 2011; Walach & von Stillfried, 2011). An attempt to interpret all the more recent empirical evidence related to both nonlocal Qs and implicit behavioral and neurophysiological responses (e.g., Bem, Tressoldi, Rabeyron, & Duggan, 2015; Mossbridge, Tressoldi, & Utts, 2012) within this theoretical framework is offered by Walach, Tressoldi, and Pederzoli (2016).

## RESEARCH AGENDA FOR THE MIND=BRAIN THEORY

1. How do first-person Q experiences emerge from the neural patterns of the brain?
2. Do Qs emerge only from the neural patterns of the brain or also from other artificial complex physical signals?
3. How can these Qs causally change brain activity?
4. How can nonlocal mind phenomena be explained?
5. How do Qs become reorganized with a partial innate brain?
6. How do "free" choices emerge from nondeterministic neural patterns?

The above is a research agenda somewhere in between the radical hypothesis that Qs are mere illusions (like free will), and the quite pessimistic agenda put forth by Adolphs (2015) (who situates the question, "How and why does conscious experience arise?" in the "we may never solve" category) and Uttal (2016) whose conclusions states: "At the present time, my overall conclusion is that searching for the neural foundations of cognitive mechanisms (i.e., developing an overarching neuroreductionist theory of the mind using macroneural techniques) is a goal unlikely to be achieved. The use of fMRI systems to explain how the brain produces mental activity is simply being carried out at the wrong level of analysis. I agree with Page (2006), who asserted … the huge investment of time and money that has accompanied this trend [functional brain imaging] has not resulted in a corresponding theoretical advancement, at least with respect to cognitive psychological theory" (Uttal, 2016, p. 428).

A complete description of all theoretical and empirical approaches currently active exceeds the scope of the present article; hence, we will describe only a selection of them. Further information is available from Seth (2007).

Cleeremans' "Radical Plasticity Thesis" postulates that "The brain continuously and unconsciously learns to redescribe its own activity to itself, so developing systems of meta-representations that characterize and qualify the target first-order

representations. Such learned redescriptions, enriched by the emotional value associated with them, form the basis of conscious experience" (Cleeremans, 2011, p. 1).

Another well-known theory is Dehaene's "Global Neuronal Workspace Theory" (Baars, 2002; Dehaene, 2014). The core of this theory is that Qs emerge from a nonlinear activity of a complex neural network constituted by long-range corticocortical connections related to sensory and cognitive processes according to their salience.

Tononi and Koch's (2015) "Integrated Information Theory" (IIT) holds that consciousness is a fundamental property possessed by physical systems having specific properties, for example, with a cause–effect power, with cause–effect structure and with a conceptual structure.

Given that according to the above theories—and all those that postulate a mind/brain identity—brain activity is regulated only by linear and nonlinear information processing regulated by classical physics, nonlocal Qs are completely at odds because they violate the spatial and temporal boundaries of classical communication.

## FINAL CONSIDERATIONS

The emergence of Qs and their functions are at the core of every theory of consciousness. In this article, we compared the explanatory power and future research agenda of two opposing types of theories to explain a list of local and nonlocal Q experiences.

The best type of theory must explain all of the Q experiences listed in Tables 1 and 2.

In light of the available evidence and the actual explanatory power, which is the weirder?

## ACKNOWLEDGEMENTS

We thank Prof. Carlo Umiltà for his important suggestions in relation to a previous version of this article and Cinzia Evangelista for her English revisions.

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## COMPETING INTERESTS

The authors declare no competing interests.

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