

The Hard Problem of Consciousness from a Bio-Psychological Perspective

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Chalmers introduced the hard problem of consciousness as a profound gap between experience and physical concepts. Philosophical theories were based on different interpretations concerning the qualia/concept gap, such as interactive dualism (Descartes), as well as mono aspect or dual aspect monism. From a bio-psychological perspective, the gap can be explained by the different activity of two mental functions realizing a mental representation of extra-mental reality. The function of *elementary sensation* requires active sense organs, which create an uninterrupted physical chain from extra-mental reality to the brain and reflect the present. The function of *categorizing reflection* no longer needs sense organs, so that the physical chain to extra-mental reality is interrupted and now reflects the past. Whereas elementary sensation is an open system, categorizing reflection remains a closed system, separated from extra-mental reality. This creates the potentiality/reality gap, since prediction from the closed to the open system remains always uncertain. Elementary sensation is associated to specific qualia for each sense organ. Chalmers also attributed qualia to thoughts, with more neutral thought qualia. Thus at the qualia level, there is also an important gap, but now between specific sense qualia and neutral thought qualia. Since all physical concepts are simultaneously linked to neutral thought qualia, the hard problem might be explained by a qualia/qualia gap instead of a qualia/concept gap. The mental function of categorizing reflection induces the change from sense qualia to thought qualia by a categorization process. The specific sense qualia mosaic of an apple is reduced to physical concepts with neutral qualia by progressive categorization first to fruit, then to food, to chemicals and finally to calories. This might explain the gap felt in the hard problem, since specific sense qualia are completely different from neutral thought qualia, so that the hard problem could already be encountered at the qualia level. Since the gap of the hard problem is due to the interaction of different mental functions, it is compatible with a philosophical monism.

Keywords: hard problem, bio-psychological perception, mental functions, qualia mosaic, sense qualia, thought qualia, thought concepts, brain locations

1. Introduction

Chalmers (1996) designated an ancient philosophical problem, denoting it as “the hard problem,” since it is more difficult to explain than some so-called “soft problems.” The hard problem of consciousness concerns phenomenal experience, which cannot be reduced to physics, since both seem to have a completely different ontology. Consequently, this problem seems to require dualism, comprising both physics and panprotopsychism.

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Several other philosophical theories provided different explanations of the same problem. The theory of physicalism considered an absolute primacy of physics over conscious experience (Ney 2008). On the other hand, the theory of neutral monism holds the phenomenological and physical difference as non-fundamental (Silberstein & Chemero 2015). Finally, idealism requires the absolute primacy of the phenomenal experience by consciousness over physics (Robinson 1968). Double aspect theories rely on the phenomenological and physical aspects and claim a common ground of wholeness (Atmanspacher 2014; Bohm 1990; Pauli 1952; Pylkkänen 2007). Alternatively, some authors link them together as complementary constituents in an information theory (Chalmers 1996; Tononi & Balducci 2008). These theories are generally starting from physics and try to explain how qualia could be conceived as emerging from physics.

From a bio-psychological perspective, a complementary interpretation could be formulated when starting in the opposite direction from qualia perception and trying to correlate it to physical concepts. The reason for the inversion of analyses is the fact that every physical law has to start with observation, a bio-psychological function, which is thereafter transformed by reduction with other bio-psychological functions into interpretation. This sense of analyses no longer requires emergence but loss of qualia, progressively replaced by physical thought concepts.

The hard problem can then change from a sense qualia/thought concept problem to a more simple sense qualia/thought qualia problem, which is due to two different mental functions. Observation as the primary mental function can only be achieved with “elementary sensation” requiring sense organs (Jansen 2016b). A different mental function “abstract reflection” thereafter allows reduction of observation to interpret with physical formalism, which is associated to neutral thought qualia. Thus, mental functions are the reason for the transformation of a sense qualia mosaic into neutral thought qualia required for physical concepts. The hard problem could then be explained at the qualia level and is in agreement with philosophical monism.

2. The Hard Problem

Chalmers (1995) characterized an old philosophical problem as the hard problem of consciousness, which will be difficult to solve. Already Locke (1690, 617) mentioned the problem as follows: “it is impossible to conceive that matter, either with or without motion, could have, originally, in and from itself, sense, perception, and knowledge.”

2.1. The Hard Problem in Philosophical Literature

Jackson (1982, 127) insisted on the existence of a gap between the phenomenological experience and its physical concept. According to his view, perception leads to non-reducible qualia in consciousness, such as: “the characteristic experience of tasting a lemon, smelling a rose, hearing a loud noise or seeing the sky.”

Levine (1983, 354) introduced the notion of an explanatory gap, stating: “psycho-physical identity statements leave a significant explanatory gap.”

Chalmers characterized this philosophical problem as the hard problem of consciousness:

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?... 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? (1995, 201)

The philosophers Silberstein and Chemero raised the question of whether the hard problem requires dualism or monism:

Chalmers (1996) argued that conscious experience has a qualitative character such that even if we had a full physical story about the world, that story would leave out conscious experience. We argued in an earlier paper... that accepting this description of the hard problem guarantees that the hard problem is soluble only by denying that there are conscious experiences or accepting a dualism in which conscious experiences are a separate ontological kind. (2015, 181)

In the philosophical theories, the essential question of the hard problem remains, how can physics explain qualia? The comparison of seeing red with a physical wavelength of about 700 nm demonstrates an inexplicable gap between sense qualia and physical concepts. This question opposes qualia to concepts, however, from a bio-psychological perspective, both are dependent on two different mental functions and might then give another explanation.

2.2. The Hard Problem and Mental Functions

The hard problem is directly dependent on the difference between qualia, such as seeing the color red of an apple, hearing a tone of a saxophone or smelling a rose, and concepts, such as physical facts, like wavelengths. A perception at the first person is based on the mental perception of extra-mental reality dependent on the mental function of elementary sensation (Ia), which requires active sense organs (Fig. 1). It allows an uninterrupted chain of physical interactions from an extra-mental object to specialized brain regions (Jansen 2014; 2016b). When seeing a tree, light reflected from the tree enters the eye and activates nerve cells at the retina, which transmit their activation to regions in the occipital lobe of the brain, specialized in visual processing. Elementary perception warrants the perception of reality, but is limited to the present. In contrast to elementary sensation (Ia), the tree can also be imagined with closed eyes, although the chain of physical interactions is then completely interrupted. When attempting to recollect an image of the tree from the memory, the mental representation is solely based on memory imagery (II) of the past, which no longer reflects reality, but virtuality when retrieving previously encoded elementary sensation, since the present could have changed (Fig. 1).

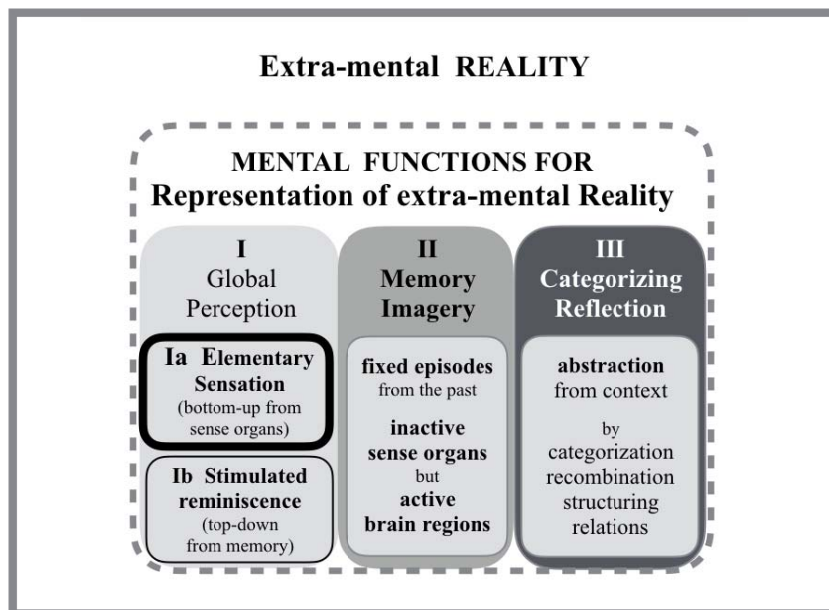


Fig. 1. Mental functions for the representation of extra-mental reality.

Global perception (I) comprises elementary sensation dependent on sense organs (Ia) and stimulated reminiscence (Ib). Memory imagery (II) is a closed system responsible solely for reminding the sense organ activity of the past. Categorizing reflection (III) allows the modification of past experiences for analysis and future expectation.

Memory imagery is a closed system, since it is no longer linked through sense organs to extra-mental reality and therefore shows markedly different properties (Jansen 2016b). As illustrated by a burn, elementary sensation is the intensity of pain felt during the entire contact of the hand with overly hot water, whereas memory imagery is the faint pain remembered a day later. During the contact of the hand with the water, the intensity cannot be voluntarily changed, whereas a day later, in memory imagery, its intensity can be forgotten or retrieved again. Hence, elementary sensation is the intense perception of the present, whereas memory imagery is a faint representation of the past. The pain intensity cannot be transmitted by language to a third person, although she might recall a faint reminiscence of an anterior burn. The intensity of the burn in the first person can also not be felt by the third person, unless she places her own hand with her own sense organs in the same overly hot water. As a result, there is a profound gap between elementary sensation (Ia) of the present in the first person and memory imagery (II) of the past.

The mental function of categorizing reflection (III) reduces individual properties through successive categorizations to abstract concepts (Fig. 3). An apple can lose its individual qualia mosaic by categorization to fruit, then to food, and finally to nutritional properties (chemical compounds or calorific value), which are abstract concepts without any remnants of the initial sense qualia mosaic of the apple. Hence, sense qualia can be transformed by categorization to abstract concepts, reminding the hard problem.

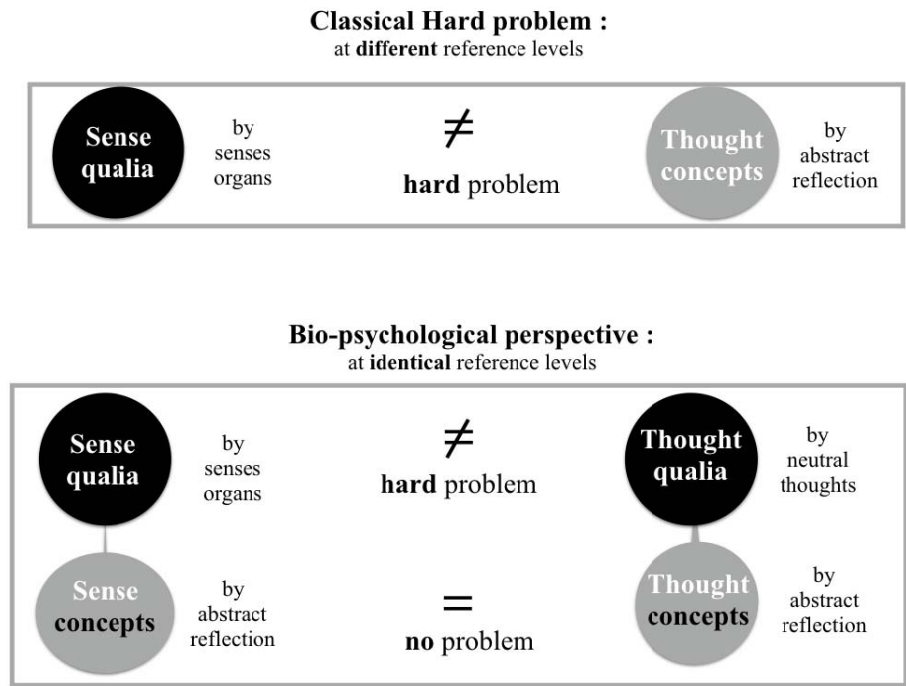


Fig. 2. Comparison of sense qualia and thought concepts.

Chalmers directly compared sense qualia to physical concepts, although they are at different reference levels. From a bio-psychological viewpoint, senses express qualia, but can also be considered as qualia, but also as concepts. In the same sense thought concepts are linked to qualia of neutrality. This allows a comparison of senses and thoughts at the same reference level.

2.3. The Hard Problem at Two Different Reference Levels

Chalmers’ viewpoint compares sense qualia created by sense organs with thought concepts from physics. He (1995, 201) also considered that thoughts have qualia by writing “the felt quality of emotion and the experience of a stream of conscious thought.” Thereby thought qualia could have qualia of neutrality with respect to non-neutral sense qualia. On the other hand, each sense qualia also corresponds to a neutral concept, seeing to vision, hearing to audition and smelling to smell etc. Thus at the level of neuroscience, vision as a concept could be considered as the effect caused by visual sense organs and the processing center of the visual cortex in the occipital lobe of the brain. In a similar way the concepts of audition or smell and others could be caused by the corresponding sense organ and the corresponding brain region (Fig. 2). If one attributes to physical concepts also a neutral qualia property and to sense qualia also a conceptual property, both could be compared at the same reference level, sense qualia with thought qualia and sense concepts with thought concepts, instead of a comparison over different reference levels.

The hard problem depends on the reference level chosen for comparison; it disappears at the conceptual level whereas it remains at the qualia level. According to Chalmers (1995), “It is widely agreed that experience arises from a physical basis, but we have no good explanation of why and how it so arises...” Thus at the conceptual level, the existence of visual experience can be caused by yet unknown neurophysiological or physical interactions in the brain, which is widely accepted according to Chalmers. This demonstrates that the

hard problem disappears when only the pure conceptual level of experience is considered for the comparison of a concept of experience with a concept of physics.

2.4. *Dependence of the Hard Problem on Mental Functions*

The fact that the mental function of memory imagery (Fig. 3, II) is voluntarily changeable has the advantage that it can be transformed through abstract reflection by successive categorization (Fig. 3, III), which replaces individual observable properties by common category properties shared with other objects or concepts.

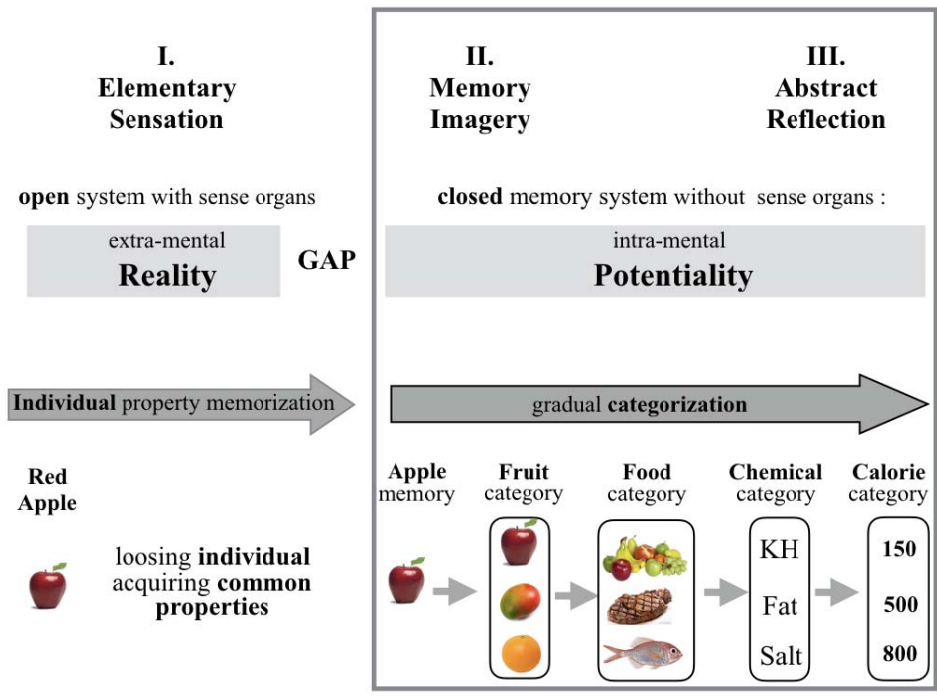


Fig. 3. Succession of mental functions for gradual categorization.

Elementary sensation (I) via sense organs reflects extra-mental reality of the present. Memory imagery (II) is a closed system segregated from active sense organs and reflects the past. Abstract reflection changes the individual qualia mosaic of objects to more common qualia and finally to physical concepts. Thus, an apple loses its individual qualia mosaic when categorized to fruit, food, chemical content or calorific value.

A red apple retrieved from memory imagery is characterized by the mosaic of its special apple qualia, such as color, smell, shape, consistency, and taste. When the apple is classified in the fruit category, its special properties are replaced by common fruit properties, such as different colors, different smells, varying tastes and shapes, or lower consistency. New properties become dominant, such as a more perishable nature. Further categorization reduces fruit qualia to common food qualia with markedly different properties. Color, smell, shape, consistency, and tastes of food are highly versatile and new properties become dominant, such as the capacity to fill the stomach and to satiate hunger. In the category of chemical constituents, apple qualia are reduced to carbohydrates, a powder with a different color, no smell, no shape, and a sweet taste. In the final category of calories, there is no longer any reminiscence of the previously perceived apple, fruit or food qualia, which are replaced by the percentages and number of calories provided by an apple. Here neutral thought qualia are attached to an abstract concept without any sense qualia.

The hard problem appears only at the qualia level when sense qualia are compared to neutral thought qualia. The gap can be frank when the qualia mosaic of an extra-mental object like an apple is compared to its calories. Nevertheless, the gap can also be progressive, when the qualia mosaic is gradually transformed through a continuous categorization process. Thereby, abstract reflection can gradually transform the qualia mosaic of an extra-mental object into pure thought qualia by a progressive decrease of the sense qualia mosaic and a continuous increase of thought qualia during the categorization process (Fig. 4).

Physicists and researchers in other disciplines of natural science strive to establish general laws for their respective fields, allowing understanding the past and predicting the future. Laws are necessarily generalized concepts obtained by elimination of individual properties during the categorization processes aimed at the detection of new common properties, such as nutritional values for an apple (chemicals and calories). Thereby, physical laws become abstract concepts devoid of sense qualia, which is inevitably lost during the categorization process.

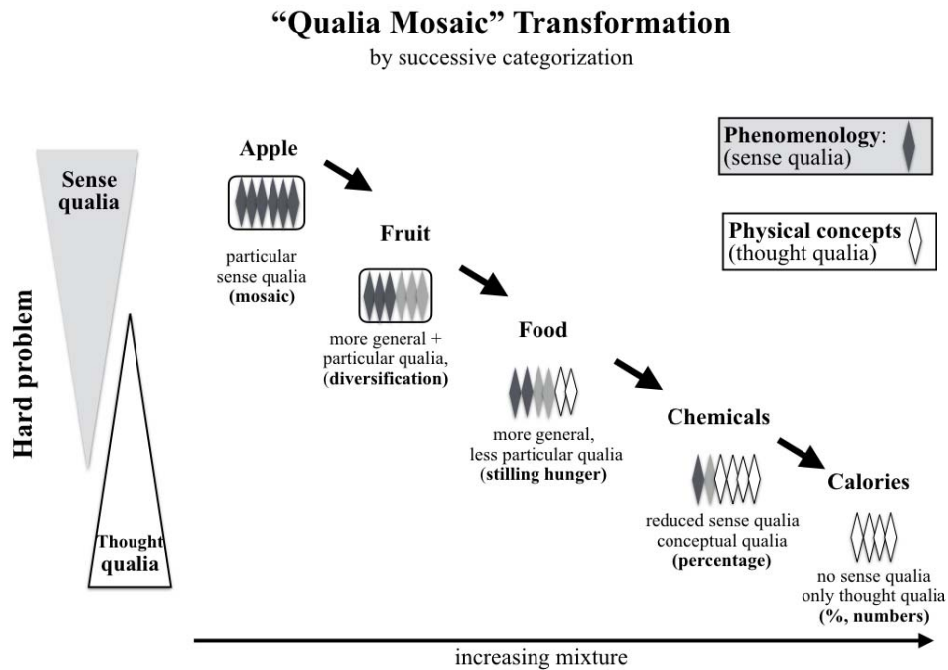


Fig. 4. Mixture of incompatible qualia during gradual categorization.

The mental function of categorizing reflection gradually transforms the sense qualia mosaic of experience to a thought qualia mosaic for concepts. The comparison of pure sense qualia at the start point and pure thought qualia at the end point of the categorization chain shows the profound gap described as the hard problem.

2.5. Extension of the Hard Problem to All Sense Organs

Although the sense qualia/thought qualia gap is very impressive, similar profound gaps exist between all sensory organs (Jansen 2016a). Extra-mental objects are perceived by different sense organs, each of which has different qualia. Together, they form a mosaic of qualia characteristic for each object. The qualia of different sense organs, for instance the visual and auditory qualia of a bell, are completely independent, with no

perceptible relation between them. When the sound at a television screen is muted, the visual impression of a clock gives no indication on the corresponding sound. Only with prior experience of chiming bells can one suppose that big bells produce a lower sound than smaller ones do. Nonetheless, prior experience does not permit imagining the precise sound of a specific bell. In the same sense, seeing a bird does not indicate its song.

Inversely, when the television screen is hidden and only the sound of a bell is perceptible, the precise shape and size of the bell cannot be visualized either. Based on one's prior experience, it could be conceived of as having the classical bell shape, although different shapes also exist. In a similar manner, hearing the song of a bird without seeing it gives no indication of its physical appearance. Since vision does not indicate auditory experience and vice versa, visual and auditory experiences are completely independent and cannot be reduced to one another. Thus, there is a profound qualia/qualia gap between two sense organs.

This can be extended to other sense organs. When touching the edge of a bell with the fingers as a means of recognizing the texture, resistance, and temperature of the material, its sound and visual image cannot be imagined either. Consequently, information obtained through touching is also completely independent from visual and auditory properties. Touching an unknown object will not give indications of its visual or auditory properties, suggesting that the qualia/qualia gap could be extended to all types of sense organs, which provide completely independent, complementary information only.

2.6. Correspondence of the Hard Problem in Neuroscience

The existence of multiple explanatory gaps, not only between the qualia mosaic of experience and physical concepts but also between all sense organs, increases the number of Levin's (1983) explanatory gaps considerably. First, there are the five sense organs, already described by Aristotle, along with many other internally oriented sense organs, since all receptors in the different organs of the body have to be included, as already suggested by Bayne (2011). Such receptors are heat, cold, pain, and pulmonary stretch receptors, as well as those for gastrointestinal function, bladder fullness, muscular tension, and many others, which are all participating in the human experience of the internal body. The functions of all these sense organs are completely independent, without any relation to others, which allows their easy individual recognition. Nevertheless, their complete independence creates profound gaps between all of them.

In neuroscience, every sense organ is represented by a different brain region: seeing to the occipital lobe, hearing to the temporal lobe, touching to the somatosensory cortex in the parietal lobe and finally cognition to the frontal cortex (Kandel et al. 2013). This suggests that the different brain regions of the mental representation of sensory organs could be associated to their specialized qualia, implying that each brain region and the corresponding peripheral sense organ produces markedly different qualia. Therefore, explanatory gaps induced by categorizing reflection of the qualia mosaic might also be attributed to the anatomical separation of brain regions with their specialized functions. Abstract reflection with neutral thought qualia is not linked to any sense organ, however; it is also found in a different brain region, the frontal cortex. Hence, there is a strong similarity between the qualia/qualia gaps of sense organs as well as the sense qualia/thought qualia gap of the hard problem reflecting a strong correlation with different brain locations for their mental representation.

3. Philosophical Mind Matter Theories

The sense qualia/physical concept gap is an essential component of the mind/matter problem, which might suggest that the mind is different from matter (dualism) or that both can be conceived as different aspects emerging from an identical background (dual aspect monism). In the 17th century, an interactive dualism (A) was proposed by Descartes, who posited that mind and matter are completely different substances. However, this view introduced the problem of the manner in which they can interact with each other. Proponents of theories of Mono Aspect Monism (B1-B3) consider, in contrast, that there exist no fundamental sense qualia/physical concept differences. While this premise eliminates the former problem, it raises another, namely why we perceive an intensive gap between sense qualia and thought concepts. Supporters of Dual Aspect Monism (C1-C2) accept the sense qualia/physical concept difference, but link it to a whole as a common ground from which the dual aspects emerge (Fig. 5). Finally, Dual Aspect Syntactic Information Theory (C3) simultaneously attributes qualia to objects and to physical concepts at all levels, down to elementary particles, thereby suggesting panprotopsychism.

3.1. *Mono Aspect Monism*

In order to circumvent the problems of Descartes' interactive dualism (A), three kinds of mono aspect monism are proposed, all of which deny any fundamental difference between mind and matter: physicalism (B1), neutral monism (B2), and idealism (B3). Since physical and mental aspects are considered to be of the same nature, these concepts are compatible with monism.

(B1) Physicalism is the theory that all is physical, whereby the mental is only an emergence from the physical (Neurath 1983; Ney 2008). This view took account of the enormous amount of acquired physical and biological knowledge and considered mind and matter as a monism.

(B2) Neutral monism is based on the work of philosophers like Russell, James and Silberstein. It suggests that there is no fundamental difference between mind and matter. According to this view, cognitive systems are extended brain-body-environmental systems (Silberstein 2009). Thus, conscious experience and cognition are inseparable and complementary aspects of coupled brain-body-environmental systems, allowing elimination of qualia and conceiving a neutral monism. Presence is a fundamental constituent for the "what it is like" of conscious experience.

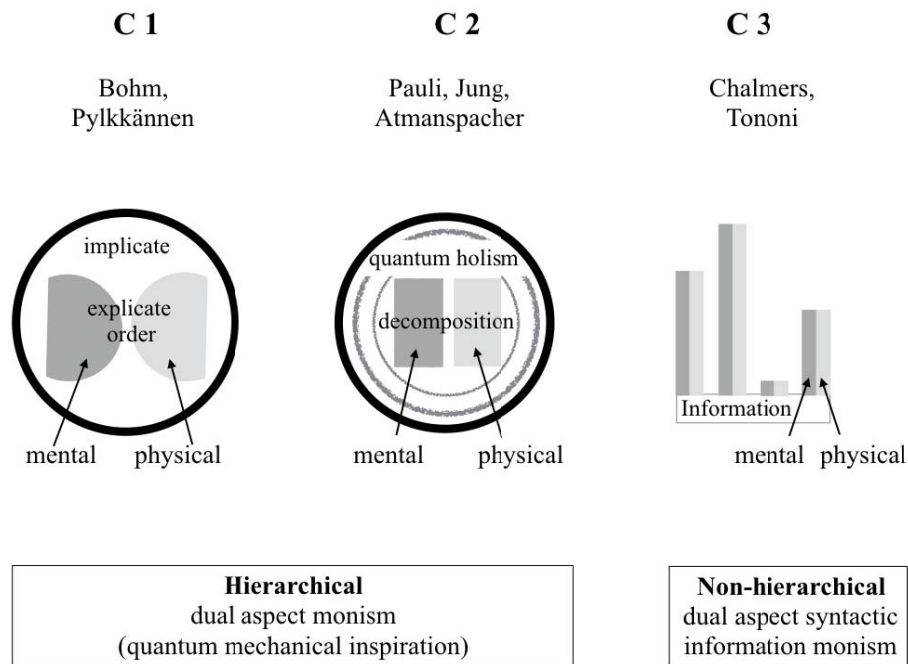


Fig. 5. Dual aspect monism.

Hierarchical dual aspect monism explains that the mental and physical aspects are emerging from a whole. For Bohm and Pylkkänen (C1), the implicate order represents the whole, while the explicate order pertains to the dual aspects. Pauli et al. (C2) proposed quantum holism, which can be decomposed into the physical and the mental aspects. A non-hierarchical theory is proposed by Chalmers (C3), in which each information space has simultaneously a physical and a mental aspect.

(B3) Proponents of idealism claim that the world exists only as spirit or consciousness (Robinson 1968). Buddhism is based on idealism and has existed since the 15th century BC. It promotes the idea that consciousness is the essence of phenomenal reality. Panpsychism is a kind of idealism, in which only the mind is fundamental to the world. It is attributed to the Greek philosophers Thales and Plato. Advocates of metaphysical idealism believe that matter does not exist, whereas proponents of epistemic idealism claim that it is not perceived. The mental is considered as the basis of the physical.

3.2. Hierarchical Dual Aspect Monism

Two kinds of dual aspect monism confirm a profound difference between mind and matter, reducing it to two aspects of monism. A detailed review of these concepts was published by Atmanspacher (2014).

(C1) Bohm (1990) and Pylkkänen (2007) proposed an “implicate order” corresponding to an exhaustive potential universe, which unfolds into the observable “explicate order” representing the universe that can be perceived with sense organs (Fig. 5, C1). “All things found in the unfolded, explicate order emerge from the holomovement in which they are enfolded as potentialities, and ultimately they fall back into it” (Bohm 1990, 273).

In Bohm’s view, the mental and the physical unfold from a psychophysically neutral “holo-movement” in a dynamic way, which is a hierarchical concept with the implicate order as the whole. It has to be unfolded into the explicate order before the dual aspects of mental and physical factors become perceptible. The theory

adopts the structure of quantum mechanics, also based on exhaustive possibilities represented by a Hilbert space, from which individual observable outcomes emerge during the measurement process.

(C2) Pauli (1952) and Atmanspacher (2014) proposed a different dual aspect theory based on a whole, which can be decomposed into its mental and physical aspects. These authors also interpreted the psychophysical problem using concepts derived from quantum mechanics, essentially with complementarity and quantum non-locality (Fig. 5, C2). “It would be most satisfactory if physics and psyche could be conceived as complementary aspects of the same reality” (Pauli 1952, 164).

Complementary mental and physical aspects are obtained by decomposition of the hierarchical, inaccessible whole, which corresponds for Pauli to quantum holism with quantum non-locality and for Jung to his conception of one un-fragmented whole, the *unus mundi*. According to Atmanspacher (2014, 253), “Both ‘ordering influence’ and ‘reaction back’ together constitute a bidirectional interchange between the psychophysically neutral domain and its two aspects.”

The psychophysical hierarchical holism is decomposed through intermediary levels into the mental and the physical aspects, which maintain inter-correlations.

3.3. *Non-hierarchical Dual Aspect Information Theory*

(C3) Chalmers (1996, 284) introduced the syntactic information theory, claiming that everything is information characterized by two different aspects, the phenomenological and the physical: “Information is all there is... This is how I understand the ‘it from bit’ conception of the world. It is a strangely beautiful conception: a picture of the world as pure informational flux, without any further substance to it.”

In contrast to the theories of Bohm (1990) or Pauli (1952), there is no hierarchical holism from which the physical and the mental aspects can emerge. Both aspects are considered as independent properties of the same entity, which is an information space (Fig. 5, C3).

The ontology that this leads us to might truly be called a double-aspect ontology. Physics requires information states but cares only about their relations, not their intrinsic nature; phenomenology requires information states but cares only about the intrinsic nature. This view postulates a single basic set of information states unifying the two. We might say that internal aspects of these states are phenomenal, and the external aspects are physical. (Chalmers 1996, 286)

In a similar sense, Chalmers, Tononi & Balducci (2008) proposed a theory of integrated information.

The aforementioned theory corresponds to non-hierarchical monism based on information with independent but complementary properties—the physical information as relations and the phenomenological information with its intrinsic nature. Relational and phenomenological information is present concurrently, which evokes the aspect of panprotopsychism from the macrocosm to elementary particles of the physical world, a kind of atomistic picture. Chalmers (1996, 284) considers information as an observer-independent ontic information space, which explains the entire universe, since “information is all there is.”

However, an ontologically conceived information space in the form of bits remains incomplete, since bits only represent an information carrier, which still needs a decoder for understanding the encoded message. A music CD containing bits for songs is an information carrier, which needs a special CD recorder to transform the carried information into music again. Similarly, for language, mental functions are required for interpreting linguistic information. A Chinese word is easily decoded by Chinese people, but not by those speaking other languages. Therefore, it remains an information carrier without detectable sense. Thus, ontologically conceived bits are information carriers, which are useless in the absence of mental decoding.

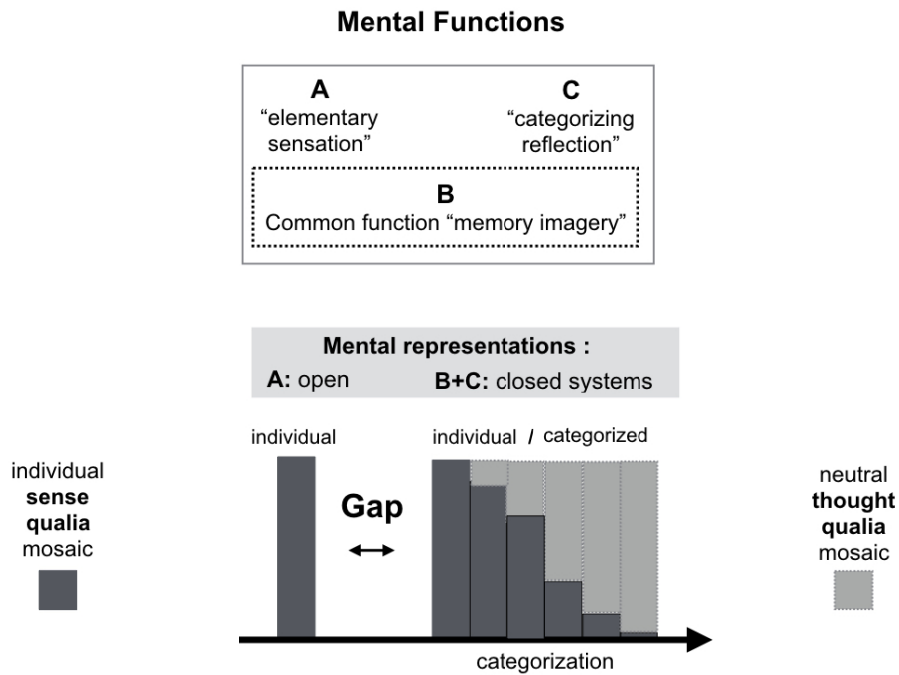


Fig. 6. Mental function monism from a bio-psychological perspective.

Human knowledge is based on three mental functions. Elementary sensation through sense organs is representative of extra-mental reality in the present, whereas memory imagery without sense organs is a closed system representing the past. The difference of presence or absence of sense organs produces a gap between them. Abstract reflection gradually transforms the individual qualia mosaic through categorization by replacing it with neutral thought qualia of common concepts.

4. Bio-Psychological Mental Function Monism

In a different approach from a bio-psychological perspective, three mental functions allow a mental representation of extra-mental reality and contribute to the hard problem, elementary sensation (Ia), memory imagery (II) and categorizing reflection (III) (Fig. 1). These functions are considered as independent complementary functions. Elementary sensation (I) represents an open system, obtaining information from extra-mental reality through sense organs for the present. Memory imagery (II) representing the past is a closed system, no longer informed by extra-mental reality via sense organs. Abstract reflection (III) also participates in the closed system and allows categorizations of past events allowing imagining a potential future (Fig. 6).

Mental function monism aligns with some basic conditions of neutral monism (Silberstein & Chemero 2015). The extended brain-body-environment system corresponds to elementary sensation with its uninterrupted chain of physical interactions from extra-mental reality to the brain. This mental function represents only the present, which is also the main postulate of neutral monism. However, after elementary sensation, abstract reflection by successive categorization is essentially responsible for the transformation of specialized sense qualia into neutral thought qualia, conceived as the hard problem.

The bio-psychological analysis is in agreement with the Pauli/Jung/Atmanspacher theory of the complementarity principle, well known from quantum mechanics, since all sense qualia are completely different from each other, while their mosaic characterizes objects and concepts. The complementarity of sense

qualia for all sense organs caused the philosophical binding problem establishing how independent, complementary properties are linked together to form one perceptual unit.

In contrast to the Pauli/Jung/Atmanspacher and the Bohm/Pylkkänen theories, mental function monism requires a non-hierarchical structure, since the functions of abstract reflection, memory imagery and elementary sensation are equal and independent mental functions. Abstract reflection with no link to sense organs can only indicate potentialities in a closed system separated from extra-mental reality. The three mental functions, which do not represent different ontological entities, are conceivable with monism.

The mental function monism agrees with Chalmers for the attribution of specialized sense qualia to objects, while also assigning neutral thought qualia to physical concepts. Thereby, the gap between sense qualia and physics could be conceived at the qualia level only, by considering sense qualia opposed to thought qualia.

5. Conclusion

The hard problem is well documented in the philosophical literature. It was first discussed by Locke (1690), at the time when physical science was becoming more accepted. Chalmers (1995) gave it an important impulse by creating the expression of the “hard problem” pertaining to the difference between the abstract third person concepts of physics and the first person qualia of experience, such as the physical concept of electromagnetic waves of $\sim 700\text{nm}$ wavelength as compared to the experience of seeing red. The direction when starting with physics for explaining experience shows a profound gap, since it is difficult to conceive qualia experience emerging from physical concepts (Chalmers 1996). This may be characterized as the physical concept/sense qualia gap.

From a bio-psychological perspective, there is another approach when analyzing in the opposite direction by starting with qualia experience and correlating them to physical concepts (Fig. 7). The reason for the opposite direction of analysis is the fact that all human and physical observation has its origin in elementary sensation produced by sense organs with their associated sense qualia. Only thereafter, observation allows interpretation by abstract reflection with physical concepts. Since interpretation may or may not be true, its truth-value has still to be verified by new observation with sense organs. In this direction the gap of the hard problem could be better explained as a loss or a qualitative change of qualia.

In the philosophical literature, several different explanations were proposed. A dualism between mind and matter was introduced by Descartes, concerning the opposite character of qualia and concepts. Some philosophical mono-aspect theories deny a difference between sense qualia and thought qualia. They are represented by physicalism, neutral monism, and idealism, purporting that qualia and physical concepts belong to the same ontic entity. More recent theories reduced the opposite character to dual aspects of an underlying monism.

Bohm’s and Pauli’s theories were inspired by quantum mechanics and considered the phenomenal and the physical aspects as emerging from a hierarchical higher order system. Bohm’s implicate order, also known as holo-movement, corresponds to exhaustive possibilities, from which the phenomenal and the physical emerge as observable reality, similar to the collapse of the wave function during a measurement. Pauli’s hierarchical holism is based on quantum non-locality and Jung’s collective unconsciousness. The decomposition of the ontic holism by an epistemic split produces the phenomenological and physical aspects by conserving correlations between mind and matter. The concept of holism, for Bohm and Pauli, has the drawback of being inaccessible and not verifiable.

Aiming to circumvent the opposite character of the sense qualia/physical concept gap, Chalmers (1996) proposed a common nature for the phenomenological and the physical aspects as syntactic information (bits) in an information space. However, information includes macroscopic as well as atomistic physical structures with a simultaneous presence of the phenomenal and the physical aspects down to the atomic level, which evokes panprotopsychism. Chalmers (1996, 267) wrote, “Whenever we find an information space realized phenomenally, we find the same information space realized physically.” This corresponds to panprotopsychism.

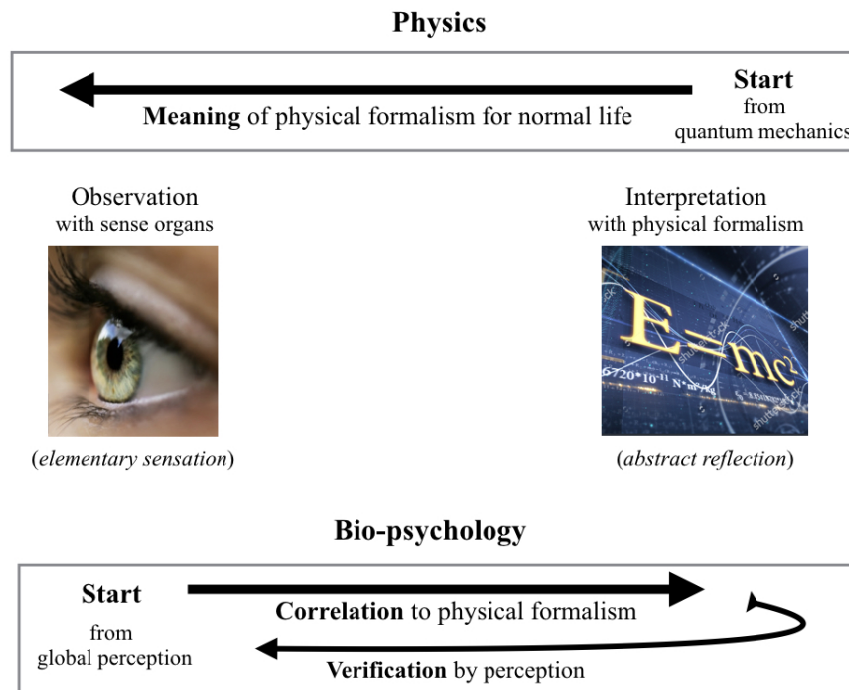


Fig. 7. Opposite direction of physical and bio-psychological analysis.

Physics are starting from quantum mechanical formalism for explaining normal life and bio-psychology starts from global perception for exploring correlations to physical formalism followed by verification.

A bio-psychological approach starts from global perception and replaces the physical concept/sense qualia gap by a transformation of specialized sense qualia to neutral thought qualia due to the mental function of abstractive reflection. Sense qualia mosaics for objects gradually change by successive categorization to neutral thought qualia. Sense qualia and thought qualia are as incompatible as other sense qualia like seeing qualia and hearing qualia, probably because of their different brain location. The only implication of mental functions for the gap of the hard problem permits its classification as philosophical monism.

The bio-psychological mental function monism essentially claims:

(1) The sense qualia/thought qualia gap is not a theoretical concept, but the description of a general perception phenomenon perceived by everyone, which cannot be disputed by any theory.

(2) The sense qualia/thought qualia gap can be explained by the activity of two mental functions: elementary sensation (Fig.1, Ia) for sense qualia and abstract reflection (Fig.1, III) for thought qualia attached to physical concepts. Both participate in the mental representation of extra-mental reality. Whereas elementary sensation (I) produces with each sense organ and the corresponding brain region a sense qualia mosaic, abstract

reflection (III) changes the composition of the mosaic by gradually replacing sense qualia by neutral thought qualia. In this respect, Chalmers (1995, 201) indicated that abstract concepts are also associated to thought qualia “the experience of a stream of conscious thought... All of them are states of experience.”

(3) A bio-psychological analysis compares sense qualia to thought qualia or sense concepts to thought concepts at the same reference level. In general, sense qualia and physical concepts are compared at two different reference levels. At a pure conceptual reference level, the hard problem disappears, but still remains at the qualia level. Every kind of qualia is incompatible with any other qualia, whether sense qualia or thought qualia. Therefore there is a profound gap between all kinds of qualia, so that the gap between sense qualia and thought qualia becomes more comprehensible. The incompatibility of sense qualia with other qualia can be interpreted as a perceptual advantage, which avoids any confusion between perceptions by multiple sense organs. The qualia/qualia gap could be explained by the different location in the brain of all senses and of thoughts.

(4) The transformation of sense qualia to thought qualia does not require dualism, but is conceivable with monism. An apple is successively categorized by the same mental function of abstract reflection (III) simply by gradually replacing the individual sense qualia of an apple with common thought qualia down to calories. This view is in agreement with Pauli’s theory of complementarity, as found in quantum mechanics, since each sense organ produces completely different qualia. Atmanspacher (2014, 252) observed, “Two or more descriptions of a phenomenon are complementary, if they mutually exclude one another and yet are together necessary to describe the phenomenon exhaustively.” The complementarity within the qualia mosaic is an essential reason for the existence of the philosophical binding problem.

In summary, the Hard Problem as a sense qualia/physical concept gap could be differently considered as a sense qualia/thought qualia gap, since there is a profound gap between all different sense qualia also including thought qualia. This might be explained in neuroscience by the localization of each qualia at different brain regions, which produce completely different qualia properties. The hard problem seems to be caused by a normal bio-psychological qualia/qualia gap appearing between all senses and also between senses and thoughts.

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