**Chapter 3: Why have explanations of consciousness failed?**

**Pat and Rick drank a lot of beer in ‘their bar’. They were frustrated by their research into the elusive phenomenon of consciousness. Pat turned to Rick and asked him, “Say, Rick, how can we figure out why they haven’t been able to catch the elusive creature in ‘our bar’ so far?” And Rick quickly replied, “Hey Pat, my good friend, it seems the basic question, “Who is the elusive creature?”, is no longer enough for you! Do you have to introduce an even more difficult question? Why haven’t they been able to catch the elusive creature so far? Why do you complicate life? You know what? You’d better drink another bottle of beer.”**

As discussed in Chapter 2, philosophers and researchers have made continuous attempts to develop a mind-body theory, or theory of consciousness (TC), based on a connection between consciousness (CΨ) and the neurophysiological processes in the brain, but so far without success (e.g., Gennaro, 2016; Koch, 2018; Rakover, 2018, 2021a; Seth & Bayne, 2022; van Gulick, 2022). For example, van Gulick (2022) concluded a review on CΨ by stating that it is unlikely that a unified theory of CΨ will ever be developed. It should be noted here that the intended TC is not a correlation between two variables—conscious experiences and neurophysiological activity in the brain—but rather a specification of the special mechanism that brings about CΨ. One reason for this methodological claim is that a correlation between these two variables cannot function as an appropriate explanation for CΨ; a correlation is no more than a phenomenon that itself needs a theoretical explanation—an empirical observation to be explained. Such an explanation, as mentioned above, has to be based on a mechanism that describes how one variable (brain activity) gives rise to or causally affects the other variable (CΨ) (e.g., Neal & Liebert, 1986; Rakover, 1990).

The modern mind-body problem (the problem of CΨ) was originally formulated by French philosopher René Descartes in the 17th century (see Hatfield, 2018). Since it is yet to be solved, this raises the perplexing question: Why is it that despite 370 years of research into this problem, a solution continues to elude philosophers and scientists? Why has a successful TC not been developed?

The “unsolved CΨ-problem”, as I call it, raises yet another question, which concerns the present chapter: What would happen if science succeeded in developing a TC that worked? Would this have positive or negative ramifications? It can be argued that scientific developments from the time of Galileo until today have been extremely beneficial and positive: There have been huge improvements in the quality of human life in all areas, such as life expectancy, health, housing, transportation, etc. Of course, one may also raise the counterargument that science has brought about great disasters, for example, horrifying acts of war, climate damage, etc. Even so, most people would agree that the blessings of scientific progress outweigh the disadvantages. Would the discovery of a successful TC be a blessing or a curse?

This chapter will be divided into two parts. In the first part, I will briefly review possible explanations for the unsolved CΨ-problem. In the second part, I will concentrate on one important aspect that may explain the continuous failure of scientists to solve our problem, which is anchored in the problems of measuring CΨ.

**Part I: A brief review of explanations for the unsolved CΨ-problem**

Many articles have attempted to explain why the mind-body problem, or the problem of CΨ, cannot be resolved. For example, Levine (1983) proposed that there is an “explanatory gap” between subjective properties (e.g., the feeling of pain) and neurophysiological properties (as in the activity of C-fibers responsible for the sensation of pain). In other words, the explanatory gap here is the difficulty in understanding how the sensation of pain arises from nerve activity. Chalmers (1996, 1997) expressed this difficult problem in his distinction between the easy problems of CΨ, which can be solved within the framework of cognitive-neurophysiological research, and the hard problems of CΨ, which cannot be understood by scientific research. Levine’s explanatory gap has sparked extensive debate (e.g., Levine, 2007; Stanciu, 2014), which I do not have room to discuss here. However, I will focus on five attempts to tackle the unsolved CΨ-problem, the last of which will lead us directly to the issue of TC’s potentially negative ramifications if such a theory is discovered in the future.

I will start with McGinn (1989), who suggested that “We have been trying for a long time to solve the mind-body problem. It has stubbornly resisted our best efforts. The mystery persists. I think the time has come to admit candidly that we cannot resolve the mystery.” (p. 349). He argued that the human cognitive system is not equipped to solve the mind-body problem, just as we cannot perceive the whole range of the electromagnetic spectrum. It could be suggested that human cognitive capacity is innately limited and unable to grasp the complex relation between the neurophysiological activity of the brain and CΨ. McGinn (1989) wrote: “… in the case of the mind-body problem, the bit of reality that systematically eludes our cognitive grasp is an aspect of our nature.” (p. 366). He argued: “… we cannot know which property of the brain accounts for consciousness, and so we find the mind-brain link unintelligible.” (p. 359). Observations about the brain will not lead to any revelations about CΨ, and methods of introspection (i.e., observing one’s own conscious experiences) will not bring us any closer to an understanding of how brain activity brings about CΨ. Physical phenomena are explained by purely physical accounts without involving conscious states such as will, belief, intention, and emotion.

McGinn’s approach, which has been called “mysterianism”, has been subject to criticism that I will not discuss here (e.g., Flanagan, 1992; Rowlands, 2007). Beyond McGinn’s proposal, I propose four alternative approaches and will concentrate mainly on the last one, which handles our additional question: What would happen if a new TC that worked was discovered?

## Limitations of the scientific method

Our failure to develop a successful TC thus far is not because of the limits of human cognitive capacity, as McGinn (1989) suggested, but perhaps because of the limitations of the scientific method, which has been developed for research in physical and biological phenomena (the sciences). It is reasonable to propose that this type of methodology is not appropriate for investigations into the phenomena of CΨ. This argument is not new. At the end of the 19th century, German philosophers and researchers (such as Wilhelm Dilthey and Max Weber) posited a distinction between two types of methodological understandings: (A) methodological comprehension based on ‘explanation’ (*erklaren*) of the natural world, such as research in the natural sciences, and (B) comprehension based on ‘meaningful understanding’ (*verstehen*) of the human world, such as research in the humanities and social sciences (see discussions in Grimm, 2016, 2019; Rakover, 1990, 2018, 2021b). Although this distinction is no longer accepted, one may reasonably suggest that it is difficult to directly apply the research methodologies developed in the natural sciences to research in CΨ (see Grimm, 2016; Rakover, 1990, 2018). While properties in the physical world lend themselves to *public observation*, conscious properties lend themselves only to private *subjective observation* (introspection). For example, while anyone can measure the weight and height of Mrs. Gordon with great accuracy, only Mrs. Gordon herself can feel the pain from a blow to her hand, no one else.

 The methodological problems that are cited as obstacles to solving the CΨ-problem will be elaborated in the second part of the chapter dealing with the measurement problem of CΨ.

## Hidden energy

Perhaps the reason why a successful TC has not been developed is because CΨ consists of a hypothetical undiscovered “hidden energy” created somehow by brain activity. The main justifications for this hypothesis are twofold: The first is the mere fact that a successful TC has not been discovered to date; the second is an analogy to two hypothetical terms in astrophysics, which were created to account for certain incomprehensible cosmological observations. One hypothetical concept relates to unobservable “dark matter”. This term is meant to account for the phenomenon of missing mass—the discrepancy between theoretical gravitational computation and the total amount of visible matter in space. The other hypothetical term is unobservable “dark energy”. This concept is supposed to explain the discrepancy between the theoretical calculation of cosmic expansion and the observation that the expansion of the universe is accelerating. Both hypothetical concepts were designed to close the gap between theory and observation. Similarly, the “hidden energy” hypothetical concept is intended to close the gap between brain activity and CΨ. (This idea is distinct from the well-known theoretical approach of “substance dualism”, which proposes that the mind is non-physical, e.g., Gennaro, 2016; Kim, 2011; Levine, 2007; van Gulick, 2022.)

Another approach suggests that CΨ is related to the brain but not limited to it and that CΨ is more fundamental than matter (see Wahbeh et al., 2022). Neutral monism, a related metaphysical theory, suggests viewing CΨ as part of the union of opposites. This approach is based on two components: the physical and the mental, which are irreducible to each other (see Horne, 2022).

The last two approaches are related to panpsychism. Although panpsychism has different variations, the basic idea behind this theoretical-philosophical approach is that elements of CΨ (mind) are a basic property of everything in the universe (e.g., Goff et al., 2022). I do not accept this approach and will not expand on it here. I do not believe that a stone in the yard has anything remotely similar to the CΨ of human beings. In my view, panpsychism replaces one problem with another equally serious problem. Instead of trying to understand how the brain produces CΨ, one has to answer the question of how CΨ exists in everything. However, in this respect, the hypothetical hidden energy to which I have alluded is a concept that may be discovered in the future with the help of the accepted scientific method.

## Consciousness as an emergent phenomenon

## Scheffel (2020) proposed that CΨ is an epistemological and ontological emergent phenomenon, i.e., it has emergent properties. This means that CΨcannot be explained by the properties of its parts (itsproperties cannot be predicted or reduced to the properties of its constituents). The argument developed by Scheffel is based on a combination of concepts related to emergence, algorithmic information theory, neurophysiology of the brain, and a particularly interesting thought experiment. The “jumping robot” thought experiment is designed to demonstrate an emergent property. Briefly, the scenario involves robots that have learned to jump as well as walk. The problem is that there is no explanation as to how the robots acquired the ability to jump, and therefore, it can be referred to as an emergent property. The upshot of all this is that the problem of CΨ is not solvable; it cannot be reduced explanatorily to its basic components. In other words, “The ‘explanatory gap’ cannot be bridged.” (p. 310). Unsurprisingly, the claim that CΨ is an emergent phenomenon has led to extensive debate (e.g., is CΨ a weak or strong emergent phenomenon?) that I will not go into here (see, e.g., O’Conner, 2021).

## I would now like to present my approach to the topic, which I call “CΨ-indivisibility”, according to which CΨ cannot be decomposed into parts. CΨ seems to be made up of a single system, something similar to a uniform energy field, and one cannot distinguish between its components. One consciously distinguishes only the parts of the phenomenon represented in one’s brain: the components of the mental state (MS) itself and not the components of CΨ per se. Furthermore, once one perceives a complex stimulus, the degree of awareness of the whole stimulus is very similar to the degree of awareness of each part that makes up the whole stimulus. Here are two everyday observations that support the CΨ-indivisibility approach. For this, I will rely on my subjective observations.

## First observation: From the balcony of my apartment situated on a mountain in Haifa, I can take in with full awareness a lovely landscape in its entirety (this view, of course, includes a tremendous amount of information). I am aware of different parts of this landscape: the blue sea, the houses on the mountain slope, the trees and plants between the houses, and the ships on the sea that look so small in the distance, no bigger than my little finger. The interesting point here is that my degree of awareness of the landscape image as a whole is the same as my degree of awareness of the various parts that make up this image. The fact that the huge ships seem so small is not because my awareness of them has weakened but because objects far away from me are perceived as small, and objects close to me are perceived as big.

## Second observation: A cup of tea is placed on the table in front of me. I am fully aware of the image of the table and the teacup as a whole, but I can also distinguish between the clear glass cup and the table and see that this cup is three-quarters full of dark reddish tea. My degree of awareness of the image of the table and the teacup as a whole, according to my judgment, is the same as my degree of awareness of each part of the image. Furthermore, when I compare in my mind the degree of my awareness of the image of the landscape and its parts to the image of the glass teacup on the table and its parts, I discover that their degrees of awareness are very similar, if not the same, even though I am describing different objects with different components. (Anyone can describe many observations of this kind. Therefore, I consider these observations as strong evidence to support the CΨ-indivisibility approach.)

 It is appropriate to expand a little on the example of the ships at sea to clarify the problem of CΨ. In case (a), I find it very difficult to decide whether the ship in the middle of the sea is a warship or a liner, whereas in case (b), it is very easy to decipher what type of ship it is since it is close to the shore. Nevertheless, my level of awareness regarding the *decision* in both cases (a) and (b) is the same. I am aware that in case (a) I have difficulty deciding, while in case (b) my decision is easy. However, my *perceptual awareness* is different in each case. My perceptual representation, the mental state of perceiving the ship [MS(ship)], in case (a) is not as sharp and clear as the MS(ship) in case (b). Therefore, if we assume that the same CΨ interacts multiplicatively with the MS(ship), then it follows that the degree of my perceptual awareness of the ship in case (a) is lower than in case (b). I assume that one’s cognitive processes impart the same level of CΨ onto any MS (because of the CΨ-indivisibility approach). Therefore, the level of perceptual awareness of a stimulus depends on the degree of information processing required by the cognitive system to represent the perceived stimulus through an MS (for further development of this idea, see Chapter 7).

## It seems, then, that while CΨ has no separate parts and is equally bestowed on all objects, the feeling that we have different degrees of CΨ when we perceive different stimuli does not arise from changes in CΨ itself but from variations in the level of information processing involved. That is, the degree of conscious perception of a given stimulus changes as a function of the interaction (multiplication) between a fixed level of CΨ and an MS of that stimulus processed at different levels. If different stimuli are processed maximally to best represent reality, the level of CΨ of these stimuli will be equal (for further development, see Chapter 6).

 Finally, if CΨ is uniform and without parts, as I assumed above, it is appropriate to ask what type of emergent phenomenon we are discussing here; it is certainly not one that can be reduced to its components because CΨ has no parts. Thus, it seems that it would be possible to call CΨ an emergent phenomenon in the sense that no mechanism has so far been discovered to satisfactorily explain how CΨ is created by brain activity.

## What would happen if a successful TC was discovered?

Perhaps a successful TC has not been developed because of the following possible scenario. If a new promising TC came to light, several unusual and strange ramifications, which I shall call “negative ramifications”, would emerge. These negative ramifications, in one way or another, could function as potential obstacles to developing the TC. For example, if researchers attempted to develop this theory, the negative ramifications would serve as criticisms, or as possible hypothetical/empirical observations that might disconfirm TC, thus preventing the scientific community from accepting it. Researchers sometimes ignore negative ramifications (or criticisms), but eventually, the scientific community is compelled to reject an unsuccessful scientific theory. This possibility will be elaborated as follows: I will first deal with the methodological framework of developing the TC and then discuss the negative ramifications.

*Developing the TC*: Let us assume that within the accepted methodology of psychology (which was largely imported from the sciences, e.g., Rakover, 1990) it is possible to develop a theory of human CΨ, which explains how CΨ emerges from brain activity. Here, I will qualify the explanatory domain of the future theory of CΨ. Since I believe in the ‘live-creatures correlation’ (the observational argument that all live creatures, even those with a minimally developed brain and nervous system, have CΨ, see Chapter 2), the TC will be required to explain two problems. *How* does the brain of a live animal (such as a human, dog, cat, or dolphin) produce CΨ¸ and *why* does only that kind of brain produce CΨ? In this case, scientists would be able to gauge the degree of an individual’s CΨ and evaluate what they are observing/sensing, even if only the individual can observe/feel their CΨ directly.

# Such a theory of CΨ, TC, which is not a mere correlation, may be expressed by the following general schematic equation:

# TC: CΨ = f(brain’s neurophysiological activity (BNA))

Here f represents a hypothetical function that connects CΨ to BNA by a certain mechanism that generates CΨ. The basic conception is that TC portrays the future discovery of how and why CΨ arises from neurophysiological activity in the brain. The TC is presented here in the most general and schematic way. Thus, it does not express any particular mind-body theory discussed in the professional literature, whether higher-order, representational, integrated information, identity theory, or functionalism (e.g., Gennaro, 2016; Seth & Bayne, 2022; van Gulick, 2022; see Chapter 2). These and other theories were strongly criticized and failed several important tests (e.g., Kim, 2011; Levine, 2007; Seth & Bayne, 2022; Smart, 2017; van Gulick, 2022; see Chapter 2). The main idea here is to imagine a scenario where researchers in the future, knowing all there is to know about previously unsuccessful attempts to develop a mind-body theory, finally succeed in developing a TC that works.

Despite the schematic presentation of CΨ=f(BNA), this general equation should fulfill the methodological requirement of unit equivalency, which is based on the well-known method of dimensional analysis. Accordingly, the sum of units of measurement on one side of any equation expressing a law or a theory must equal the total units of measurement on the other (see Rakover, 2002, 2018). For example, consider Galileo’s law of free fall: D=1/2GT2. Since D is measured by the meter, the expression GT2 likewise has to be measured by the same unit: meter=(meter/time2) x time2. That is, the vertical distance traveled by the falling body in a vacuum is equal to the combination of two different concepts: gravitational acceleration and time elapsed (the distance traveled is not identical to either of these two but to their combination).

Given this requirement, one should ask: How can the variables in CΨ=f(BNA) be measured? The BNA can be measured by the conventional units employed in the sciences, such as differences in voltage, electric current intensity, or certain chemical reactions in the brain. For the sake of simplicity, I will refer to these units of measurement by the general term “conventional units” (UC).

As for the measurement of CΨ, the answer is complex. It is, of course, possible to assume that different behaviors express different properties of CΨ. However, while verbal responses are considered to represent one’s subjective CΨ, no one knows how to directly measure these conscious experiences. For instance, Rakover (2020) argued that it makes no sense at all to say that Jacob loved Rachel 7.5 units of love (Ulove)more than he loved Leah, simply because Ulove is unknown. There is no unit of measurement for love like the objective units of measurement for distance and weight.

 However, if a theory of CΨ, TC, were to emerge in the future, what might the measurement units of CΨ be? I suggest two hypotheses:

(A) The units of measurement of CΨ will be of the type accepted and used in science. These will be a certain part, a special combination of units in the group of UC.

(B) The units of measurement of CΨ will be a completely new type, a novel discovery that science will accept (let us call them new units, UN).

It is important to emphasize that the fundamental difference between these two types of units of measurement is connected to their time of discovery. While UC is based on units of measurement known to science today, UN is based on units of measurement that will be discovered in the future. However, the fact that both types of units were discovered by (or will be discovered by) the accepted scientific method leads to the following methodological consequences (based on the requirement for unit equivalency), which are interesting, strange, and have negative ramifications.

Given the above discussion about CΨ = f(BNA), it can be proposed that CΨ also has to be measured by UC (or UN). Let us assume that CΨ is measured by UC (a similar argument can be made in connection with UN). If BNA is measured in milliamps (the measure of electric current intensity), then CΨ must also be expressed in milliamps. However, consider the following possibility. Let us assume that science has finally discovered that CΨ is measured by a certain UC but not in milliamps like the BNA. In this case, the above equation would have to be multiplied by a particular constant so that the sum of units of measurement multiplied by [Constant BNA] would equal the sum of units of measurement of CΨ, thus fulfilling the unit equivalency requirement.

If we assume that CΨ can be measured like other phenomena in the natural sciences, i.e., by observable, objective, conventional units of measurement, or UC, then it could be suggested that conscious mental properties such as understanding and inner representations of meaningfulness (of life), words, and pictures could also be expressed with UC. After all, it has been argued that CΨ is considered a necessary condition for these mental properties (e.g., Rakover, 2018, 2021b). Furthermore, it is reasonable to propose that a whole technology based on TC could be developed and manufactured, such as a device called the “CΨ-Meter”. On the one hand, this device could measure any kind of CΨ (subjective meaningful experiences) in UC, and on the other hand, it could measure in UC any physical or chemical property in the world. This hypothetical future development would lead to the “bare-mind” scenario, where any person’s inner world (sensations, feelings, thoughts, intentions, etc.) would be openly accessible to everyone.

The bare-mind situation has several negative ramifications, which I shall now briefly discuss. The main negative effect would be to undermine what I call the “inner-world culture”, the most fundamental infrastructure of any human civilization on earth. The inner-world culture is based on three main assumptions, which I think are self-evident:

(A) Only individuals themselves can sense/observe their inner worlds (CΨ).

(B) Because of (A), each person can be seen as a whole world.

(C) People’s actions can usually be explained by their unique inner worlds.

The bare-mind scenario would undermine (A) because people would be able to observe each other’s inner worlds. It would negate (B) and (C) since anyone in the world would be able to understand another’s behavior based on that person’s inner world, which would cease to be a solitary, unique inner world. Put differently, the uniqueness of a person would vanish since everyone would be able to observe his/her feelings and thoughts.

The negative ramifications of the bare-mind hypothesis can be viewed as elements of the destruction of the inner-world culture. They can be divided into two broad categories: (1) a dreadful world (a, b, c), and (2) theoretical problems (d, e, f), all of which represent serious criticisms of the future TC.

## (a) Loss of individuality: We may envisage the bare-mind scenario in which the privacy, individuality, and subjectivity of each person disappear. This would lead to a horrifying scenario in which individuals become fearful of their thoughts and intentions since these would no longer be their secrets but publicly exposed. This might result in the avoidance of thinking and planning—a destructive condition for the specific individual and cultural progress generally. There would be no new ideas, plans, or reforms. Thus, it could be argued that a hidden, private inner world is a necessary condition for the development of a prosperous culture.

## (b) A world full of objective meanings: Before the development of the TC, humans ascribed meaning to an indifferent world (e.g., see Rakover, 2021a). However, the TC, the bare-mind scenario, and the CΨ-Meter raise the possibility that everything in the world could have an objective meaning since any physical or chemical property could be measured by the CΨ-Meter’s meaningful UC. Does this indicate that the meaning of any phenomenon in the universe would be objective and independent of human assessment? According to TC and its technology, the answer is affirmative: a wonderful world full of meanings, which are part of all other objective features of nature. In this situation, the differences among people and cultures would be reduced because all the different interpretations given to the world would disappear, and every feature in the world would have an objective meaning expressed by UC.

(c) *A malicious use*: It is not hard to imagine the following scenario: Following the discovery of TC, a dictator orders the development of pills that will increase or decrease CΨ, meaning, and understanding. He forces his citizens to take one pill each day to increase his importance in their eyes and a second pill to enhance their stupidity and diminish their understanding of his malicious intentions. Furthermore, with certain pills, he creates a small number of geniuses specifically designed to fulfill his goals, while the majority of his subjects are required to do all the hard work for disgracefully low wages.

## (d) Loss of dimensionality: The TC and the bare-mind situation would lead to the tendency to mix things that belong to different dimensions or categories. The same level of importance could be attributed to the meanings of things with completely different qualities since they would have the same UC. For example, if Smith’s love for his wife Anna and his secondhand car both amount to 20UC, then his love for Anna equals his “love” for the used car. From our point of view today, there is no comparison between loving a woman and wanting to drive or fix a used car. These are two different qualities.

## (e) Tc falsification: Imagine that the TC and the CΨ-Meter were applied in two cases. First, when Mrs. Smith from New York, a lover of Renaissance art, saw the Mona Lisa, her level of ‘art-excitement’ was measured by the CΨ-Meter, and it equaled +50UC. Second, in an art survey, it was found that an environmental sculpture installed in Paris, made of objects that had been discarded and retrieved from the municipal garbage dump, radiated exactly +50UC. Given this, it was hypothesized on the basis of TC and the CΨ-Meter that Mrs. Smith’s impression of the environmental sculpture would equal her ‘art-excitement’ related to the Mona Lisa, +50UC precisely. However, when Mrs. Smith was shown the sculpture in Paris, the CΨ-Meter recorded -50UC. She detested the sculpture. Thus, the prediction was not confirmed by observation, thereby refuting TC.

## (f) A conscious robot: Suppose that Roby the robot is constructed in such a way that it has experiences (measured in UC) that are equal to those of Mrs. Smith. Roby the robot’s ‘art-excitement’ associated with the Mona Lisa is +50CU. Will Roby detest the environmental sculpture like Mrs. Smith? The answer to the question could be either positive or negative. I opt for a negative answer based on well-known arguments, such as Searle’s (1980) Chinese room, Jackson’s (1982) vision expert Mary, Levine’s (1983) explanatory gap, and Chalmers’ (1996, 1997) hard problem, all arguments suggesting that a full explanation of CΨ cannot be provided by the materialist approach. (In an article summarizing debates about these and other arguments, Levine [2007] concluded: “… the basic mind-body problem is still with us.” [p.380].) However, other researchers take an opposite approach and play with the idea that it is possible for complex sophisticated robots, or computers, to have consciousness (for reviews and discussions, see, e.g., Buttazzo, 2001; Chella et al., 2019; Koch, 2018; Reggia, 2013; see Chapter 2). Here, in my opinion, lies the big difference between a creature that has CΨ and a creature that only imitates the behavior of a conscious creature. If Roby had been endowed with CΨ (like Mrs. Smith), he would have responded like Mrs. Smith (he would have loathed the environmental sculpture). However, because he is nothing more than a machine, he responds like a machine with the same level of ‘art-excitement’ for the Mona Lisa picture and the environmental sculpture (both +50UC). Rakover (2021b) argued that CΨ is a necessary condition for understanding and meaning. Hence, while Mrs. Smith understands the meaning of her ‘art-excitement’ (positive in one case and negative in the other) Roby understands nothing! Similarly, in contrast to a racing car, which does not understand that it has won the most important competition in the world, the human racing driver celebrates the full meaning of the glorious victory.

Given the above, it is instructive to revisit an example of the opposite approach that I cannot accept. Consider the integrated information theory (IIT) of CΨ (e.g., Tononi, 2015; Tononi et al., 2016; for a review, see Fallon, 2019). According to IIT, CΨ is founded on the neurophysiology of the brain. Therefore, it may be argued that CΨ can be measured using standard scientific units and that it is possible to construct a mechanical system that meets all the requirements of IIT—a device that has CΨ. This conflicts with most people’s intuition, common sense, and my approach, as stated above (for similar criticisms, see Reggia, 2013). However, Tononi et al.’s (2016) response was very interesting as they were willing to accept that possibility: “Intriguingly, IIT allows for certain simple systems, such as grid-like architectures, similar to topographically organized areas in the human posterior cortex, to be highly conscious even when not engaging in any intelligent behavior.” (p. 460). In the same vein, Koch (2019) discussed several conclusions emerging from IIT and suggested that if an organism is characterized by intrinsic causal powers that are whole and irreducible, then it can be speculated that this organism is endowed with a certain (tiny) degree of CΨ. Examples include microscopic organisms and even the structure of an atom.

As can be seen, TC and its technology create extremely negative ramifications (and I deliberately refrained from discussing the horrifying possibility that with the help of the TC and its technology, it would be possible to produce robots with CΨ!). Can any of these ramifications be interpreted positively? For example, one may suggest that the loss of individuality and privacy would lead to the elimination of depression due to loneliness and that other mental disorders could be treated with medication. However, in my opinion, such potential benefits do not compensate for the negative ramifications described above. Even if we accepted that the theoretical problems raised here against TC are not so decisive, the world that would emerge after the discovery of TC would still be terrible! It would be based on the destruction of civilizations who would be replaced by a world full of flat people without unique personalities.

What I have described above is sufficient to show that the TC (to be revealed in the future) raises a whole host of problems that interfere with the aim of scientific research to discover TC. How can we respond to the negative ramifications that emerge from TC? Here are some considerations.

First, researchers may look for flaws in the logic of the negative ramifications presented here. If such flaws are found, the goal of developing TC will be encouraged.

Second, if no flaws are found to discount these negative ramifications, scholars may respond by suggesting that they are based on speculations that certain events will occur given particular conditions, and as such, they are not compelling as logical proofs. Thus, it can be argued that the propositions of these hypothetical consequences are not equivalent in status to mathematical or geometrical proofs. TC is not similar to a law in Euclidean geometry. Therefore, it makes sense to continue working hard to discover the mechanism that links the neurophysiology of the brain with CΨ. If successful, we may worry later about the negative ramifications raised above, along with any others that may emerge.

Third, researchers may suggest that research on the relationship between the neurophysiology of the brain and CΨ has reached a dead end and that it is time to look for entirely differentways to explain CΨ—perhaps by striving to discover the “hidden energy” suggested earlier.

The following question now arises: How should CΨ be treated in the present? As suggested in Chapter 2, I propose that it may be useful to methodologically conceive of CΨ as a basic explanatory factor of behavior. This contradicts Kim (2002) who suggested that conscious experience is an epiphenomenon. I propose a reversed epiphenomenalism, whereby CΨ can affect behavior and should be regarded as an explanatory concept, precisely because a satisfactory explanation for it has not been found. Similarly, Cleeremans and Tallon-Baudry (2022) proposed that CΨ has an intrinsic value that affects behavior: “… we claim that phenomenal experience has a function because it has intrinsic value. And things that have value typically have a function and contribute to guiding behavior.” (p. 2).

Given the above, let us consider CΨ as an essential theoretical explanatory concept that cannot be explained by more basic terms (for further development of this idea of CΨas an explanation, see chapters 4 and 5).

**Part II: Measurement and the unsolved problem of CΨ**

The fact that the problem of CΨ remains unsolved is not due to a limited capacity for understanding, as McGinn (1989) posited. Rather, it is because no method has yet been discovered to directly measure CΨ; there are no units of measurement (UMs). Based on this assumption, it can be said that the scientific method that forms the basis of psychological research is unsuitable for research in CΨ. Why not? For the simple reason that this methodology was developed to discover explanatory relationships between dependent and independent variables when each variable is measurable using certain UMs.

In contrast, in psychological research, one may observe behaviors of different kinds to offer speculations about CΨ. However, the problem is that it is difficult to use these behaviors to gauge CΨ because it is very hard to distinguish between the following two possibilities. The activation of the independent variable in the experiment may affect (a) everything related to the conscious behavior itself (muscles, the nervous system, brain activity, the representation of the stimulus [i.e., mental state (MS)]) or (b) CΨ itself or the mechanism that produces CΨ. The experimental distinction between these two possibilities is extremely difficult, if not impossible. For example, fatigue or drugs may affect not CΨ itself, but the relevant behavior being observed. (For the sake of brevity, when I speak of a direct effect on CΨ, I also include the hypothetical mechanism that produces it.)

 It is impossible to turn CΨ on or off in the same way a computer or robot can be switched on or off. With animals, complete unconsciousness means death. The moment a human being is born (and even in the mother’s womb) CΨ comes into being at the same time. Consciousness stops completely when the person dies. It is, of course, possible to alter levels of CΨ using appropriate manipulations (for example, drugs), but once again, these manipulations do not act directly on CΨ but rather affect the relevant MSs.

 So far, I have discussed the difficult question of whether it is possible to directly measure CΨ. I have suggested a negative answer because first, CΨ is seen as one unified process that is bestowed on different MSs, and second, the effects of experimental manipulations on behavior can be interpreted not as affecting CΨ itself, but as affecting behavior. In addition, several researchers have suggested that various psychological attributes (such as intelligence, emotions, and personality attributes) are not measurable (e.g., Franz, 2022; Michell, 1999; Trendler, 2009, 2019). Michell (1999) claimed that psychologists have not devoted the necessary theoretical-empirical efforts to check whether psychological attributes are quantitative, that is, if a given trait empirically fulfills the mathematical requirement of additivity. He wrote:

… the point is that in the absence of experimental tests known to be specifically sensitive to the hypothesized additive structure of the attributes studied, it is not known whether or not these attributes are quantitative and thus it is not known whether or not existing procedures measure them. The error committed, therefore, is that of accepting hypotheses prior to possessing adequate evidence (p. 216).

Trendler (2009) suggested that the question of whether psychological traits are quantitative cannot be tested empirically, and Franz (2022) concluded that this question raises extremely difficult conceptual problems. I believe that there is truth in the claims of these three researchers, as I will try to show in what follows.

There is a big difference between measurement in physics and measurement in psychology: the attempt to bridge the theory–observation gap. In physics, the gap between theory and observation is bridged by the equivalence between theoretical and real units of measurement (UMs) (e.g., a ruler to measure length). In psychology, the gap is bridged by using hypothetical UMs that are somehow indexed by behavior. In other words, while physics uses theoretical UMs that are equivalent to UMs in reality, researchers in psychology use hypothetical UMs that are connected to observations through predictions about behavioral indices (e.g., correct response rate and reaction time). (However, the distinction described here ignores the proposition that measurement in physics is influenced by elements of arbitrariness and conventionalism, see, e.g., Tal, 2020.)

Psychology is influenced by two contrasting approaches to measurement (for a review and discussion, see, e.g., Coombs et al., 1970; Michell, 1999; Tal, 2020). According to Campbell, measurement is based on the empirical discovery of the relation between a certain amount of quantitative property and the UM of that same property. For example, given that the length of the stick (S) is 3 meters (S=3 meters), we can state that the relation between the length of S and its unit of measurement (meter) is 3 (S/meter = 3). (For a discussion of the terms, “quantitative property” and “number”, see Michell, 1999.) Stevens (1946), on the other hand, proposed a broad definition of measurement based on the attribution of numbers to psychological properties according to a certain rule. This definition opened the door to the use of numbers and mathematics in the field of psychology. However, Michell (1999) wrote, “… there has been little serious scientific research undertaken to show that the relevant attributes are really quantitative and, therefore, that the relevant attributes are measurable” (p. 187). In other words, psychologists have bypassed or ignored the need to empirically show that the psychological property to which numbers are applied is indeed a quantifiable property that can be characterized by an additive structure. (For other approaches to scientific measurement, such as realistic and representational, see Tal, 2020.)

 An important point in Campbell’s measurement approach is that researchers have discovered an empirical operation (e.g., counting how many times the UM fits into the length of L) that upholds mathematical properties on which the mathematical language in a physical theory is based. To illustrate this, let us examine two mathematical properties: transitivity and additivity. The transitive relation states that if [(A = 15) > (B = 10) and (B = 10) > (C = 5)], then (A = 15) > (C = 5); and the additive relation proposes that (C = 5) + (B = 10) = (A = 15). These relations exist in the following series of ‘sticks’, A, B, and C:

A|---------------|

B|----------|

C|-----|

To show this, we first define a natural and arbitrary UM for length, here delineated by a dash (-). Second, we count how many times this unit fits into A (15 times), B (10 times), and C (5 times). Finally, we see that the lengths of the three sticks uphold the transitive relation, because A is greater than B, B is greater than C, and A is greater than C; moreover, the additive relation is upheld, because A = B + C.

Measurement of the length of an object using real and arbitrary units maintains all of the mathematical properties of numbers. Therefore, what is determined by numbers is also determined by the lengths of the measured objects. The same may be said of other quantitative properties such as weight and time. Measurement of weight is based on the use of scales, and measurement of time (clocks) is based on the use of a periodic phenomenon, such as the earth revolving around the sun. Many other measurements are derived from these fundamental UMs (length, weight, time), such as speed (distance/time), acceleration, energy, etc. Other measurements are based on physical laws for certain phenomena. For example, consider temperature; its measurement is founded on the ideal gas law and thermal expansion (see Bringmann and Eronen, 2016; Sherry, 2011).

Methodologically, Bringmann and Eronen (2016) and Sherry (2011) suggested that it would be worthwhile to think of the qualitative/quantitative status of psychological terms as analogous to the development of the term temperature, which changed from a qualitative term to a quantitative term as a result of the development of an appropriate physical theory: temperature is a measure of the average kinetic energy of microscopic particles in a substance. Following this analogy, one may expect a psychological term to shift in status from qualitative to quantitative by developing a suitable theory. Although this notion is attractive, to the best of my knowledge such a development has not been achieved in the field of psychology. For example, despite the massive investment in empirical and theoretical research on the concept of intelligence, one cannot treat the calculation of an IQ score like the measurement of length or weight.

In the field of psychology, the physical approach to measurement does not exist. Psychological properties (behavioral, cognitive, mental) cannot be measured by the empirical discovery of a relationship between the psychological property and the UM of that property because such UMs are very difficult to define and observe. Nor can one appeal to an empirical psychological law to measure some psychological property. This has led researchers and philosophers such as Kant, James, and Leibovitch to cast doubt on the possibility of developing a psychological science (see discussion in Algom, 2019; Marks & Algom, 1998).

According to Luce (1972, p. 96), on the one hand,

… psychological measurement is not of a character closely analogous to either fundamental or derived physical measurement. … In brief, the reason is that psychological measures do not exhibit any fixed relation to physical measures and most likely not to one another when examined over individuals. This is reflected in the absence of any structure to the units of psychophysical measures.

On the other hand, Luce proposed a hypothesis whereby

… man—and any other organism—is, among other things, a measurement device, in function not unlike a spring balance or voltmeter, which is capable of transforming many kinds of physical attributes into common measure in the central nervous system. According to this view, the task of psychophysics is to unravel the nature of that device.

 Hence, Luce agreed that measurement in psychology is not like measurement in physics; instead, he suggested a research approach based on the metaphor of perceiving human beings as a measurement device.

 In view of the above considerations about the distinction between measurement in physics and measurement in psychology, the following points should be highlighted. First, under earthly conditions, distance, weight, and time are unidimensional and independent of each other. In contrast, psychological traits are multidimensional and tend to affect each other. For example, consider the case where a person has a natural *ability*, a talent for tennis, which fuels their *motivation* to become a professional tennis player. Thus, ability and motivation are not independent.

Second, the operation of ‘concatenation’ is very important in physics but absent in psychology. Taking a measurement using a measuring device, for example, measuring the length of a table by placing a ruler alongside the edge, is an example of concatenation. However, it is possible to measure temperature without a concatenation operation (e.g., not by adding the same amount of heat). With temperature, one measures differences: a temperature of 29 degrees Celsius means 29 degrees above the temperature of freezing water. The operation of concatenation cannot be performed in psychology simply because there are no UMs for psychological attributes, and no method has been found to measure psychological traits in a similar way to measuring temperature.

Nevertheless, the above does not categorically mean that psychological attributes are not quantifiable. The development of the theory of conjoint measurement proposes that psychological attributes may show additivity if they empirically fulfill certain requirements (axioms) of this theory (see Luce & Tukey, 1964; for a less technical presentation of this theory, see Coombs et al., 1970; Irribarra, 2021; Michell, 1999). Very briefly, according to the conjoint measurement theory (which I abbreviate here to CMT), if certain conditions (mathematical axioms) are met empirically, then it follows that two (or more) psychological attributes contribute additively to a certain observable behavior. For example, it is possible to test with CMT whether two variables, the magnitude of reinforcement and its frequency, contribute to the speed of learning in an additive manner. In terms of analysis of variance (familiar to all psychologists), this means that the interaction between the independent variables (magnitude of reinforcement and its frequency) is insignificant. This theory, therefore, does not examine whether a psychological property is quantitative, that is, whether it meets the requirements for additivity in a way similar to measuring distance by using UM(cm) in concatenation. Instead, CMT tests whether the contribution of the psychological attributes to behavior is quantitative, i.e., additive. The theory does that by mapping a qualitative empirically *represented* structure onto a *representing* structure—real numbers—thereby producing intervals or ratio scales. Thus, CMT is a broad theoretical approach which meets Campbell’s requirements without relying on the concatenation procedure. Coombs et al. (1970) emphasized that the empirical fact that it is possible to create interval scales in psychology under a theory of measurement shows that the operation of concatenation is not a necessary condition for scales of this type.

Although CMT attempted to show that psychological attributes can be measured by intervals or ratio scales, its impact on psychology was minimal. Even so, it provoked much debate regarding its theoretical foundations (e.g., Cliff, 1992; Heene, 2013; Michell, 1999; Krantz & Wallsten, 2019; Trendler, 2019). For example, Heene (2013, p. 3) concluded, “Altogether, it is possible that human cognitive abilities and personality traits simply are not quantitative.” And Trendler (2019, p. 101) wrote, “… so far, no interval or ratio scales have been established in psychology, neither by conjoint measurement nor by any other means.” Krantz and Wallsten (2019) rejected this statement. They cited several sources showing that these types of scales were useful constructions in psychology while admitting that the impact of CMT on psychology had been minimal.

Finally, the following considerations are intended to throw more light on the question of whether psychological traits can be quantified. These are questions that may interest (and amuse) the reader.

*Empirical test.* In the domain of physics, it is possible to measure any physical phenomenon using standard measurement units (the SI system includes the centimeter, gram, second, ampere, etc.), but this cannot apply to psychological phenomena. Even if the use of CMT was very popular, the question of whether the contribution of two or more attributes to behavior is additive requires an empirical answer: sometimes yes, sometimes no. On this issue, Cliff (1992, p. 189) wrote, “Measurement theory says that if certain conditions hold, then scales of a given kind are defined. If not, they are not.” Thus, CMT produces different results depending on the sample of subjects. Furthermore, even if we assume that UMs can be estimated from the results of CMT, would it be possible to use these UMs in other cases with the same degree of certainty as in physics? Given that the estimated constants in psychology vary radically from experiment to experiment, I believe that the answer to this additional question is negative.

*Illusions and man as a measurement device*. Consider the famous Müller-Lyer illusion: 

Figure 3.1 depicts the Müller-Lyer illusion.

Physical measurement reveals that the length of the right-hand line is equal to that of the left-hand line, although people tend to perceive the left-hand line as shorter. The reason is that physicists measure the physical properties of this illusion objectively, while people estimate them subjectively, processing the information through their perceptual systems. Given this comparison between physical and psychological measurement, it becomes apparent that our perceptual systems make mistakes and create distortions. If humans perceive certain stimuli in distorted forms, the following question arises: Can a person be considered a valid and reliable measuring device?

*Intelligence quotient*. Over many years, thanks to huge efforts in empirical and theoretical research, psychologists have developed tests for measuring intelligence. At the end of the test/measurement process, subjects receive a numerical grade expressing their intelligence level, known as the intelligence quotient (IQ). To what extent does IQ attest to one’s level of intelligence? The following example substantiates that the IQ score is extremely problematic. Let us assume that Einstein’s intelligence level was very high: an IQ of 150. Is it then possible to argue that his intelligence level was equal to the total intelligence level of three imbeciles, each of whom had IQ = 50? If one assumes that IQ is a quantitative attribute (i.e., its structure is additive), then the answer is yes! But this is utterly ridiculous. Hence, one may propose that in many cases like this, psychology plays the math game correctly without mirroring psychological reality.

*Transitivity*. Not all psychological attributes can be quantified because many of them do not meet the requirement for transitivity. Let us examine the attribute ‘attraction’. David finds Dorit more attractive than Rina and Rina is more attractive than Shoshana, but he says that Shoshana is more attractive than Dorit. The transitivity property does not hold here because this attribute is multidimensional. Dorit is more attractive than Rina because of her beautiful hair; Rina is more attractive than Shoshana because of her green eyes; Shoshana is more attractive than Dorit because of her warm smile.

 I believe these examples illustrate an important problem in psychology. It is very difficult to quantify psychological variables for one main reason: Units of measurement for psychological attributes have not yet been discovered.

*Is it possible to learn something from attempts to apply methods of physical measurement to the measurement of* CΨ*?* I think the answer is rather pessimistic. First, because CΨ is not divisible and therefore it is impossible to find measurement units for it in a comparable way to distance and weight. Second, CΨ is not a cyclical phenomenon, so it cannot be measured like time. Thirdly, since CΨ is indivisible and applied to innumerable phenomena perceived by the senses and the mind, it does not seem likely that CMT can be applied to it. It does not seem that CΨ can be divided into different values, but different phenomena (of which one is aware) can be divided into a different number of values with different meanings.

 An important analogy that could be drawn between CΨ and a measurable property in physics is temperature. If the temperature of an iron rod is 30 degrees Celsius, it is clear that even if one divides the rod into four parts, the temperature of each part will equal 30 degrees Celsius. Similarly, my level of awareness of the office where I am currently working is the same as my level of awareness of every part of this office: the bookshelf, the computer on the table, the reproduction of the surrealistic painting of the liquid clocks by Salvador Dali, etc. The measurement of temperature (what feels hot/cold) is based on the fact that certain liquids expand with increasing temperature. Historically, temperature measuring devices and their calibration have been refined thanks to theoretical developments. To the best of my knowledge, no proposal in the professional literature shows that CΨ can be measured in a way functionally similar to measuring temperature. Furthermore, there have been no attempts in CΨ research to emulate the methods used by physicists to measure new phenomena, such as electricity and magnetism.

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