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**Consciousness: New perspectives and their implications for artificial consciousness and the scientific progress of psychology**

**Preface**

What is the purpose of this book? This is a complicated question that is very difficult to answer. It is quite easy to explain the purpose of books such as “Introduction to Psychology” or “Introduction to the Philosophy of Science” because the answer is almost self-evident. An introduction to psychology aims to present the student with the main axes of scientific knowledge resulting from research in psychology (e.g., experimental findings, theoretical explanations, and an agreed methodological approach). A similar answer can be offered regarding the second example. However, this book addresses a particularly tricky and elusive subject: the mind-body problem, alternatively known as the consciousness-brain problem or the problem of consciousness. *The Conscious Mind: In Search of a Fundamental Theory* (Chalmers, 1996) opens with the statement: “Consciousness is the biggest mystery. It may be the largest outstanding obstacle in our quest for a scientific understanding of the universe.” (p. xi). Indeed, even today, the conundrum is far from being resolved. With that in mind, how can the aims of this book be defined?

First of all, it does not offer a solution to the question of consciousness (CΨ). The first section is a review of various theories (and their empirical support) that have been proposed to explain consciousness—a review that substantiates the claim that, to this day, not one single theory has been accepted by the scientific community as an explanation for the phenomenon of CΨ. What is quite clear is that CΨ is created somehow by the brain, but no one has been able to explain how the brain does this. Evidently, CΨ depends on the brain rather than on other parts of the human (or animal) body. Damage to other parts of the body (or amputation), such as hands, feet, kidneys, and even the heart (which can be replaced with an artificial heart), does not impair CΨ. On the contrary, a person who has undergone an amputation of a hand or a leg is acutely aware of their disability. However, despite the central role of the brain in consciousness, research into neurophysiological processes has suggested that not all parts of the brain are involved in generating CΨ (e.g., Koch, 2018).

In light of the above (the fact that there is no solution to the problem of CΨ), this book offers three relatively new considerations. First, it shows that in addition to the sort of mechanistic explanation accepted in the sciences and psychology, a mentalistic explanation is needed based on the individual’s CΨ. Second, the book outlines a solution to the question of how non-consciousness becomes conscious. This question is probably easier than the problem of consciousness. Finally, the last part of the book uses the developments of previous chapters to answer two questions that are anchored to the very fact that the problem of CΨ has not yet been solved. First, can sophisticated robots develop CΨ? And second, why has psychology not developed like the so-called “hard sciences” (for example, physics)?

This work completes a line of thought on the subject of CΨ that has occupied and fascinated me since my first year of psychology studies. One may wonder how I can speak of completion when, after many years of considering the problem, I am no closer to resolving it than I had been as a student at university. The answer to this question is based on the information that I present in this book, which may not offer the key to the problem but is nevertheless interesting in itself and nourishes the debate on consciousness. This information is based on a scientific methodology and philosophical inquiries that have developed over many years, mainly in Western culture. Furthermore, I suggest that this methodology and these inquiries are founded on a certain type of culture, which characterizes the human race perhaps more than anything else, a type of culture that I will call the “lonely-mind culture”. According to this conception, every person (and probably every animal) is a world in itself. Their inner world (sensations, feelings, and thoughts) is accessible only to the individual self and not to any other being. One may learn about the inner world of the other with the aid of different learning methods, such as observing their behavior under certain conditions (especially through verbal reports), but one cannot communicate directly with the inner world of the other. In my opinion, if humans could connect directly to each other’s inner worlds, culture as we know it would be irrevocably changed.

In my first year of study at The Hebrew University of Jerusalem, the psychology department arranged a debate on the question: “Is psychology a scientific discipline?” The main speaker, who argued that it was not, was Professor Yeshayahu Leibowitz, a revered figure not only on the university campus but throughout the state of Israel. Three students, Amos Tversky, Yehoshafat Giveon, and Emanuel Donchin, argued that psychology should qualify as a science. At the end of the debate, all the members of the psychology department, both lecturers and students, who were at the time influenced by the behaviorist approach, were convinced that Leibowitz had lost. I, however, thought otherwise. In my opinion, no one had countered his argument about psychology’s lack of objective measurement of subjective phenomena: nobody, he pointed out, could feel his toothache except Leibowitz himself. Donchin, as far as I recall, responded by saying that Leibowitz’s sensation of pain was of no interest to the psychologist. What was important for the science of psychology was his observable behavior, namely the fact that he visited the dentist. This answer missed the point of Leibowitz’s argument since it did not tackle the problem that the eminent professor had emphasized: a very important aspect of human behavior simply does not correspond with the methodology of the natural sciences—one’s inner world. Leibowitz’s toothache scenario illustrates the mind-body problem or the consciousness-brain problem. Donchin’s response largely reflected the behaviorist approach, which disregards the individual’s internal, subjective, mental world as an explanatory factor and concentrates on publicly observable behavior. In Chapter 2, I suggest restoring the individual’s inner world as an essential component in psychological explanations and show that mentalistic explanations (which are based on one’s feelings, motivation, and beliefs) can be part of a scientific methodological framework.

This debate profoundly affected me, and since then, I have never tired of reflecting upon the mind-body problem and the question of consciousness. Over the years, I have read countless books and articles on the topic and published a large number of articles myself. This book can be understood as a summary and extension of my thoughts and ideas on the problem of CΨ, which have developed over the course of my academic career. Again, I repeat, there has been no solution to this difficult problem, but I hope this book will inspire the reader with some new ideas (whether they are criticisms of what has been written or further developments). Moreover, if indeed this is what I achieve, I can pat myself on the shoulder and say that I have contributed something tiny to this difficult problem.

Since the topic of CΨ has been studied over the last few decades from different research angles, such as psychology, philosophy, neurophysiology (of the brain), and physics, it seems appropriate that I describe my scientific background so that the reader will be able to judge where my strengths and weaknesses lie. What I can guarantee is that I will do my very best to present the complicated issues at stake in the clearest and most readable way. I am an experimental psychologist. My doctoral research focused on fear and avoidance learning in rats, but my attention then turned to face perception and recognition. During my studies at The Hebrew University of Jerusalem, I completed (in addition to psychology) a BA in sociology, two years in statistics, and introductory courses (including laboratory work) in physics and chemistry. Above all, I freely attended philosophy courses at both Jerusalem University and the University of Haifa, especially in the philosophy of science, which required reading many books and articles related to science. This, then, is my scientific-knowledge-business card.

Now it is appropriate to describe the scientific approach I have developed over the years so that the reader may understand the angle from which I approach the problem of CΨ. I call this approach “reality comprehension” (or perhaps “the big wondering”), and it is based on two fundamental ideas. On the one hand, I believe, as a full-fledged realist, that the world exists independently of the existence of man. In my view, the following entities exist independently of any particular human: galaxies, stars, the Earth, cities, buildings, animals, plants, etc. In addition, I hold that all humans have an inner world that contains feelings, emotions, thoughts, curiosity, intentions, fears, and so forth.

On the other hand, because the world is indifferent to the very existence of humans, people have no choice but to create and attach meaning to it, which allows them to lead a more or less reasonable way of life. I believe that man has developed tremendous cultures in order to understand and adapt to the world. These cultures have included the development of languages, logic and mathematics, religion, and scientific methodology.

In my opinion, the fundamental assumption behind any scientific methodology is that there are unknown true explanations for various phenomena that human beings can observe with the help of their senses, using devices that science has helped develop. Moreover, it seems that the goal of science is about getting closer to the ultimate scientific explanation (a theory, a model, or a law that describes/explains observations). The ultimate explanation is approached through a procedure of eliminating theories that do not meet the principle of “empirical matching”. Accordingly, I believe that the culture of science, developed over hundreds of years, manages to progress and develop because science is based on this rational criterion. Empirical matching is founded on the correspondence between theoretical/empirical developments and empirical observations (although these are not free from various theoretical influences). A theory that does not fulfill this principle is eliminated. This rational principle makes it possible to advance cultural efforts to solve the riddles of nature, including the greatest puzzle of all, the enigma of consciousness.

Given the scientific approach I have adopted, I perceive the problem of CΨ as still unsolved. If the reader is looking for the answer to the question of how the human mind creates CΨ, they will not find it in this book. However, I hope they will find it interesting to follow the discussion that unfolds in the following chapters dedicated to this amazing subject. In these respects, I will not deal with literature related to parapsychology (such as contact with the dead, experiences after death, and reincarnation). The literature on the paranormal tries to argue against materialism and supports some sort of spiritualist approach (e.g., Ng, 2023). I have read enough on the subject and remain completely skeptical. In the same vein, I will not address speculative literature related to religious, moral, and legal questions that may arise in the event that robots develop CΨ. The reason for this, as you may read in the book, lies in the fact that I am very skeptical about this question as well. As things seem to me today, I strongly doubt the possibility that robots or computers will develop CΨ.

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**Chapter (1) The concept of consciousness**

Pat and Rick drank a lot of beer in ‘their bar’. They were frustrated by their research in the elusive phenomenon of consciousness. Pat said to Rick, “In ‘our bar’ there is an elusive creature that only I can see.” And Rick replied firmly, “Not only you, I see him too.” Pat, lost in deep thought, said, “Well, that’s only because you drank seven bottles of beer.”

**(1.1) Delineating the concept of consciousness**

In recent decades, there has been a surge in theoretical and empirical research aiming to explain and solve the problem of consciousness (CΨ) (e.g., Brown et al., 2019; Gennaro, 2012, 2023; Jones & Hunt, 2023; Seth & Bayne, 2022; Van Gulick, 2022). Most researchers have rejected the solutions suggested thus far, and as a result, the problem of consciousness continues to trouble them (e.g., Butlin et al., 2023; Carruthers & Gennaro, 2020; Dehaene et al., 2021; Rakover, 2018, 2021; Uttal, 2005). Hugeefforts have been made to explain how neurophysiological processes in the brain bring about CΨ, but such attempts have failed to offer satisfactory explanations for the classical mind-body problem (e.g., Butlin et al., 2023; Gennaro, 2023; Jones & Hunt, 2023; Rakover, 2018, 2021; Seth & Bayne, 2022; Uttal, 2005; Van Gulick, 1995, 2022). In other words, researchers have not yet succeeded in developing theories that solve the ‘hard problem’ (Chalmers, 1996), explain ‘phenomenal consciousness’ (Block, 1995), and bridge the ‘explanatory gap’ (Levine, 1983). Block (1995) distinguished between phenomenal consciousness (P-consciousness) and access consciousness (A-consciousness). While the first concept refers to the private subjective experiences of each person (qualia), the second refers to mental information, which is accessible to different cognitive processes that use it for different purposes, such as speaking, drawing conclusions, and monitoring behavior. Other concepts, such as Chalmers’ (1996) hard and easy problems and Levine’s (1983) explanatory gap, are based on the observation that the subjective experience of each person is very difficult to grasp by scientific methodology. These are discussed further below.

To reiterate, there is still no theoretical explanation of the question of how the brain produces CΨ. Frackowiac et al. (2004, p. 269) wrote, “We have no idea how consciousness emerges from the physical activity of the brain, and we do not know whether consciousness can emerge from non-biological systems, such as computers.” According to these authors, consciousness has not yet become a scientific term that can be defined precisely, and we all use the term in many different and even ambiguous ways.

The concept of CΨ is controversial (e.g., Dehaene et al., 2021; Gennaro, 2004; Van Gulick, 2022). As Vimal & Sansthana (2010, p. 93) point out: “About forty meanings attributed to the term consciousness can be identiﬁed and categorized based on functions and experiences. The prospects for reaching any single, agreed-upon, theory-independent deﬁnition of consciousness appear remote.”

Nevertheless, I do not believe that I would be wrong to say that most researchers (e.g.,  [Searle](https://en.wikipedia.org/wiki/John_Searle), 2005) conceive of consciousness as the unique subjective experience of a person who perceives stimuli in the external world or their internal world. This description is consistent with Nagel’s (1974) famous “What is it like?” approach and other views, such as those of Gennaro (2012), who followed Nagel. Similarly, Chalmers (1996) distinguished between hard and easy problems. Accordingly, the ‘hard problem’ of CΨ deals with the question of how humans’ [phenomenal](https://en.wikipedia.org/wiki/Consciousness#Types_of_consciousness) experiences are generated by the brain, where [phenomenal](https://en.wikipedia.org/wiki/Consciousness#Types_of_consciousness) experiences are conceived of in the sense of Nagel’s conception of CΨ—a problem that appears to defy explanation. This is in contrast to the “easy problems” relating to such behaviors as discrimination or integration of information, which can be explained by specifying the processes that execute them. As mentioned above, most researchers distinguish between two kinds of consciousness, one related to subjective experience, which is difficult to grasp with accepted scientific tools, and another that can be expressed and used in different ways (e.g., Block, 1995; Chalmers, 1996; Levine, 1983).

In addition to the conceptions or qualities of CΨ discussed in the professional literature, I propose here a new important quality: Consciousness evokes the fundamental experience of being alive. Rakover (2021) suggested that CΨ endows life-meaning to mental representations. I distinguished between two types of meaning: innate and acquired life-meaning. The innate meaning is related to the perception of sensory stimuli, encompassing sight, hearing, feelings, pleasure, pain, and fear. When a person sees, for example, a landscape, they are in a state of CΨ of the landscape which includes the innate feeling of being alive, an inherent feeling of aliveness. I call this the “aliveness-feeling”. Consciousness is a necessary and sufficient condition for the aliveness-feeling. Without CΨ, not only is a person unable to stand on their feet, but the feeling of being alive disappears. The basic argument is that perceiving sensory stimuli consciously gives the individual a sense of being alive, an aliveness-feeling, which is natural and inborn. (However, note that people do not constantly say to themselves, “How wonderful, I am alive!” just as they do not constantly say to themselves, “How wonderful, I am breathing air!”) The acquired life-meaning refers to customs, values, traditions, and norms that society transfers to its members. Thus, while sensory perception gives the individual the basic meaning of life, namely the feeling of being alive, the acquired meaning offers a way of life that has to be followed in order to integrate well into society.

**(1.2) The development and evolution of consciousness**

In this section, I would like to emphasize that given the philosophical and scientific attempts to understand CΨ, one must take into account the observation that the conscious brain is a very dynamic system. It seems that the more or less conventional view of CΨ, namely that consciousness is created in an indecipherable way (so far) by the brain’s neurophysiological systems, is based on an incorrect fixed and static picture of the brain. It appears that this stationary view is based on an analogy to a computer, where the hardware and software that constitute the device are unchangeable, that is, neither their components nor the scope of their functions ever change. The hardware remains a fixed system for many years and so does the software (including software capable of learning a certain task). For example, the inverted-face recognition program that I used in a series of experiments many years ago can be safely used today. But this is not the case with the human brain and consciousness.

Several years ago, I watched a film showing a surgical operation being performed on the human brain. Focusing the camera on a certain area of the brain clearly showed that this organ is buzzing with dynamic activity all the time, for example building and eliminating connections. Kays et al. (2012, p. 119) wrote:

Until fairly recently, the adult brain was considered largely fixed and stable. Although it was accepted that changes occurred in the context of learning and memory, the general consensus was that major processes essential to normal brain development (e.g., generation of new neurons, neuron migration, pruning) ceased once full development was reached.

However, as mentioned above, this conception does not correspond to reality. Moreover, not only is the adult brain in a constant state of dynamic flux but both the brain and CΨ continually develop over a person’s lifetime. Furthermore, the human brain has evolved throughout the long history of the human race (millions of years). In what follows, I shall briefly review these developments in order to give a more comprehensive picture of the topics presented in this work.

In a review article of the relevant literature, Fabbro et al. (2019) outlined the development of CΨ over a human lifetime. It was discovered that a fetus is already aware of a distinction between itself and its environment. This “minimal level of consciousness” continues to develop during the first year after birth. From then onwards, higher-level cognitive functions are added to CΨ up to the level of CΨ characteristic of an adult person. For example, at the age of two, children show an initial level of self-awareness and are able to recognize themselves in the mirror. Between the ages of four and five years, they develop a ‘theory of mind’ related to the understanding that others also have their own desires and goals.

Research into human evolution goes back to the very distant past. It has been suggested that language was invented approximately 90,000 years ago and writing approximately 5,500 years ago. However, it has also been hypothesized that CΨ as it is comprehended today did not exist prior to 3,000 years ago. According to Jaynes (1976), the ancient Greeks did not perceive their emotions and desires as we do today (as subjective mental states that belong uniquely to a person) but as the result of the actions of the gods. Jaynes’ book *The Origin of Consciousness in the Breakdown of the Bicameral Mind* made a huge impression from the moment it was published and continues to provoke debate to this day. (I cannot review this vast bibliography here. The reader who searches “bicameral mentality” on Google will be flooded immediately with references to hundreds of books and articles relevant to the subject, e.g., Algom, 1991; Rowe, 2012.) However, I shall present here a very brief summary of the main ideas underlying Jaynes’ theoretical approach.

The fundamental idea is that until the days of Plato and Aristotle, humans did not have a concept of CΨ as it is known to us today. In Homer’s time and before, there was no subjective consciousness (e.g., expressed through desire, belief, anger, joy, worry, etc.). Our ancestors did not conceive of their actions, desires, or emotions as originating from themselves (as we do today) but saw themselves as being driven and operated by the gods who resided on Olympus (according to Greek mythology). The ancient man heard voices in his head, which were probably similar to auditory hallucinations. According to Jaynes, CΨ (mainly the ability to introspect) is not an innate process, but a learned one that grew out of the development of language. In this view, since CΨ developed around the time of Plato and Aristotle, it follows that the primitive man functioned on the basis of non-conscious processes, like a kind of zombie (devoid of CΨ but physically and behaviorally indistinguishable from a conscious person). To support this approach, it is possible to appeal to cognitive psychology research, which proposes that a great deal of human behavior is unconscious (occurring without awareness). For example, no one is aware of their own memory retrieval processes. These processes are very fast, automatic, and not in the domain of CΨ.

On the basis of split-brain research (Gazzaniga’s split-brain experiments in 1967), Jaynes proposed that our ancestors were in what he called a “bicameral” (two-chambered) state of mind, a mechanism whereby the right side of the brain, the visual side, transmitted hallucinatory voices to the left hemisphere which listened and obeyed these voices as though they were commands from the gods (or from ruling figures such as kings). This mechanism collapsed in the 2nd millennium BC, and consciousness as we understand it today developed in its place. There were several reasons for the disintegration of the bicameral mind, mainly population growth, the building of empires, wars, and the migration of large groups. All of these factors contributed to undermining the influence of the ‘voices’ of the gods, and the ancient mind had to evolve and become self-aware to adapt to the changing world. This gave rise to consciousness.

As I mentioned above, Jaynes’ book has sparked much interest and debate (e.g., Rowe, 2012). While Jaynes’ theory is very interesting, I do not think it is true. It is not appropriate for present purposes to summarize the relevant literature and point out the weaknesses of various arguments, but I can offer an alternative and simpler explanation that contradicts the theory of the bicameral mind. Although Rowe (2012, p. 99) tries to explain “... the absence of consciousness in the ancient world” (by using the executive function that includes memory, inhibition, and planning), he does add: “However consciousness is conceived, most people find it difficult to believe the assertion that Bronze Age Greeks and ancient Egyptian pyramid builders did not possess it.” I am one of those people.

Contrary to Jaynes, I assume that all humans before, during, and after the bicameral era had consciousness (it is inborn and not a product of language). They experienced sensations, feelings, thoughts, and inner images, and some of them even heard hallucinatory voices in their heads. In other words, I hold that consciousness in people has existed for thousands of years. In short, I do not accept the distinction between the mentality of humans in the past (bicameral man) and that of humans today. However, I do accept the hypothesis that the Homeric man might have attributed subjective mental experiences (hallucinatory voices) to the gods, perceiving them as commands. (It is important to emphasize that Jaynes considered hallucinatory voices as a cornerstone in his theory. See, e.g., Rowe, 2012, p. 103.) My interpretation of this, which I have called the “faith-interpretation”, is as follows.

The ancient Greeks heard voices in their heads and attributed these voices to the gods because this fitted in very well with their complete and total belief in the gods. At that time, people believed that the gods on Olympus managed the actions of people and punished and rewarded them according to their moral standards. This very deep belief in the gods and their reign over humans was the determining factor that led people to attribute their inner voices to the external gods, not a bicameral mentality. (The vocal commands heard in the head are conceived of today in a completely different way.) To strengthen this alternative interpretation, the faith-interpretation, I appeal to two examples from the Bible. The first story is famous: Abraham heard God commanding him to sacrifice his only son Isaac, and he prepared to carry out that command (Genesis, chapter 22). My interpretation is that Abraham heard the vocal command in his head and attributed it to the voice of God. Earlier, it is said that God commanded Abraham to leave his homeland and go to the promised land (Genesis, chapter 12). Once again, I propose that Abraham imagined the vocal command. The second story is an account of how God revealed himself to Samuel the Prophet (Samuel 1, chapter 3). God called the boy Samuel several times and it was only after the fourth time, when old Eli realized that God wanted to talk to Samuel, that the boy answered God. And here again, it seems clear to me that the voices heard in the head (Samuel’s in this case) were attributed to God’s will, which corresponded with the prevailing faith.

**(1.3) The evolution of consciousness: animal perspectives**

Given the above, one may see that the activity of the brain, which produces CΨ, is dynamic and that conscious and unconscious cognitive processes continue to develop throughout a person’s life. According to evolutionary theory, the processes responsible for the creation of all degrees of CΨ are rooted in the distant past of humankind. They originated hundreds of millions of years ago (e.g., Blackmore, 2013; Fabbro et al., 2019; Jaynes, 1976; Feinberg & Mallatt, 2016).

About 540 million years ago, there was a tremendous burst of diversification on Earth with the emergence of many new organisms, an event called the “Cambrian explosion”. In fact, most of the animal species we know today appeared in the evolutionary chain at that time. The reasons for this are unknown, but it is speculated that this explosion was related to an increase in oxygen levels and perhaps to the development of animals’ visual mechanisms, which split them into two main types: predators and prey. The development of the nervous system and especially the creation of the primary layers of the brain (as a result of natural selection) during and after the Cambrian period were crucial conditions for the creation of basic, primary, sensory CΨ in all animals, whether vertebrates, invertebrates, birds, reptiles, or mollusks. Sensory CΨ is the individual’s subjective awareness of external stimuli. After that period, certain conditions developed, which allowed the individual brain to form representations of stimuli and which eventually led to self-awareness and awareness of consciousness itself in the human species.

At a conference on consciousness in humans and animals held in Cambridge, England, in 2012, a group of neuroscientists made the following declaration (see Low, 2012):

We declare the following: “The absence of a neocortex does not appear to preclude an organism from experiencing affective states. Convergent evidence indicates that non-human animals have the neuroanatomical, neurochemical, and neurophysiological substrates of conscious states along with the capacity to exhibit intentional behaviors. Consequently, the weight of evidence indicates that humans are not unique in possessing the neurological substrates that generate consciousness. Non-human animals, including all mammals and birds, and many other creatures, including octopuses, also possess these neurological substrates.”

## Similarly, in 2024 at a conference held at New York University on the subject of the science of consciousness in animals, a large group of scientists made the following statement (The New York Declaration on Animal Consciousness, New York University, 19 April 2024):

Which animals have the capacity for conscious experience? While much uncertainty remains, some points of wide agreement have emerged.

First, there is strong scientific support for attributions of conscious experience to other mammals and to birds.

Second, the empirical evidence indicates at least a realistic possibility of conscious experience in all vertebrates (including reptiles, amphibians, and fishes) and many invertebrates (including, at minimum, cephalopod mollusks, decapod crustaceans, and insects).

Third, when there is a realistic possibility of conscious experience in an animal, it is irresponsible to ignore that possibility in decisions affecting that animal. We should consider welfare risks and use the evidence to inform our responses to these risks.

I believe that these two declarations, made by international groups of scientists concerned with the issue of CΨ in animals, provide strong support for the hypothesis that all animals are endowed with CΨ to some degree (e.g., Allen & Trestman, 2024; Blackmore, 2013). All I can add in this regard are the following natural observations (based on Rakover, 2007, 2019) and the results of animal experimentation (on white laboratory rats and fishes) (Rakover, 1975, 1979, 1980). These can be interpreted quite simply as indicating that animals are endowed with a certain level of CΨ (sensory CΨ in particular).

**First observation:** **the dog and the elevator**. My flat is located in block A of an apartment complex situated on a hillside (e.g., Rakover, 2019). In block B, located directly above, a dog owner lives. His pet, Doggie, is the protagonist of this observation. Below complex A is a parking lot, from which a corridor leads to an elevator that connects the parking lot level to an exit level with a small garden, from where the apartments in both blocks A and B can be reached. The elevator ascends and descends nonstop between the parking lot level and the exit garden level, and occupants of the two blocks can use it.

Doggie customarily lies about in the parking lot all day long, looking out onto the street from which cars enter the parking lot. One day, after parking my car and walking toward the corridor that leads to the elevator, Doggie began following me, then ran ahead of me, turning round to look at me from time to time to make sure that I was still there. This behavior continued while I walked along the corridor to the elevator. I pressed the elevator’s call button, and the two of us waited for the elevator to come down. When the elevator doors opened, Doggie quickly went inside, and I stepped in after. I pressed the “up” button, and when the elevator reached the top floor, the doors opened onto the garden, and Doggie ran out and entered block B.

How can Doggie’s behavior be explained? To propose an explanation, I need to add two important facts. First, this was the first and only time that Doggie and I walked along the corridor and went up in the elevator together. Second, Doggie and I were familiar with one another thanks to the many times that he saw me from the parking lot entering or leaving the corridor. I suggest that a teleological explanation can be given for the range of Doggie’s behaviors (overtaking me, running, looking back, waiting for the elevator, etc.): Doggie’s purpose was to reach his dwelling place, his master’s apartment in block B. To achieve this purpose, Doggie made use of the behavior he expected from me, namely ascending in the elevator to the garden. To this end, Doggie had to work through a process of memory retrieval. He had to recognize me as a human who lived in the building, habitually walked to the elevator, and rode in it to the garden level. (It is reasonable to assume that Doggie had taken the elevator several times with his master and generalized that information to apply it to me, as another human inhabiting the apartment complex.) The ways in which Doggie used these pieces of information are expressed in his behavior. He recognized me, ran and overtook me on my way to the corridor, checked from time to time whether I was walking in the correct direction, entered the elevator, and kept an eye on the doors in anticipation that they would open onto the garden (he stood in the elevator with his nose pointing in the direction of the exit).

According to this explanation, Doggie is endowed with many mental abilities. For example, he can store past pieces of information, retrieve them, and use them to guide his behavior. Since Doggie recognized me, it is reasonable to propose that he had access to information about the past. To be sure, Doggie does not possess the intellectual abilities of a human, but his cognitive abilities are sufficient to contend with challenges such as ascending in an elevator. Furthermore, although we cannot know whether Doggie has self-awareness, we may assume that he has fairly high levels of recognition of feelings and desires. Moreover, if he is aware of his own desires, it is possible to hypothesize that he is conscious that these desires are his own, that he knows how to plan ahead, and that he may have some low level of self-awareness.

I do not think that another explanation based on instinctive processes alone will succeed in fully explaining Doggie’s behavior. Likewise, a theory of mechanistic learning would be hard-pressed to explain the behavior of a dog that fetches the leash for its master, to urge him to take it out for a walk.

**Second observation: the pampered cat**. This observation relates to my Himalayan cat, Max (based on Rakover, 2007). Late one evening, when I was watching television, Max approached me. With his forepaws, he scratched at the edge of the armchair in which I was sitting and then sat on his hind legs, looking up at me with his blue eyes. We exchanged looks. I leaned toward him, picked him up, settled him on my knees, and stroked him. How can Max’s behavior toward me be explained?

A teleological explanation for this observation would be that Max wanted me to pet him. In this case, the act of scratching (the edge of the armchair) undergoes a change of function, from a natural, adaptive, survival function to the function of attracting my attention with the aim of being petted. Scratching is a natural cat behavior, and cats do this for various reasons: defense/attack, hunting, marking their territory with scent glands, and keeping their claws in good condition. (Max has a special stand on which he customarily sharpens his claws.) None of these functions were activated in the present observation. Hence, the scratching acquired a new function: a means to attract attention (to be petted). A long learning process led to the acquirement of the new function.

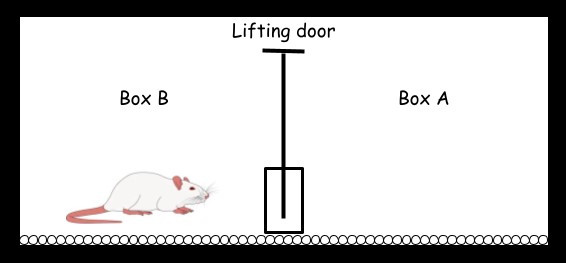
Based on these two observations, it may be suggested that animals (dogs and cats, at least) have cognitive processes that make it possible for them to learn to adapt to their environment: They remember past events, change their behavior accordingly, and as a result become able to plan ahead. These reactions are intertwined with CΨ. This conclusion arises from the fact that in both observations, the animals made rational considerations based on several pieces of information that helped them to perform the right behavior to obtain their desire. In view of the above, did Doggie and Max demonstrate a theory of mind? This would be an extreme proposal. I do not believe that Doggie and Max possess a theory of mind according to which they assume that I have certain mental states and processes and that my behavior can be predicted on this basis. It is more likely that they formed some sort of a “behavioral hypothesis,” suggesting that under certain conditions, I would behave in a certain way, which meant they could exploit this to achieve their goals. Does this interpretive description support the suggestion that these animals have consciousness? It seems to me that the answer is yes.

Does this level of cognitive development allow the animal to develop self-awareness? (I use the term ‘self-awareness’ here as being equivalent to the term ‘self-consciousness’; see, for example, Smith, 2024. I will come back to this complicated issue of self-consciousness in Chapter 6.) This is an extremely difficult question. Nevertheless, I tend to give a very cautious and hesitant affirmative answer because the above explanations were based on the animal’s inner world. Doggie wanted to get to his master’s apartment and used me as a means of achieving his goal; Max wanted me to pet him and achieved this by scratching the edge of the armchair on which I sat. These interpretations suggest that both animals acted intentionally and took into account the way I was behaving. Despite these speculations, one must consider that experiments on various animals have shown that dogs and cats do not pass the mirror test that indicates self-perception, signifying self-awareness (see below and Gallup & Anderson, 2020).

**Two experiments on fear and avoidance.** Rakover (1980) showed that bar-press avoidance learning is affected by the intertrial interval and demonstrated that fish, like rats, learn shuttle avoidance better than lever-press avoidance (Rakover, 1979). These results can be interpreted as indications that rats and fish experience suffering, that they feel pain and fear, because they invest energy and work hard to avoid pain, which is signaled by a stimulus arousing fear (see Dawkins, 1987, who suggested that a good measure of suffering is the effort invested in avoiding suffering). These findings are particularly interesting since several researchers believe that fish may not be bothered by pain (see Allen & Trestman, 2024).

**Measuring fear by pain**. If a patient experiences sharp pain during a dental treatment, the patient may avoid returning to that dentist or may prefer to postpone the next treatment for a long time. Since postponing treatment may worsen the dental problem, it could be proposed that the patient is paying with pain for their fear. Fear of pain may be seen as suffering in addition to the physical sensation of pain itself. Rakover (1975) attempted to measure fear with pain in laboratory rats. Dawkins’ (1987) experimental question was: How much pain is a rat willing to endure in order to avoid fear? In other words, what degree of pain is a rat willing to endure to avoid a situation in which it previously received a strong electric shock?

This question was answered empirically by the following procedure that was implemented using a device consisting of two boxes, where Box A is connected to Box B but separated by a lifting door (see Figure 1).



**Figure 1.1** schematically describes the experimental device. In the first step, the rat receives a strong electric shock in Box A. In the second step, the rat is moved to Box B, the door is opened (raised), and it receives another electric shock, which increases in intensity until the rat moves from Box B back to Box A. The small circles on the floor of the device represent the bars through which electric shocks were delivered to the rat’s legs. The rectangle in the middle marks the small fence between the two boxes.

First, a rat confined in Box A received a strong electric shock (in milliamps [mA]), and as a result, Box A aroused strong fear in the rat. Then, the rat was transferred to Box B, where it received another electric shock that was weak at first and then steadily increased. This situation raises the following question: What level of pain (caused by the increasing electric shock in Box B) is a rat ready to suffer in order *not* to enter Box A, which arouses strong fear? The results showed that the degree of pain that the rat was willing to endure in Box B to avoid entering Box A increased as a linear function of the intensity of the electric shock that the rat received previously in Box A. It was found that FearmA =.23xPainmA. For example, if PainmA = 2mA, then FearmA =.46mA.

This result indicates two interesting points. First, the rat was afraid to return to the box where it had received a strong electric shock in the first place, because it was willing to pay in suffering (in pain) for the avoidance of something that caused fear.

Second, it appears that the rat’s behavior in this experiment was rational, where rational behavior is defined as behavior that lies between the following two limits.

*Lower limit*: if the rat enters Box A, which arouses strong fear, without even feeling minor pain in Box B, one may say that its behavior is not rational, because it has learned nothing from its past experience (the pain it suffered previously in Box A).

*Upper limit*: if to avoid entering Box A the rat in Box B suffers pain that is greater than the pain it suffered previously in Box A, one may suggest that its behavior is not rational. The rat pays to avoid the cause of fear with pain that is greater than the pain it suffered previously.

The fact that the rat’s suffering was between the lower and upper limits shows that its behavior was rational. It is interesting to note that in many cases human behavior is not necessarily rational. People are willing to pay more than the upper limit, for example, when they reject medical treatment due to fear and allow a health problem to worsen; or when they risk their lives in bloody wars for the sake of dubious glory.

The observations and results of the experiments that I have described above all indicate with a reasonable degree of certainty that animals (dogs, cats, fish, and rats in the above examples) are endowed with a certain (sensory) level of CΨ. However, the question of whether behaviors are valid indices of CΨ in humans and animals arouses vigorous debate (e.g., Irvine, 2013a, b). Furthermore, in her book on the concept of CΨ, Irvine (2013b) suggested that, in light of the many methodological issues surrounding the measurement of CΨ, one should doubt the validity of these measurements and eliminate the concept of CΨ from scientific research. I do not accept this approach, which seems to me too extreme. On the basis of the examples discussed above (the observations and experiments) and considering the above-cited declarations of researchers who claim that animals do possess CΨ, I reject Irvine’s “scientific eliminativism”. (Later I present additional arguments against Churchland’s “eliminative materialism”.)

I am well aware of the methodological problems associated with the attribution of CΨ to animals and even to other humans, which is also referred to as the “problem of other minds” (e.g., Allen & Trestman, 2024; Avramides, 2023; Rakover, 2007). Indeed, it could be argued that since CΨ is a subjective and private phenomenon, it is not amenable to objective research. However, if one accepts, as I do, the assumption that CΨ, like all other phenomena in life, developed in an evolutionary manner and is therefore not epiphenomenal, one would be able to justify scientific research in CΨ (see the discussion in Allen & Trestman, 2024). On this basis, as we will see later, I have developed a mentalistic model of explanation (based on the inner world of the individual) to account for the public behavior of the individual.

**(1.4) Evaluating consciousness by conducting experiments.** A fundamental question is how can one know if a certain behavior indicates a state of CΨ? How may a behavioral index indicate whether an individual is in a state of CΨ or not? These are important questions for all those who wish to judge whether another’s behavior signifies CΨ. Why? Simply because only the individual knows if he or she is in a state of CΨ. However, even individuals themselves are not always aware of all the stimuli in their field of perception. For example, are you aware of what is happening in the periphery of your field of vision? You are certainly aware of the stimulus on which you are concentrating. However, are you conscious of the stimuli around the center of gaze? Consider, too, extreme situations in which a doctor wants to know if the coma patient has a certain level of CΨ; and if so, can the patient in a vegetative state show any signs of CΨ? These are matters of life and death.

Huge effort has been made in research into certain behavioral phenomena associated with changes in CΨ, such as the phenomena of ‘blindsight’ and ‘binocular rivalry’. (The former refers to when people respond correctly to visual stimuli, which they do not consciously perceive because of [lesions](https://en.wikipedia.org/wiki/Lesion) in the [visual cortex](https://en.wikipedia.org/wiki/Visual_cortex#Primary_visual_cortex_(V1)). The latter refers to when people perceive two different alternating images instead of one superimposed image when two different images are presented to each [eye](https://en.wikipedia.org/wiki/Human_eye). For a review of other behavioral phenomena indicative of CΨ, see Kim & Blake, 2005.) The indicators of these behaviors relating to CΨ can be divided into two main categories: subjective (verbal reports) and objective (behavior, neurophysiological activity in the brain) (e.g., Blackmore, 2013; Hunt et al., 2022; Irvine, 2013a; Seth et al., 2008). However, as it turns out, appropriate statistical and theoretical analyses have shown that none of the subjective or objective indexes is immune to serious flaws. For example, Persuh (2018) suggests that objective indexes specify the individual’s behavioral performance rather than their CΨ. To elaborate a little on the criticisms of objective measures of consciousness, I will focus on two behaviors, one related to humans and the other to animals (for criticisms directed against subjective measures, see the articles above).

The *binocular rivalry* phenomenon can be used to discover the neural correlates of consciousness (NCC) (e.g., Blake et al., 2014; Miller, 2015). In normal vision, the individual perceives the same stimulus with both eyes, though each eye views the same stimulus in a slightly different way. The brain creates a coherent union of these stimuli and thus one perceives a stable uniform image (a three-dimensional one). However, when each eye is presented with a different image (e.g., the right eye is presented with a face and the left eye with a house) instead of perceiving a superimposition of these two different stimuli, the observer experiences the phenomenon of binocular rivalry whereby visual perception alternates between the two visual stimuli: One stimulus is seen for a few seconds, then the other, in a random order. The phenomenon of binocular rivalry makes it possible to discover changes in the neurophysiological processes in the brain that correlate with changes in the awareness of the two different stimuli that are presented separately to each eye. As one might expect, the idea of a connection between brain activity and CΨ has been criticized. In my opinion, brain activity can be interpreted as an effort to process the information derived from the presented stimuli and not necessarily as a process that generates CΨ. Blake et al. (2014) and Miller (2015) have put forward a number of interesting reasons to doubt the hypothesis that the NCC discovered in the experiments on binocular rivalry are the neural correlates of CΨ. While Blake et al.’s article concentrates mainly on certain conceptual issues, Miller’s paper emphasizes methodological ones. The main problem highlighted by Miller (2015) is that research in CΨ should focus on attempts to discover not the neurophysiological *correlates* of CΨ, but the neural *constitution* of CΨ. However, an acute methodological problem arises here: No empirical strategy is capable of distinguishing between the *correlates* and the *constitution* of CΨ. A detailed analysis of this distinction ultimately leads Miller to suggest a new approach to the science of CΨ.

The *mirror self-recognition* (MSR) test is one of the most important and well-known tests for determining CΨ in animals (e.g., Allen & Trestman, 2024; Blackmore, 2013; Gallup, 1970, 1998; Povinelli, 1998). When chimpanzees stand in front of a mirror for the first time, they react to the figure they see in the mirror as another chimpanzee. Over time their behavior changes and can be interpreted as if they are seeing themselves in the mirror (e.g., they examine the inside of their own mouths). To rule out the interpretation that the chimpanzees are just intrigued by the figure in the mirror (for example, Max the cat showed interest in the figure in the mirror until the moment he tried to smell it, see Rakover, 2007), Gallup carried out the following experimental manipulation. He anesthetized the chimpanzees, drew two red dots on their foreheads, and placed them in front of the mirror after they woke up from anesthesia. The result was that the chimpanzees showed great interest in these dots (touching and rubbing them). Gallup’s interpretation was that they remembered themselves without the dots and wanted to know what these marks that had appeared on their forehead were.

The introduction of the MSR test sparked a great deal of further research. Studies revealed that certain animals (such as orangutans and baboons) passed the MSR test, but other animals did not recognize themselves in the mirror (e.g., cats). After rigorous examination of the experimental evidence, Gallup and Anderson (2020) proposed that only chimpanzees, orangutans, and humans convincingly passed the mirror test. The test has raised substantial questions about the relationship between the findings of the test and the attribution of CΨ to animals. Here is not the place to review the rich literature on the subject. However, it seems to me that the following commentary may be of interest. In my view, the MSR test can be interpreted in many different ways. While Gallup believes that the results of this test can indicate self-recognition that points to self-awareness, that is, CΨ, other researchers offer interpretations that contradict Gallup’s view. In my opinion, one may conceive of the MSR experiment as a conundrum that the animal has to cope with. The animal may regard the figure in the mirror from several points of view, such as: (1) It is a strange and intriguing shape; (2) It is a figure whose movements are related to my movements; (3) Who is this animal? I have never seen it around. (4) What a strange and terrifying creature. It has a familiar shape, and it is in a familiar environment; but it does not smell, it does not make a sound, and it has a strange and scary gaze. (5) Hey, I can see inside the mouth of this creature; what does it have in there? These possible interpretations may indicate that the MSR test does not determine whether CΨ exists in animals, but rather, it uncovers different cognitive abilities (attributes), such as curiosity and apprehension that the figure in the mirror arouses in animals. It should be added here that the different degrees of a cognitive attribute (such as intelligence) do not correlate with CΨ because, for example, cowardly and brave humans are blessed with the same level of CΨ and so are the foolish and the wise. In other words, the same level of CΨ applies to people who are very different from each other (for similar ideas, see Koch, 2019).

In view of these criticisms, the following question arises once again: Are all animals endowed with CΨ similar to that of humans? This question may exacerbate the “problem of other minds” that was mentioned above. According to this problem, an individual cannot justify their confidence that another person has CΨ similar to their own because one can only observe one’s unique inner world (e.g., Avramides, 2023; Fabbro et al., 2019). Usually, in everyday life, we tend to accept the other’s verbal report as reliable evidence for their state of mind. We accept that the other has a subjective inner world similar to ours without disputing this assumption. However, because animals are not gifted with the ability to learn and use language like humans, the problem of other minds is compounded in their case. We have no choice but to rely on observations of their behavior and neurophysiology (Koch, 2019, offers an overall positive answer based on the integrated information theory (IIT) of consciousness, which I will discuss in the next chapter). Nevertheless, given all the arguments for and against CΨ in animals and considering the proposition that CΨ has developed in an evolutionary way, I am inclined to propose that the answer is ‘Yes’, animals do have a certain level of CΨ similar to that of man—a form of sensory CΨ.

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