On the Science of Consciousness: Epistemological Reflections and Clinical Implications

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Consciousness has been one of the most important and tantalizing issues ever since the origin of philosophy and medicine. The concept of consciousness and the so-called "hard problem" (i.e., the mind–brain relationship) are highly complex topics that have yet to be elucidated, involving the realms of both science and philosophy with profound epistemological implications. In the lively debate on the foundations of the science of consciousness there are several potential biases of an essentially philosophical nature, such as those related to the paradigm and axioms adopted, and the ostensible logical contradiction between monism and dualism. Their origin dates back largely to Descartes' thinking and the birth of the new sciences as a compromise with the Inquisition, but they have been handed down through the Enlightenment and Positivism. A proper investigation of consciousness and the world of subjectivity demands a careful reflection on the paradigm of scientific medicine to identify possible flaws and overcome the limits of the mechanistic-reductionist approach.

Keywords: Consciousness, Epistemology, Psychology, Religion, Science, Spirituality, Hypnosis, Meditation, Human mind

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INTRODUCTION

Consciousness, the mind, and the soul have been among the most important and tantalizing issues ever since the birth of philosophy and medicine. Speculation on their nature dates back to Pre-Socratic philosophers like Pythagoras in the West, and to Vedic tradition, Yoga and Buddhism in the East. The soul has since been studied for some 2000 years in medicine as well.[1,2] Since the late 19th century, both consciousness and the soul have become controversial topics that the ruling positivist and physicalist stance prefers to disregard.

Wundt rejected the concept of an unconscious and dismissed Freud's ideas as pertaining to a "*mystical psychology*". The behaviorism stemming from Wundt's experimental psychology committed consciousness to oblivion up until the 1980s.[3] As Williams James put it, "*Souls are no longer fashionable*" (quoted by Assagioli).[4] This raises the question of whether consciousness and the soul are an illusion adopted by humankind as a whole, or the mere misconception of a modern intellectual elite fascinated by the materialist approach to the outer world. It is hard to say.

Consciousness has attracted a great deal of interest in the past 30 years, and a wealth of information on its neurophysiological, physical, molecular, psychological, and behavioral aspects is now available in the literature. Consciousness is not a strictly medical topic, but enters the fields of psychology, biology and physics, and epistemology and philosophy too, posing an increasing need for interdisciplinary efforts and exchanges of ideas. In fact, the problem of the nature and role of consciousness is endowed with far deeper aspects than the more limited, though essential issue of its cerebral correlates. The science of consciousness is complex, many questions remain to be answered, and—given the breadth of the fields of knowledge involved—an open-minded approach is needed to avoid taking restrictive or prejudicial stances based on an individual's education and beliefs. Personal convictions can strongly influence the study of consciousness, inadvertently introducing crucial flaws of a metaphysical nature, as discussed below.

The same profound epistemological implications behind the science of consciousness may also permeate medicine, and clinical practice generally, affecting how we approach patients and the diagnosis of their conditions. For example, taking an unyielding reductionist approach a priori means underestimating or disregarding the psychological and psychosomatic components of a patient's symptoms and disorders. Far from being a matter for the philosophers alone, the epistemological

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issues discussed here also concern every professional involved in medical research and clinical practice.

Consciousness is not just another scientific conundrum. It has always been at the very heart of the matter of being human and an extremely complicated issue to analyze. Consciousness includes not only subjective phenomena, in the sense of something separable from physical phenomena. Everything perceived and experienced about the outer world resides in and comprises the stuff of consciousness (the World 3, according to Popper and Eccles).[5] Bearing this in mind may help us to escape the endless debate and logical contradiction between monism and dualism, materialism and immaterialism, often implicit in any discussion on the science of consciousness, and deriving from the limited and weak concepts adopted in the past, which were drawn from phenomenal realism.

In the history of the science of consciousness, the above-mentioned discontinuation of its study during most of the 20th century points to its dependence on the so-called *spirit of the time*, viz. the accepted axioms and theories. As a result, two opposing options became available at the start of the 21st century: (1) the physicalist stance—which leads to a disregard for consciousness in relation to the soul (seen as a merely nominal feature, devoid of any scientifically definable value)–is a well-established evolution of scientific and philosophical thought; or (2) the concept that consciousness and the soul (however ill-defined) are not just plain, passive (and meaningless) epiphenomena of the brain circuitry, and cannot be reduced to physical mechanisms alone. Should the former be true, then there would be no point in studying consciousness; or else it would be indispensable to reappraise the physicalist paradigm right from its very foundations, to seek possible biases, before attempting to study consciousness, and subjective phenomena in general. *Tertium non datur*.

Here we take no stance on the issue, but merely wish to focus attention on a few crucial philosophical aspects of the matter, in an effort to move beyond certain pointless elements in the still ongoing debate on the foundations of the science of consciousness, and the related dispute between monists and dualists. Of course, our considerations must remain strictly within the bounds of science. On the one hand, science cannot be constrained within the limits of the axioms and paradigms adopted at any given time, and this goes to show the inescapable pragmatic relevance of the philosophical issues behind science. The aim of this article is to provide a brief outline of the issues involved in order to draw attention to possible weaknesses and flaws springing from the use of mental tools (e.g., language, logic, axioms, paradigms, and theories).

SEMANTIC APECTS

The term *consciousness* has a variety of meanings, making it ambiguous and a potential source of misunderstanding among scholars studying different aspects of consciousness. It is also closely related to a number of mental functions, making its definition even more complex. Table 1 shows the main aspects of consciousness, the related mental functions (which may not be constitutive parts of it, but are able to shape conscious activity), and some neuropsychological disorders (capable of influencing consciousness, even though they are not disorders of consciousness in themselves). Some non-ordinary mental expressions (NOMEs) have also been included, to stress the existence of ostensibly odd, though not pathological human mental activities.

Figure 1 synthetically illustrates consciousness and its relationship with the brain, and the individual's outer and inner world. The latter (left circle) is identified as the "*hall of mirrors*" (i.e., "World 3", according to Popper and Eccles),[5] indicating the relationship between the outer world (as it is in itself) and its human representation. Dotted lines are used to shape all these elements in order to emphasize the conventional nature of their conceptual boundaries, the close relationships between them and their permeability in relation to one another. There is a close link between the outer world as it is in itself and the hall of mirrors, but they are far from being one and the same thing.

The above-mentioned terminological issues and the complex, elusive nature of consciousness have favored different approaches, taking both monistic and dualistic stances. This has also given rise to two apparently incompatible main theoretical schools, i.e., the neurophysiological and the cognitivist. The essential assumption of the former is that consciousness is a "thing", i.e., belonging to the realm of the *concreta*, while the latter assumes that it belongs to the world of *abstracta*, i.e., it is "a process, not a thing".[6] Such a distinction might seem spurious, simply missing the dictionary definition of the term "thing", which indicates both a physical object and an action, activity, concept, or thought (Oxford English Dictionary).[7] This example shows how hard it is to establish suitable foundations for new fields of knowledge, which are necessarily based on metaphysical concepts, hypotheses, undemonstrated axioms, nominalism, and linguistic ambiguities, reflecting our ignorance rather than our knowledge.

Communication has always been influenced by rhetoric and the art of persuasion, ever since the time of Plato and Aristotle, who were seriously concerned about how strongly rhetoric could influence *apódeixis* (the rigorous demonstration required to establish knowledge). Rhetoric was used in discussions in the sphere of politics and law, as well as in medical debates.[8] After more than 2000 years, the situation has not changed: science relies heavily on the narration and communication of results, and on their critical discussion among scientists. This is the best way to recognize errors, but science is still far from unerring. It is especially easy for errors to occur when dealing with subjective phenomena, and even more so in the case of unconventional topics, such as NOMEs and psi phenomena,[9] due to their ostensible implausibility. But plausibility is conventional in nature, and reliant on accepted axioms and knowledge established at any given time,[10] while phenomena and facts are not implausible or false in themselves.

EPISTEMOLOGICAL AND PHILOSOPHICAL ASPECTS

As mentioned earlier, the question of consciousness has profound philosophical implications that date back to the

Table 1. The main features of consciousness, related mental activities, and the neuropsychological disorders affecting consciousness and non-ordinary mental expressions (NOMEs). Dream and sleep have been included as separate phenomena because they are the inevitable, cyclic counterpart of consciousness

Features of consciousness			
Arousal	Ego	Dream	
Awareness	Qualia	Sleep	
Drowsiness	Self		
Excitation	Wakefulness		
Mental activities			
Absorption	Emotions	Intention	Motivation
Action planning	Empathy	Introspection	Perception
Attention	Experience	Judgement	Reason
Compassion	Feelings	Love	
Conscience & ethics	Imagination	Language	
Dissociation	Inner thought	Memory	
Neurological disorders			
Akinetic mutism	Coma	Minimal responsiveness	Split brain
Agnosia	Delirium	Neglect	Vegetative state
Aphasia	Dementia	Parkinson's disease	
Autoscopy	Epilepsy	Psychosis	
Blindsight	Memory deficits	Stupor	
NOMEs			
Clairvoyance	Derealization	Lucid dream	Presentiment
ESP[a]	DMILS[b]	Mystical experiences	Synesthesia
Depersonalization	Hypnosis	NDEs	Telepathy
Hallucinations	Meditation	OBEs	Trance

[a]Extrasensory experiences.
[b]Distant mental interactions with living systems.

birth of the new sciences and the subsequent separation of science from philosophy and religion, which has persisted until the present day, giving rise to a fracture and consequently to severe problems of communication between different fields of knowledge.[11] Nevertheless, Husserl claims that modern sciences ideally remain branches of the one and the same philosophy (intended as the world of reason and knowledge), and the positive sciences are professional specializations—limited, but still valuable concepts of this philosophy. They are dedicated to investigating the physical world, but they have often underestimated the need for a critical analysis of the mental processes involved in understanding this physical world, by means of which it is rendered in its actuality, as it has been coded. These fundamental mental processes are briefly analyzed below, emphasizing their practical relevance in the founding of the science of consciousness.

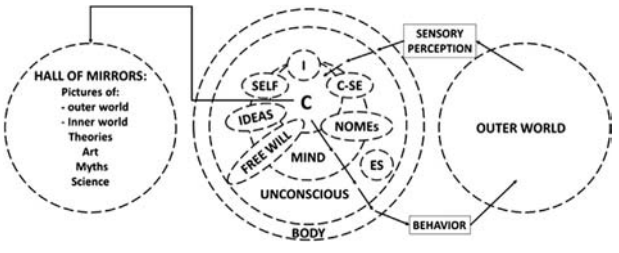

Figure 1. Schematic representation of the main aspects of consciousness: its relationship with other components of the inner world, the outer world and its conscious representation. Dotted lines are used to emphasize the permeability and close relationship between all these elements (C = consciousness; C-SE = conscience and super-ego, ES = psychanalytic Es).

Metaphysical Terms

A short definition of the terms dualism/monism and materialism/immaterialism is useful here to avoid any misunderstandings, before any attempt is made to suggest a solution to their logical contradiction. In fact, monism and dualism are metaphysical concepts that can have a variety of meanings and implications, like other previously mentioned terms.

In its more general definition, dualism refers to any doctrine adopting two explanatory principles in any field of investigation (as in religious, metaphysical, psychological, scientific, methodological dualism, etc.). In metaphysics, it essentially indicates the coexistence of two parts, a co-eternal

binary opposition. In the world of consciousness, mental phenomena are believed to be non-physical in some respects, a concept that underscores the non-identity of body and mind. Another important meaning attributed to the term is contained in Kant's critical dualism, indicating the diversity between phenomenal appearance (what we have called the *hall of mirrors*) and the reality of things in themselves.

Unlike dualism, monism acknowledges only one substance, though it may include both idealist and materialist views: the whole world is conceived as the expression of a unitary principle, and any duality between matter and spirit is ruled out.

Materialism is the term used to define all philosophies that deny the existence of any spiritual substances, only recognizing physical substances. Materialists are usually atheist and, in the world of science, they often regard Democritus's atomism as the first materialist perspective, which leads up to the principles of reductionism.

With his mechanistic approach and radical dualism, Descartes inadvertently helped to spread materialism due to the introduction of an irreducible logical contradiction and consequent incompatibility between the *res cogitans* (ego and soul) and the *res extensa* (body and physical world). This enabled the former to be disregarded and the latter alone to be studied, leading to the idea of the *Man Machine* advanced by La Mettrie in the following century, and then to Vogt's famous utterance "*The brain secretes thought as the liver secretes bile*".

Immaterialism refers to the philosophical view expressed by Berkeley, who warned against the common belief concerning the nature of matter, based on phenomenal realism. His "*Esse est percipi*" ("*To be is to be perceived*") emphasizes the irreducibly subjective nature of humans' images of the world (the *hall of mirrors* again). At first glance, immaterialism may seem formally incompatible with materialism, but it does not deny a physical reality; instead, it challenges the illusory stance of phenomenal realism (see below).

It is worth stressing that, although they strictly belong to metaphysics, the above-mentioned concepts are unavoidably the concern of neuroscientists and caregivers, as well as philosophers, because they are strongly implicated in the ongoing discussion on the meaning of consciousness (e.g., see Pockett[6]), and in the definition of the mind–brain and mind–body relationship, along with their clinical implications.

Metaphysical Problems

With its discursive mode of reasoning, the human mind is strongly inclined to substantialize and ontologize, and this has induced us to seek universals since time immemorial. As a result, man has unwittingly projected human categories and beliefs into reality, and taken them for objective properties, even though many philosophers (like Kant) have warned against taking this illusory stance. Western culture, including its science, has consequently been unable to avoid a certain phenomenal (naïve) realism.

Given the huge complexity of this philosophical problem, we can only see a glimpse of a few relevant issues here in an effort to recognize any prejudices persisting in our scientific approach to consciousness, i.e., those related to metaphysics, to the thinking of Aristotle and Descartes, and to the seemingly endless debate between monists and dualists.

The study of metaphysics has been disparaged since the Enlightenment and the arrival of Positivism. Even though the logical empiricism of the early 20th century (which saw science as the highest form of knowledge) judged Western culture to be enslaved by metaphysically founded beliefs that needed to be systematically abandoned, its accepted axioms remain metaphysical in nature. For instance, the physicalist view that consciousness is a plain byproduct of the brain circuity may look sound, but it is axiomatic and—however plausible, self-evident, appealing, readily understandable, and supported by empirical observation of the dependence of the mind on brain function—it has yet to be demonstrated, and it might therefore be disproved in the future.

Posterity turned Aristotle's philosophy into a sort of undisputed, dogmatic doctrine,[11] while the temporal and spiritual power of the Church (with its exclusivist doctrine) subordinated rational investigation to revealed truth for centuries. On the other hand, the rational theology of Thomas Aquinas also provided a rational foundation for religion, probably playing a meaningful part in paving the way to the birth of 17th-century rationalism and the scientific revolution.

Aristotle himself warned against the uncritical use of axioms, which are undemonstrated by definition (*Metaphysics*, 1005B, 1–5). He insisted on the constant need to test their validity— as a duty of the philosopher then, and of the scientist today, while they may be applied by lesser professionals unaware of their limits. For new disciplines, in particular—like the science of consciousness—it is essential to recognize the appropriateness and weaknesses of accepted axioms and theories, and where necessary to move beyond cultural filters. Otherwise there is a serious risk of imposing doctrines, beliefs and dogmas, of whatever origin, even in scientific fields. In the 20th century, the most outstanding example of the ability to fly unfettered by the spirit of the times was Albert Einstein, a philosopher-scientist endowed with a remarkable imagination.[12] New ideas are usually implemented as a result of scientific revolutions, rather than from a linear progression, with revolutionary outsiders (like Einstein and the quantum physicists of the early 20th century) having to win a hard battle with their detractors (the dull guardians of the temple of orthodoxy, or of accepted scientific beliefs and dogmas). After the revolution in the science of physics in the 20th century, the next step may be a revision of the paradigm of medical science.

Descartes made several mistakes in his speculations because he was concerned about obtaining the approval of the Church and Scholastics (Table 2; for further details, see Refs. 10, 13, and 14). According to Damasio, those mistakes have continued to carry some influence. Many people (scientists included) still do not see the need to reconsider Descartes' radical dualism, which has given rise to some apparently irreconcilable contradictions, and to even self-proclaimed monist scientists inadvertently taking a dualist stance. To give an example, there are the cognitivist scientists who do not see themselves as dualist, though they think they can study the mind without considering the brain circuits

Table 2. Descartes' main errors

Errors	Criticism
Cogito ergo sum	Consciousness and ego are not the foundations of the human being, but an evolutionary epiphenomenon. The certainty of *cogito* is perceived by intuition, rather than a demonstrated fact, as in St. Augustine's "*fallor ergo sum*".
Mistaking the ego for the soul	Unlike its Eastern counterpart, Western culture ignored the existence of the unconscious up until the end of the 19th century. Whatever the soul may be (like other entities of the psyche, it is an ill-defined concept), it can be seen as part of the faculties of the human mind and, as such, independent of any religion or theology. In any case, it is not the ego.
Indicating the ego and the intellect as the supreme human faculties	This is the expression of a strongly egocentric culture, which has encouraged and enhanced this stance until recently, arbitrarily awarding intellect and utilitarian abilities supremacy over other mental functions.
The definition of man as a monolithic being endowed with a rational soul	This idea permeated Western culture up until the 19th century, then collapsed under the evidence of unconscious processes and the first reports of multiple personalities.
Radical dualism, which assigns a different ontology to the *res cogitans* and the *res extensa*	There is no separation in vivo, where mind and body are intimately connected, like two sides of the same coin. This idea was used by Descartes to defend the soul from the mechanistic approach, but there is no reason for such an irreconcilable separation, not even in the field of religion.
Dissociation of mind from body	This has led to the observer being excluded from the facts observed, and to medicine being founded as the science of the body merely as an earthen machine, a safe approach in the times of the Inquisition.
Introduction of the mechanistic model in biology	This led to an artificial separation of the functional unity of the mind–body, and to both animals and bodily parts of human beings being considered as *automata*, denying the importance of the complex, inseparable mind–body relationship.

and, vice versa, there are the reductionist neurobiologists who believe they can study the mind taking into account the brain circuitry alone.[13] It is not Descartes' genius that is in question, but the inclination of posterity to turn the founders of disciplines into icons, uncritically accepting questionable assumptions, and running the risk of turning them into ill-founded dogmas.

The new sciences were born with an "*original sin*", i.e., based on a compromise with the Church and the Inquisition, rather than on a free, well-founded epistemological reflection. This led to the soul and consciousness (the Church's exclusive domain) being withdrawn a priori from the field of the new sciences.[10,14] Scientists thus devoted themselves to exploring physical reality, dealing only with "*la materia roza*" ("*the rough matter*") and leaving the soul to "*higher disciplines*" (i.e., theology), to use Galileo's words in his *Dialogues Concerning Two New Sciences* (Day 3, Corollary 3). The world of medicine likewise focused only on the Cartesian *earthen body machine*, disregarding consciousness and the soul, and safeguarding itself against the Inquisition. A degree in medicine nonetheless continued to be a degree in *Medicine and Philosophy* up until the 18th century (Figure 2), when advances in the sciences and their separation from philosophy meant that the latter was no longer a part of a physician's training, and any residual contact between medical science and philosophy was lost for good.

It is due to these historical circumstances that the science of medicine developed by increasing its knowledge of physical diseases and its ability to manage them, but neglected consciousness, the soul and subjectivity, relegating the latter to the realms of religion and philosophy up until the end of 19th century.

The other relevant aspect to consider is the key role of dualism vs. monism in the debate on the science of consciousness and subjective phenomena, the logical contradiction of which looks like an insurmountable wall. It may be impossible to properly found the science of consciousness and other subjective phenomena until these seemingly irreconcilable incompatibilities have been overcome. The so-called *hard problem* (a term coined by Chalmers[15]) lies at the heart of the matter: it is an age-old issue, formerly known as the mind–body problem. Neuroscience has redefined it as the mind–brain relationship, thus shifting the focus from the body to the brain without affecting its metaphysical involvement in the debate of dualism vs monism.

What Chalmers called the *easy problem* concerns the mechanistic approach to consciousness based on the paradigm governing neuroscience (the problem is far from easy, of course, but the way has been paved and poses no thorny epistemological questions). A solution for the *hard problem* has yet to be found. It has to do with experience, its qualitative features (the so-called qualia), and how they emerge from the brain (even granting the questionable physicalist idea of a bottom-up hierarchy, from the brain to the mind). How the neurotransmitters, electrical activity, and the neural circuits relate to the experience of colors, pain, emotions, feelings,

li Benedictione . Sic itaque summa cum laude, ac honore plurimo prę=
dictus Perillustris Dominus SEBASTIANVS de ANTONIIS
ad summum apicem Doctoratus Philosophię, et Medicinę (DEO fa=
uente) peruenit . An quorum omnium, et singulorum supraseri =

Figure 2. Degree in Medicine and Philosophy, University of Padua December 23rd, 1687. Diploma granted to Sebastiano Silvio de Antoniis from Vicenza. Bottom: detail of the 2nd page (ll. 7–10) *"…Perillustris Dominus Sebastianus de Antoniis ad summum apicem Doctoratus Philosophiae et Medicinae…"* (Adapted with permission from: Diplomi di Laurea all'Università di Padova (1504–1806). Baldissin Molli G et al. (Eds), Biblos, Cittadella, © Università di Padova, 1998).

and all other experiences as they are lived in their actuality with their meaning remaining a mystery closely associated with the metaphysical problem of monism vs. dualism. Scientists and philosophers taking the materialist stance, according to which the mind is merely a byproduct of the brain circuitry, define themselves as monists, while those interested in the qualia and the *hard problem* (like Chalmers) are labeled as dualist.

In short, though it may seem scientific in nature, the hard problem and its solution are endowed with essentially metaphysical implications. As a result, there is paradoxically nothing more relevant and pragmatic than philosophy in the foundations of the science of consciousness. On the other hand, finding a solution for the incompatibility between monism and dualism might be no less hard than the *hard problem* itself, but it is worth trying to identify any sources of prejudice behind their incompatibility as part of the process leading to its solution.

The dominant scientific stance is monist-materialist, meaning that the term "dualist" is considered in a negative sense, almost an affront to hard scientists. Psychoneural dualism, i.e. the old idea that matter and mind are separate entities (with Descartes at the cutting edge), was judged scientifically and philosophically untenable by Bunge,[16] who produced a well-shaped, synthetic report of both the dualist and the monist approaches. In his review on the philosophy of the mind, he concluded that philosophy should learn more from the science of the mind, while scientific psychologists should tacitly set aside any dualistic expressions. Both psychoneural dualism and monism appear to be open to question, however,

Table 3. Main arguments against dualism and in favor of monism according to Bunge[16] and related criticism

Dualism: Cons

A. A non-material mind (NMM) cannot have a physical action → Mind–body interaction = oxymoron.
B. The brain can be measured, the mind cannot.
C. The abilities of the mind grow and decay during the lifespan, a fact pertaining to the brain, body and evolution.
D. The NMM violates the law of energy conservation (its activity would imply a creation of energy).

Criticism: The value of the above physicalist remarks depends on what we mean by the terms "immaterial", "energy" and "information". The mind–brain relationship may be better described in terms of information and energy, where action decided by the mind (information driven through the brain) does not contradict the law of energy conservation. The problem therefore lies in the nature of information and energy, and their relationship with the "physical" brain. Pain (a very relevant clinical problem) is subjective, a matter of "experience", and cannot be reduced to its mechanistic aspects alone.[124,149] Both dualist and monist stances are metaphysical, in that they decide a priori what the mind is, and to which logically incompatible categories it belongs.

E. Adopting a stuff/function dichotomy separates psychology from the other disciplines.
F. It endorses the pseudosciences (parapsychology, psychoanalysis and beliefs in the supernatural and afterlife).

Criticism: Psychology and psychoanalysis are valuable, complex disciplines for studying phenomena that cannot be brought down to brain mechanisms alone. The idea of the pseudosciences (including an arbitrary and/or prejudicial mix of disciplines in this category) is a questionable personal opinion, not a demonstration. Parapsychology is the study of physical phenomena beyond those explainable at present, or ostensibly incompatible with adopted axioms,[9,147] while facts, in themselves, can only be true or false, never paranormal. The afterlife is not the domain of the positive sciences, and the fact that its existence cannot be proved does not demonstrate its non-existence.

Materialist–monist conception of the mind: Pros

1. It is at the cutting edge of contemporary psychology and psychiatry.
2. In principle, it may explain all the mental phenomena known to classical psychology.
3. It can deal with the brain mechanisms behind mental activities.
4. The neurobiological approach has enabled the "*ineffective shamanic psychiatry*" to be replaced.
5. It is suited to the materialist ontology and undermines the "*idealist fantasy that world is mental*".

Criticism: The "cutting edge" is the consequence of mechanist–reductionist axioms: it works, but does not prove the inexistence of other possible properties of the mind and other approaches to the treatment of mental problems. It can explain mechanisms, but is blind to experiences and their meanings: reduced to its brain mechanisms alone, even science would cease to exist as such. The criticism of shamanic psychiatry is a personal opinion, not a confutation of its value: transcultural psychiatry is a relevant topic that should not be rejected a priori.[148–151] The "mental world" may turn out to be more than mere fantasy: it might be real once the relationships between matter and energy, between the observer and the phenomenon observed, and between the mind, the brain, the body and the outer world are analyzed from the perspective of quantum physics[58] and taking a stance that is not dualist, but not inflexibly materialist either.

and biased by inadvertent metaphysical, prejudicial assumptions (Table 3 shows the main pros and cons, and criticisms of them).

The main difference and logical contradiction between monist and dualist stances in the field of consciousness seems to lie in whether the focus is on the brain mechanisms or on the agent's experience, respectively, which are two sides of the same coin. The stuff/function dichotomy cannot generate incompatibility, since they are two parts of the same, inseparable reality in vivo. It can only indicate two distinct conceptual aspects (viz. logical categories) that reflect two phenomenal facets of the same living existence. In essence, the views of the monists and dualists thus seem to be partial (though worthy of respect), more a matter of taking sides than of correctly interpreting actual reality.

The above considerations suggest that common potential sources of bias may gather supporters of both monist and dualist views, and may stem from their unwittingly falling back on metaphysical (a priori) assumptions—abhorred, but by no means dismissed even by the monists of modern times. The persistence of a sort of latent metaphysics is due to the inclination to substantialize and ontologize, and thus take concepts, words and cultural categories for real "things" and "substances". Most philosophical achievements (and often scientific ones too) have been based on phenomenal realism, "*a modern heresy*",[17] the expression of "*the dogma of immaculate perception*",[10,14,18] stemming from the inclination of both Galileo and Descartes (in spite of the latter's doubts) to believe that God and man know things in the same way.

Like materialism, monism has also been applied to idealist and even mystical conceptions. For example, all philosophies holding the existence of only one substance, from Plotinus to Spinoza, Shelling and Hegel, have been considered as monist, regardless of whether they admit of something "non-material",

be it the spirit, God or anything else. Spinoza was greatly appreciated by Einstein and Damasio for his wisdom, secular religiosity, and ecstatic contemplation of the laws of nature.[19,20] It is worth noting that Plotinus and Spinoza were both well versed in Eastern philosophies (which have always retained a non-dualistic perspective); instead, Western philosophy has progressed towards a more and more dualistic stance from Aristotle through Descartes, emphasizing the intellect and classical logic as the most important human faculties.

The basic perspective of ordinary consciousness and the discriminant mind has duality, i.e., it knows by recognizing differences and separating what is perceived into opposite classes (light-dark, good–evil, body–mind, etc.). This may lead to an arbitrary perception of the world as being composed of different, independent or even opposing things or "substances", in a dichotomous separation that leads to their complex, intimately integrated relationships being lost. This naïve way of perceiving and knowing should be carefully reappraised because it is potentially dissociative: its unyielding application may be unable to provide a reliable integrated knowledge, with the risk of drifting unawares towards a sort of cultural schizophrenia, an arbitrarily splitting of what in nature is undivided. This aptitude has been strongly favored by the classical tripartite Aristotelian logic, considered (especially the *principle of non-contradiction*) as the most indubitable and incontrovertible law of thought and knowledge for over 2000 years.

The scientific evolution has been paralleled by the emergence of different kinds of logic, such as set theory, fuzzy logic, and dialetheism, which might help us to solve the *hard problem* by providing different approaches, even though they are all necessarily axiomatic. They help to reduce the inflexibility of the Aristotelian principle of non-contradiction, which is valuable but becomes a source of error when applied to the letter. In fact, its validity relies largely on a clear, perfect knowledge of the phenomena being analyzed—something that happens only rarely, if ever; as yet unknown or only partially known phenomena (as is the rule) may wrongly seem incompatible as a result, simply due to our ignorance. Dialetheism, on the other hand, assumes that some propositions and their negations may both be true.[21] It does not reject classical logic, but it does allow for some propositions to be *true* contradictions, i.e., both their statement and their negation may hold. Although it was only reintroduced in the 1970s, the approach is not new: pre-Socratic philosophers, Taoists, some Neo-Platonists and Hegel have adopted a dialetheist view (see Ref. 21 for further details).

Pre-Socratic philosophers such as Heraclitus and Parmenides adopted a non-dualistic paradigm and warned against the dissociative attitude of mind held by ordinary consciousness. Interestingly, theirs was similar to the Taoist paradigm, probably because they shared the same origin in pan-Asiatic prehistoric shamanism, and because of the huge trading and cultural exchanges between East and West in ancient times.[14,22–24] The Taoist concept of *Yin-Yang* is similar to Parmenides' idea of *Light-Night*, well explained in the following words: "*Mortals have settled in their minds to speak of two forms, one of which they should have left out, and that is where they go astray from the truth. They have assigned an opposite substance to each, and marks distinct from one another.*" (*Perì Phýseos,* Fragment 8, 51–54; transl. John Burnet, 1892). The *Yin–Yang* pair in the Taoist view likewise indicates not a substance, but only the attributes by means of which a unique, inseparable, dynamic reality manifests itself: none of them may exist in themselves, but only as a polarity in the world of becoming (like the positive and negative poles of an electric current).

On the whole, these ancient philosophies are sounder than commonly believed, and should be reconsidered, as they suggest a way to overcome the ostensible incompatibility between monism and dualism, and how wrong it is to mistake concepts for substances, and superimpose them on the world, when they are really only clumsy, provisional, cultural attempts to classify phenomenal reality; this is what Kant called a "*natural and inevitable illusion*".[25]

If we move away from the idea of different incompatible substances to that of a single stuff—be it matter–energy, space–time, or mind–body—endowed with coexisting opposite attributes, then the stances of monists and dualists may come closer and closer.

Twentieth-century physics has radically overcome the dualistic separation between energy and matter, perceived as different substances by classical phenomenal realism: they coexist inseparably in the same object (as in the atomic bomb), and they may be converted into each other and become separate from each other with no trouble at all. It is worth mentioning that Taoism had already defined matter as *Yin* and energy as *Yang*, and stated the possibility of their mutual transformation into each other more than 2500 years ago, revealing a remarkably keen view compatible with modern physics. Saying that "matter causes energy", that "energy is a byproduct of matter", or that "particles cause waves", or vice versa, is meaningless in quantum physics—and the same may be true of the mind and the brain.

To conclude this section, it is worth recalling the words of the Nobel prize-winning physicist Richard Feynman, who clearly outlined the huge problem of the plausibility of theories and facts[26]: "*Finally, there is this possibility: after I tell you something, you just can't believe it. You can't accept it. You don't like it. I'm going to describe to you how Nature is—and if you don't like it, that's going to get in the way of your understanding it. It's a problem that physicists have learned to deal with: they've learned to realize that whether they like a theory or they don't like a theory is not the essential question. Rather, it is whether or not the theory gives predictions that agree with experiment. It is not a question of whether a theory is philosophically delightful, or easy to understand, or perfectly reasonable from the point of view of common sense. The theory of quantum electrodynamics describes Nature as absurd from the point of view of common sense. And it agrees fully with experiment. So I hope you can accept Nature as She is—absurd*".

ON THE WAY TO SOLVING THE *HARD PROBLEM*

Since intellectual and rational knowledge (scientific knowledge included) is necessarily axiomatic, hypothetical and conjectural in nature,[27] any exclusivist support for a given paradigm carries a high risk of prompting a dogmatic drift:

the revolution of 20th-century physics is an outstanding example.

The Cartesian radical dualism, and the ban imposed on dealing with consciousness and the soul, warped the foundations of science in the 17th century, while the friction between science and the Church led to the hard-liner scientists' prejudicial rejection of anything carrying a whiff of dualism and transcendence up until recently. It is of paramount importance to recognize and overcome all inadvertent sources of bias in order to lay proper foundations for the science of consciousness and other subjective phenomena, which have been neglected for some four centuries. The ostensibly irreducible contradictions between traditional monist and dualist stances, favored by neopositivist and reductive physicalist attitudes, might be solved by dealing with their metaphysical biases. This step is essential for the sake of consistency with the very concepts of science and philosophy.

The greatest challenge lies in taking a broader perspective, unfettered by prejudices and cultural filters, that succeeds in fitting the *hard problem* with the fundamental philosophical and scientific problem of the relationship between mind, brain, body, and outer world. Physics began to take up this challenge already in the early 20th century. The time is now ripe for a similar evolution in medicine and psychology—otherwise the *hard problem* risks turning into a sort of *impossible problem*.

Granted the above considerations, it is reasonable to speculate that the world as a whole is one, so a monist view would seem to be more appropriate. The dualist stance that considers (immaterial) consciousness and the (physical) brain–body as different "substances" with a different ontology seems to be weak, grounded on an arbitrary separation stemming from a logical classification of what is inseparable in nature. The reductive physicalist approach appears ill-founded too, since it rejects half of the dualistic view a priori, without providing any proof of its inexistence or irrelevance, thus prejudicially taking sides and retaining a latent dualism as a consequence. According to the great Taoist philosopher Zhuāngzǐ[28] (Chuang Tzu, 4th century BC), we ought to affirm what we deny, and deny what we affirm.

According to Spinoza, the idealists and the mystics, monism can contain the whole world of dualism, avoiding the need to split it arbitrarily into incompatible human cultural categories: let us provisionally call this Whole Monism (WM) to distinguish it from reductive materialist monism. Granted this WM, we no longer need to shape monism and dualism as logically incompatible, and we can solve the contradiction by means of a single, broader representation of the whole world, the two (dualist) subsets of which are attributes ($D \in WM$, to use the symbols of set theory). Kant judges this solution feasible because we are only talking about words, concepts, mental categories, not about substances. This being the case, the brain and the mind can be conceived as two aspects of a single undivided and mutually convertible reality in vivo (brain $\cup$ mind). Their ceaseless dynamic interaction might be better explained by the non-dualistic *Yin–Yang* relationship of Taoism rather than by a fixed, one-way, bottom-up hierarchy: brain activity allows for the emergence of consciousness and the mind, which at the same time may shape the brain, inducing both functional and plastic changes.[10,14,29,30]

Once the naïve, phenomenal realism and the classical irreconcilable dichotomies have been overcome, and the non-dualistic paradigms (from Taoism and the pre-Socratic philosophies right up to quantum physics) and non-classical logic have been appraised, the mind–brain relationship may begin to seem a less hard problem that can be faced by using a different paradigm and/or different tools with respect to the past; there might be a parallel with the shift in modern physics from the classical separation towards the identity of matter–energy.

Overcoming the limits of the above-discussed metaphysical assumptions may yield important theoretical and practical consequences. The former concern the theories of consciousness and their plausibility, as well as the approach to NOMEs. The latter may help us to avoid the ill-founded *fascination with objectivity and disregard for subjectivity* prompted by the mechanist–reductionist approach to medical practice, which has prevented a proper understanding and care of patients with psychological, psychosomatic, functional and/or painful disorders, and an appropriate general approach to the world of suffering.

THEORIES OF CONSCIOUSNESS

The available hypotheses on the nature of consciousness provide a wide range of possibilities, including:

1. mechanistic and pragmatic neurophysiological interpretations (starting with Francis Crick's famous, provocative *Astonishing Hypothesis*,[31] as well as cognitive and information theory approaches)[32,33];
2. intriguing but still undemonstrated quantum theory hypotheses[34–39]; and
3. seemingly outlandish hypotheses ranging from proto-consciousness to extended, non-local consciousness, some of which have the flavor of a neoanimism or panpsychism.[40–50]

Some of the hypotheses in items 2 and 3 may well be better founded than was hitherto believed (despite their appearing odd or outlandish when seen through the prism of the classical materialist–monist stance). A skeptical but open-minded attitude (neither accepting nor rejecting anything a priori) seems wiser and more appropriate for investigating these features of consciousness, while we wait for them to be confirmed or disproved.

The quantum physics hypotheses remain the most interesting because they suggest a physically based revolution in both the concept of consciousness and its role in the world. Although no proof of the quantum nature of consciousness can be drawn from the reviews conducted by Smith,[34,35] the game is by no means over, and there has been an increase in the number of studies published since 2009. It is worth stressing here that quantum physics has two different implications in the study of consciousness: (1) the as yet undemonstrated possibility of quantum mechanisms in the brain

being behind the emergence of consciousness; and (2) the new perspective offered by the quantum physics paradigm for analyzing and understanding consciousness and cognition.[51–54] This latter paradigm is new, coming closer to Eastern philosophies and the pre-Socratics than to classical Western thought and, as such, it does not involve the need for quantum mechanisms in the brain's subcellular structures.

The hypotheses concerning the non-locality of consciousness are compatible with those based on quantum theory (should the latter prove true in future). They do not appear to be implausible in themselves, but only vis-à-vis the classical materialist view (already disrupted by quantum physics). In other words, if science cannot be non-materialist,[55] an unyielding reductive physicalism cannot properly explain the possibility of a physically based existence of the mind beyond the brain circuitry, or even the idea of a mental universe.[56–58] Once again, the crucial problem is metaphysical in nature, i.e., it concerns the validity of the endorsed axioms. Instead of rejecting them a priori as implausible on the grounds of what we know, it would therefore seem much wiser to admit them provisionally while awaiting a demonstration that they are false, as Popper suggested.[27]

Should consciousness be subserved by quantum mechanics or show quantum-like properties, this would radically change all present assumptions and justify—on the strength of hard, physical evidence—new properties previously judged to be inconceivable. For instance, non-locality and entanglement might emerge as "normal" physical properties of consciousness, turning such apparently "parapsychological" phenomena as extrasensory perception, telepathy, premonitions, presentiment, distant mental interactions, and healing, clairvoyance and/or witnessed out-of-body experiences (OBEs) into ordinary physiological functions. A growing body of rigorous studies demonstrate their existence as a matter of fact awaiting a proper non-prejudicial scientific interpretation.[59–63] An appropriate attitude is to neither accept nor reject anything a priori, for the sake of consistency with the very nature and history of science, which has always been disseminated with detractors: only an open-minded, rigorous research will do.

Finally, anything that cannot be proved false (such as the claim that other realms exist, as in the idea of afterlife) lies outside the sphere of science and beyond the scope of the present article, though it is important to acknowledge that it may be no less relevant to the meaning of human life and its end, since we are all doomed to die. This is the huge, never solved problem that humans have always faced; it has been prejudicially denied by positivism, but remains the domain of philosophy and religion. Alongside conscious intellectual reasoning, its comprehension may also call for intuition and unconscious thought[64–66]—properties of the human mind that are still little known and underestimated - to help us move into the hazy land beyond the bounds of the positive sciences and classical logic. Here, philosophy and religion (once dogmas, impositions and the above-mentioned metaphysical flaws have been removed) become less incompatible with science for the purpose of elucidating our inner and outer worlds. As Fraser wisely put it in the *Golden Bough* (Chapter 37), the value of religions lies in "*the similar and independent workings of the mind of man in his sincere, if crude, attempts to fathom the secret of the universe, and to adjust his little life to its awful mysteries*".[67] The job for philosophy and religion thus remains surprisingly similar to that of modern physics in its efforts to grasp the awful mystery of the dark energy and matter comprising about 95% of the physical universe.[68,69] The whole issue is well explained in Einstein's famous sentence: "*Science can be created only by those who are thoroughly imbued with the aspiration toward truth and understanding…This source of feeling, however, springs from the sphere of religion… The situation may be expressed by an image: science without religion is lame, religion without science is blind*".[70]

NOMES

Like other entities with a transcendent flavor (the soul and the spirit), NOMEs were misunderstood and rejected a priori in the 20th century due to their incompatibility with physicalist axioms. They remain a relevant field of interest, however, because of their impact on the physiology of consciousness, health, and clinical practice (see below). The NOMEs that seemed to pertain to the area of religion were excluded from the world of science, and considered part of a different *magisterium*.[71] This position was endorsed in 1998 by the National Academy of Science, though it looks like a politically correct compromise, a truce in the old conflict between the new sciences and the Church, rather than a solution. Near-death experiences (NDEs) and mystical experiences (MEs) occupy an area where the two *magisteria* overlap and clash (especially if old prejudices and dogmas persist when they come face to face).[10]

The main apparently inexplicable feature of NDEs, OBEs, and MEs lies in that they lack a counterpart in experiences in the outer world, a situation stemming from the physiological manifestation of unconscious content and the inner world, rather than a matter of plain hallucination or delusion. Of course, as a product of the mind–brain, they may also derive from pathological changes, making a proper assessment, and differential diagnosis of paramount importance to avoid simply attributing anything with no direct counterpart in the phenomenal outer world to illusion, hallucination, or delusion, which is the main risk run by taking a narrow, reductive, physicalist approach.[72–74]

NDEs

A wealth of data are now available on NDEs in the literature, including several scientific interpretations, none of which have so far provided convincing evidence of any brain mechanism at their origin. At best, they offer hypotheses regarding possible triggers, while some of them may be disproved by other known facts.[10,75] The idea that NDEs are merely the result of a brain going awry when it is damaged remains elusive, and is possibly a plain attempt to bring unexplained facts down to fit in with our available knowledge, and our endorsed axioms and theories.

NDEs occupy the ticklish area where the two different *magisteria* of science and religion clash, challenging both, as well as the monists and dualists, survivalists and skeptics striving to grasp their mechanisms and meaning. As in the case of the *hard problem*, the scientific and philosophical

communities seem, here again, to take two sides, those holding the dualistic idea of out-of-brain consciousness and the skeptic materialist-monists who attribute the whole phenomenon to brain disorders. The latter risk following a sort of hidden dualist trail (i.e., the mind–brain dualism) by separating and rejecting the influence of experiences from the analysis; this approach has sometimes given rise to a dogged defense of reductionism[76] (see Ref. 75 for criticism). Other proposals have been much better discussed, and are worth pondering carefully, but they risk missing a relevant part of the story in an effort to bring the meaning of subjective experiences down to their neurobiological counterpart in the name of realism.[77]

This can happen especially when we are faced with the weirdest phenomena, such as witnessed OBEs, reports of veridical perception during cardiac arrest, with the suggestion of a persistence of consciousness and the possibility of its separation from the body. Taking a rigorous prospective, a large-scale study recently reported on the OBE of a patient experiencing a conscious awareness lasting at least three minutes (checked by the hospital staff) at a time when there should have been no cerebral function.[78] Another similar case had been described in a previous prospective study,[79] and three more anecdotal cases have been reported.[80–82]

The so-called "Peak in Darien" experiences seem even more outlandish. These are NDEs in which an individual meets a recently deceased person of whose death they had no previous knowledge. For example, a child met his sister, who had died in an accident while he was in coma, or a patient encountered an unknown man, who turned out afterwards to be his biological father.[47,83] If these are facts, they cannot be ignored, however uncommon they may be, and seemingly incompatible with established knowledge. It is the duty of science to neither reject nor ignore them a priori, nor to make them fit at all costs with the known laws of nature. The goal should be to understand them thoroughly, whatever their nature may be, refusing dogmas and preconceptions. According to the Nobel prize-winning physicist Erwin Schrödinger, we must be aware that "*living matter, while not eluding the 'laws of physics' as established up to date, is likely to involve 'other laws of physics' hitherto unknown, which, however, once they have been revealed, will form just as integral a part of this science as the former*".[84] This awareness should be applied to the "newborn" science of consciousness too (which is still in the process of being founded) in order to avoid the risk of turning science into a prejudicial, dogmatic doctrine.

There is a link between NDEs, ND-like experiences (NDLEs) and MEs as regards both their content and their transformative value.[85] NDLEs and MEs may also occur in entirely normal, mentally healthy, subjects, which rules out any role of neurological or psychiatric disorders in originating them, and consequently challenges reductionist interpretations.[86–89]

MEs

Mystical experiences have permeated the whole history of humankind and have been reported in both Eastern philosophies and Western religions (in the Holy Bible, in Christian, Hebrew, and Islamic mystical currents), and so has the ingestion of psychotropic drugs, leading to the acknowledgment of an association between the latter and religious fervor,[90,91] and to these drugs being termed entheogens, entactogens, or empathogens[92] (see Ref. 93 as a review). Both unitive and dualistic mystical experiences (also named *apophatic* and *kataphatic*, respectively)[94] may occur during hypnosis and meditation too.[30,95–99] As a whole, they seem to share several scientifically approachable features,[99] while for a proper understanding of them we need to move beyond a limited, though applicable, mechanistic approach to include an insight into their symbolic content and meaning by taking a secular meta-philosophical and meta-religious approach.[86] By the terms meta-philosophy and meta-religion we mean the search for key concepts and meanings common to several or, possibly, all philosophies and religions, beyond their formal differences and various modes of theorization: metaphorically speaking, this means we need to switch from looking only at the different fruits born by a tree to analyzing its trunk and roots.

Hypnosis and Meditation

Hypnosis has been misunderstood and prejudicially rejected for some two centuries due to its incompatibility with post-Enlightenment rationalism, positivism and the materialist-reductionist stance.[14,29,30] It has nonetheless clearly proved a powerful therapeutic tool in recent decades. One of its most outstanding effects is seen in hypnotic analgesia, which enables an individual's pain threshold to be deliberately increased up to the same level as in surgical anesthesia.[10,29,100,101] This clearly disproves the classic materialist-physicalist view, and demonstrates the inconsistency of its axiomatic (viz. false) idea of a one-way, bottom-up brain–mind hierarchy.

Any out of the ordinary but real phenomenon—like hypnotic analgesia—is first judged to be unbelievable. Once it has been demonstrated, it is considered exceptional. Then, if it interferes with people's beliefs and their adopted model of the world, it may be buried in oblivion. This is what happened to hypnosis after the introduction of pharmacological anesthesia in the mid-19th century, leading to it being neglected until recently, when its ability to allow for enhanced recovery after surgery was demonstrated.[29]

Hypnotic analgesia also shows to what extent mental introspective activity can affect the activity of unconscious brain circuits. It is a simple, basic application of the physiology of the mind, showing a two-way mutual influence between brain and mind more closely resembling the previously mentioned *Yin–Yang* relationship of Taoism than that of the physicalist perspective. The same applies to meditation, where the complex patterns of brain changes yielded by practicing meditation (e.g., those related to attentional processes) depend on the duration of the training; these changes then become steady and spontaneous in everyday life of expert meditators, unlike novices and controls:[102–107] here again, reality may be precisely the opposite of the picture painted by physicalist metaphysics.

Neuroimaging techniques have made it possible to examine the power of hypnosis and meditation to modulate the activity of the brain circuits, making them appealing as

models for helping us to study consciousness as well. What is remarkable (and worthy of reflection) is how modern science has discovered and demonstrated the power of hypnosis and meditation with the aid of highly sophisticated, expensive investigation methods, whereas other cultures (like the ancient Indian) dedicated to the introspective analysis of our inner world arrived at this understanding over 2000 years ago without spending a dime. What is more, our scientific knowledge has only explained some brain mechanisms, while Indian culture has effectively established why and how to use meditation, which is the key point of the whole issue (see Refs. 14 and 30 for further details).

Religion, Soul, and Spirit

Judging from Einstein's above-mentioned comment on science and religion, the separation between science, philosophy, and religion is prejudicial and is mainly the outcome of inflexible choices made by both sides. The essence of knowledge lies in reflecting on and being aware of reality (whatever that may be), so knowledge can only be *one* thing, though it may be set out in different fields, using various methods and diverse competences. Incompatibilities between different disciplines, the aim of which should be the same "*aspiration toward truth*", may therefore only reflect a combination of ignorance and the previously discussed projection of human categories, beliefs, dogmas, power, and interests onto the real world.

It becomes important here to reconsider how we define the term *religion*, taking into account its etymology and distinguishing it from its various denominations. Religion is usually defined as an organized system of beliefs, practices, rituals, and symbols designed to facilitate closeness to the sacred or transcendent (God, higher power, or ultimate truth/reality).[10,106] On the other hand, religiosity (the essence and starting point of any kind of church) is a state of mind, a physiological function of the mind–brain that is per se independent of any denomination or theology—and, as such, it is the domain of psychology and medicine, as well as of philosophy and church.

The Italian term *religione* was coined in the 14th century from the Latin *religio*, the etymology of which is uncertain: Cicero considered it as deriving from *relegĕre* (*re-examine*), while Lactantius suggested that it originated from *religāre* (*rejoining, binding together*), a view also endorsed by St. Augustine in his later writings. Granted a shift in meaning with respect to Augustine's thinking (i.e., binding souls to God), the latter interpretation becomes more relevant. From a secular point of view, *religāre* may mean rejoining what ordinary consciousness has arbitrarily separated by taking a dualist stance (mind versus body, I versus not-I, inner versus outer worlds). The faculty to rejoin and thereby lead to spirituality have been fully implemented by means of meditation in all cultures, including the non-theological Eastern philosophies, the mystical currents of the Abrahamic tradition, and modern, Western mindfulness meditation.[14,30,108–111] They have proved to be effective introspective methods, capable of improving awareness, metacognition, self-control and, as a result, resilience and wellbeing. In this regard, it is worth stressing that the term *Yoga* also derives from the Sanskrit verb *yujir* (*binding together, joining*).[14,30]

This secular view of religiosity should also be borne in mind in the science of consciousness because it would help us to discover and investigate the higher functions of the human mind, an area hitherto precluded by the narrow perspective of reductive physicalism and the centuries-old friction with the Church. Such an approach is also in line with Pavlov's reflection on the difference between artists and thinkers: "*The artists… comprehend reality as a whole, as a continuity, a complete living reality, without any divisions, without any separations. … the thinkers pull it apart, kill it, so to speak, making out of it a temporary skeleton and then only gradually putting it together anew, piecemeal, and thus try to give it life in order that they might also succeed*".[112]

Thus, religiosity should paradoxically be regarded as a secular field of knowledge marked by an undivided way of relating to oneself, and one's inner and outer worlds, instead of splitting them into irreconcilable, arbitrarily separated parts. It may prove to be the opposite of the dissociative stance inadvertently taken by ordinary consciousness and an unyielding use of classical logic. As such, it is a relevant issue for both the neurosciences and philosophy, and suggests the need to reappraise and reintroduce in the world of science two neglected components of the human mind–brain that are closely related to religiosity, the soul, and the spirit, hitherto rejected a priori on the grounds of materialistic metaphysics.

It may seem odd to be speaking about the soul and the spirit in a scientific article, making it wise to attempt to define them briefly as potentially relevant components of an open-minded science of consciousness.[41,113] Certainly, they are often inadequately defined, but then other accepted components of the human mind–brain, like the unconscious and consciousness itself, have hardly been well defined, and are no more "material", so in principle there is no reason why we should take a different attitude (viz. to adopt double standards) to the terms soul and spirit.

Etymology may again give us some clues as to their features. The term *soul* seems to derive from the Proto-Germanic *saiwaz* and the Old English *sæ*, "*sea*" or "*lake*", probably reflecting the vast unknown place supposedly inhabited by our souls before birth and after death. St. John's *Revelation* (20, 13) also seems to confirm this etymology: "*And the sea gave up the dead which was in it*".

In Greek and Latin, the soul is indicated with the terms *ψυχή (psikhè, "wind", "blow")* and *anima*, (from *ἄνεμος*, *ánemos*, "*wind*"), respectively. So the etymology of both soul and psyche (symbolically represented as a butterfly or a winged girl in Ancient Greece) includes the features of energy (wind) and of being part of a whole (sea).

The term soul has been used in the past to indicate a vital (not necessarily individual) principle, be it mortal (Aristotle's *βιός "bios"*, Averroes), eternal (Plato, Plotinus), immortal (Abrahamic traditions), subject to reincarnation (Pythagoras, Plato, Buddhism, and, in Christian tradition, Origen) or not (Abrahamic traditions), but it is mainly in Christian tradition that it was conceived in hard, irreconcilable dualist terms, especially in the light of Descartes' thinking. The concept of soul was later changed by empiricism, with Hume considering

it as an unceasing flow of facts or psychological events—a view much closer to that of modern psychology.

The Greek term for spirit is πνεῦμα (*pnêuma*, *"blow", "breath", "air"*), with the same meaning as ψυχή (*psikhè*), suggesting that soul and spirit are of the same nature. Among the different concepts of soul available in the history of philosophy and religion, it is worth mentioning its triple nature introduced in *Zohar*, a mystical text belonging to the *Qabalah*. Its two most high-minded components—*Rùach* (spirit) and *Neshamà* (soul)—are considered not innate like *Nèfesh* (the vital principle, like Aristotle's *bios*), but developed through study and behavior. This view is compatible with the secular view of modern psychology, i.e., the development of the self, and with Jung's concept of individuation, a fact of life in the *here and now*, outside any metaphysical, theological or dualist assumption. *Neshamà* enables us to advance far beyond the limits of ego and ordinary consciousness in our progress towards wisdom and enlightenment, a theme shared by all (non-theological) Eastern philosophies, as well as by the Sufi and Christian mystics.[14,30] If this is the case, then the soul and spirit are the most valuable *non-ordinary*, *better-than-normal* faculties of the human mind (in themselves independent of any church or theology) that enable our emancipation from all conditioning and attachments, i.e., the highest level of awareness achievable. According to Dante: "*Consider well the seed that gave you birth: you were not made to live your lives as brutes, but to be followers of worth and knowledge*" (*Inf*. XXVI, 112–120).

Not being ego-centered, the spirit is universal, allowing our consciousness (the *hall of mirrors*) to become a microcosm of the whole world in our awareness of the inseparable mutual interrelationship of all beings (like Pavlov's artist): this is the way toward awareness, individuation, wisdom, and enlightenment, the neuropsychological correlates of which may be approached in terms of connectome and integration. The ordinary, limited egocentric perspective, on the other hand, has no such awareness and is prone to conditioning, dissociation and alienation, making us feel separate from the outer world and liable to suffering, and to wrongly claim the right to manipulate it at will (Hobbes' *cupiditas naturalis*). Pavlov's thinkers occupy a higher intellectual level than this basic, ordinary consciousness, but may still be influenced by its perspective. All enlightened men and women (be they religious or secular) of all times and cultures have clearly taken a universal, non-egocentric, non-egoistic stance, including Buddha, Lǎozǐ, Zhuāngzǐ, Christ, the prophets, saints, and mystics of the Abrahamic tradition, and all those along the way to Mahatma Gandhi and Nelson Mandela.

The above definition of the spirit as something that has outgrown the narrow, ego-centered ordinary perspective and development of the self, should be seen as the essential secular component of spirituality and a feature of paramount importance. Omitting it from the science of consciousness could induce us to investigate only ordinary functions and focus on the intellect, and we would thus risk losing forever the chance to know the highest functions of the human mind, and this would result in a harmful mutilation or pruning of the mind. It would be much the same as the arbitrary underestimation of the role of emotions and feelings by the rationalists of the last century, as already reported by Damasio.[19]

On the role of spirituality in science, both the World Psychiatric Association (WPA) and the World Health Organization (WHO) have recently recognized the relevance of spirituality and religion for mental health and quality of life. Sections on spirituality and religion have been created by the WPA and by several national psychiatric associations too,[107,114–117] confirming its importance for science, knowledge, and clinical practice.

In conclusion, including the physiology of the soul and spirituality, viz. their corresponding mental faculties, in the realms of science may pave the way to a deeper understanding of the highest, but still under-investigated resources of the human mind. Both intentional introspective tools like meditation and hypnosis, and NOMEs like NDE and mystic experiences are relevant facets of this topic.

IMPACT ON CLINICAL PRACTICE

Growing out of physicalist metaphysics and its paradigm may have a huge impact in clinical practice. Modern medicine has traditionally focused on Descartes' body as an earthen machine, neglecting the mind and the mind–body relationship as if it played no part in pathophysiology and therapy. It has concentrated instead on organic diseases and considered patients as passive bearers of disorders to be managed with pharmacological or surgical manipulations. Although this approach has led to hugely improved outcomes and saved many lives, it is ill-suited to a proper understanding and management of NOMEs, psychological and psychosomatic disorders, and subjective symptoms such as suffering and pain.

The boundaries between the so-called 'normal' state of consciousness (assuming it can be defined), NOMEs and pathologically altered states of consciousness are hazy, and there is a high risk of misinterpreting them and mistaking meaningful physiological conditions for disorders.[74] An inflexible physicalist stance makes us strongly inclined to take NOMEs for brain dysfunctions warranting pharmacological treatment. Metaphorically speaking, it is tantamount to looking at Michelangelo's frescos in the Sistine Chapel and only considering the chemical composition of the plaster and the colors, while missing their content and meaning—however important these aspects might be to restorers, such an approach to his masterpiece would be misleading. This is not only an issue in medicine, but also in the social sphere and in science generally, whenever outsiders, revolutionaries, and anyone not complying with the *spirit of the time* may be deemed foolish or outlawed.

Physicians and psychologists may come into contact with people who report NOMEs and may ask for help in interpreting their meaning. The specialist should avoid passing judgement a priori, and should listen with respect and an open mind, striving to understand and help such individuals to integrate their experiences in their lives. Genuine transcendent experiences, like NDEs and MEs, need to be carefully distinguished from delusions or delusional processes of the kind seen in cases of hyper-religiosity and mania:

misdiagnosing the former, and administering inappropriate psychoactive medication could turn a person into a psychiatric patient, blocking their meaningful transformational process, with its important philosophical implications and positive effects on the individual's maturation, wellbeing, spirituality and ability to overcome the fear of death (see Refs. 86, 93, 118, and 119 for further details on the meaning and impact of NDEs and MEs).

Moving beyond the traditional physicalist approach in medicine may have a relevant impact on several disorders, and especially on chronic pain, psychological and psychosomatic disorders, and the so-called medically unexplained physical symptoms (MUPS).[120]

Pain is a universal phenomenon and one of the major health problems the world over, severely affecting quality of life. In the later 20th century, the international Association for the Study of Pain (IASP) defined pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.[121] The subjective nature of pain clearly emerges from the great variability in its perception, representation and description, including the influence of cultural and linguistic factors.[122–124] This being the case, pain may also be managed through consciousness using behavioral techniques such as hypnosis, which has proved a powerful analgesic tool. On the other hand, although the accepted definition of pain considers it as an *experience* and avoids linking pain to the nociceptive pathways, its clinical management remains fettered by the dominant mechanistic-reductionist paradigm and relies on the use of analgesics, adjuvant drugs (e.g., antidepressants), and invasive techniques. In this regard, it is also worth commenting on how the roles and meanings of placebo and nocebo have so far been neglected or underestimated.

(a) Placebo has only been used to check the effects of drugs in scientific studies, and otherwise disregarded, but it is the powerful, and even lasting capacity of patients to modulate both pain perception and other functions in several diseases (including depression and Parkinson's disease), depending on their expectations and doctor–patient relationship.[125–132] In other words, it is a useful therapeutic tool that has been filtered out a priori and ignored by the ruling reductionist approach in scientific medicine.
(b) The nocebo effect stems from a negative doctor–patient relationship and communication problems, and it has been demonstrated that it causes hyperalgesia and allodynia, a decline in quality of life, lower adherence to therapy, anxiety, phobia, and post-traumatic stress disorder.[133–138]

The above comments clearly point to the huge relevance of caregivers' behavior, and the importance of paying attention to patients' subjectivity. Caregivers may be like the two-faced Janus (the Ancient Roman god of time) facing towards past and future, in war and peace. Depending on their behavior, caregivers may be soothing and protective, actively helping patients to recover, or warrior–torturers causing avoidable suffering.

The MUPS include such varied disorders as chronic fatigue syndrome, fibromyalgia, multiple chemical sensitivities, somatoform disorders, and the Gulf War Syndrome. They are commonly encountered by medical practitioners and have a marked impact on patients' wellbeing and quality of life. As with pain, the conventional approach has mainly been as follows: (a) a search for physical causes, giving different names to seemingly different clinical pictures and splitting MUPS into different syndromes, each with its own hypothetical pathogenesis; (b) treatment with drugs and invasive procedures for discrete disease states. The description of MUPS may have been influenced by the different approaches taken by the various specialists involved, i.e., multiple chemical sensitivity is the realm of environmental medicine, fibromyalgia is treated by rheumatologists, and chronic fatigue syndrome by infectivologists. It is consequently still not clear whether they are entirely separate syndromes or overlapping conditions depending on particular psychosomatic factors.[120,139] For example, fibromyalgia is a disorder of unknown etiology, and there is no consensus on the treatment of choice. Specialized care does not offer clear advantages.[140] It has recently been reported, however, that the disorder is associated with higher rates of symptoms of post-traumatic stress disorder.[141–143] A more holistic, psychosomatic approach would probably help to clarify the complex mind–body–environment relationship behind the condition, where cognitive and representational processes involved in generating the symptoms might be driven by a psychoneurobiological interplay. Such a situation might be better managed by supporting cognitive and behavioral changes, and with an active coping approach, all factors belonging to the psycho-philosophical-existential domain, rather than to the world of pollutants, viruses or other single biochemical abnormalities.

CONCLUSIONS

The above discussion reflects the authors' increasing doubts rather than their certainties, and their concerns rather than their convictions. If these doubts are allowable, they suggest the need to carefully reconsider the very foundations of the ruling mechanistic paradigm of medical science, which has always ignored consciousness and the soul for merely political reasons. This is of paramount importance in an attempt to solve the *hard problem* and to promote a better understanding of the relevance of subjectivity and its pathophysiological and therapeutic implications in clinical practice.

The process involved is nothing new, it has been underway since Aristotle's times. It is part of the physiology of the evolution of human knowledge, marked by Kuhn's scientific revolutions and changes in the *spirit of times*, wave upon wave in the sea of human progress. We believe that the time is ripe to start this thorough review of our knowledge and beliefs, including both explicit and hidden metaphysics, accepted axioms, paradigms, logical tools, and any unconfirmed general principle.

Given the exclusively subjective nature of consciousness, we might wonder whether the ruling classic mechanist–reductionist paradigm suffices (though powerful, it was

designed to investigate only physical reality), or needs to be updated to cope with the world of subjectivity.[10,58,113] While 20th-century physics has succeeded in making a massive adjustment to its paradigm in the light of discoveries in the worlds of the infinitely large and infinitely small, biomedicine has so far not felt the same need to adapt because the dimensions of the biological phenomena investigated can be managed adequately with the classical mechanist–reductionist paradigm. The nature of consciousness remains elusive, however, and the inflexible cognitivist and neurobiological approaches are unlikely to be able to solve the *hard problem*. Several authors have been advocating a shift of paradigm to enable the neurobiological and subjective aspects of consciousness to be properly combined into a whole, starting with the neurophenomenological approach taken by Francisco Varela, and right up to the recent proposal advanced by Cardeña and Brabant.[10,144–146]

The beneficial revolution undertaken by physics in the early 20th century has allowed for profound change in our knowledge of such basic concepts as time, space and energy, reshaping our whole world. A similar process is probably needed in medicine and the life sciences to improve our understanding of matters that are beyond the grasp of the classic approach alone.

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