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# An Information-Theoretical Perspective on Consciousness: Implications for the Treatment of Death Anxiety

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## ABSTRACT

In this paper, we propose a trans-materialist information-theoretical approach to a full spectrum of conscious experience, from its normative embodied mode as part of an integrated brain/mind system to altered modes of consciousness, including nonlocal and near-death experiences (NDE). It allows for bridging the Cartesian gap and resolving the “hard problem” of non-material mind arising from material brain. The first part focuses on quantum information science, specifically an extension of the Bohmian model that re-defines brain/mind from a Cartesian duality to a unified quantum/classical system based on implicate informational dynamics that underlie both the physiological processes of the brain and phenomenological processes of the mind. In this light, consciousness, personal identity and free will are seen as informational processes that incorporate both classical matter/energy and quantum field domains. We then review reports of veridical information obtained during near-death experiences (NDEs), which support the view of consciousness and self-identity as *coherent informational patterns* (CIPs) that may persist in the absence of a functioning brain. The second part will focus on using the informational framework as a clinical tool in alleviating the ubiquitous experience of existential death anxiety.

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## KEYWORDS

consciousness, death anxiety, information, meta-reductive, near-death experience, quantum.

“Self-awareness is a supreme gift, a treasure as precious as life. This is what makes us human. But it comes with a costly price: the wound of mortality. Our existence is forever shadowed by the knowledge that we will grow, blossom, and, inevitably, diminish and die.” Irvin Yalom, *Staring at the Sun*, 2009

## INTRODUCTION: BRIDGING THE CARTESIAN GAP

Nearly four centuries after Galileo, Descartes, and Newton established the foundation of natural sciences,

we still do not have an effective science of consciousness. The Cartesian gap between the objective physical brain as part of objectively defined physical reality and subjective first-person phenomenology of conscious experience has proven resistant to any reductive materialist approach (Nagel, 2012). It is the authors’ contention that any consistent model of conscious human experience, whether applied to normative brain/mind waking/sleep modes or to extended forms of consciousness associated with non-local or near-death experience (NDE) will require a trans-materialist approach rooted in the quantum informational dynamics of evolving natural systems.



Descartes' famous dictum: "I think, therefore I am" assigns immaterial authority to the existence of mind and consciousness in relation to the postulated brain/mind duality. This axiomatic proposition, which essentially introduced material/immaterial dualism that postulates the existence of an independent non-physical domain for the human conscious experience, has been reinforced by Descartes' proposed reductive methodology for the development of the nascent natural sciences. His reductive method is applied in the form of a 3-step algorithm that involves *reduction*, *analysis*, and *synthesis* in exploring the material world. However, the exclusive application of formal reductive logic inevitably leads toward the self-referential paradox of the *reductive epiphenomenalism of consciousness* (REC) expressed in the form of: "I think, therefore I am not" (Wegner, 2003). Here, only the physical brain can carry functional causal authority, while mindful human consciousness is an epiphenomenal illusion within a materialist paradigm. This philosophic attitude is common in relation to eliminative materialist positions, which effectively erase the mind, consciousness, and free will from existence on the grounds that they are reductively incompatible with the material world in which we live (Anthis, 2022). Another, equally misleading philosophical direction, involves dualistic approaches, which confuse *non-material* physical processes with a "non-physical" domain that has no tangible way of interacting with the material brain or wider physical reality (Spackman, 2013).

All of us have a first-person *experience of being conscious*, i.e. possessing a sense of personal identity (a sense of Self extended in time)<sup>1</sup>, intentionality (free will), a range of emotional attachments, intellectual pursuits, relational engagements, and cultural identity that allow us to create a sense of meaning and purpose in our lives. While the nature of consciousness and its relation to the brain remain elusive, its basic tasks involve *experiencing ourselves* in the world and adapting to our physical and social environments.

Another universal aspect of being conscious is that our experiences are corporeal, inextricably linked to the physical body we are born into and patterns of neural network connectivity in our brains. The corporeal nature of self-experience is so universal that it may be hard to imagine a disembodied conscious state. Yet, transpersonal experiences have been described in every culture throughout human history, from shamanic journeys to expanded consciousness states, out-of-the-body and near-death experiences (OBEs and NDEs), or even ordinary and lucid

dreaming, where corporeal rules no longer apply. Other examples include *psi* phenomena such as telepathy, clairvoyance (distant awareness) and precognition (awareness of future events), which have also been reported in high-affect psychoanalytic settings and where veridical information may become available in the absence of direct sensory data (Cardeña, 2018; Shapiro & Marks-Tarlow, 2021).

Yet another barrier to conceptualizing disembodied conscious experience is the prevalent materialist stance of the physical and psychological sciences today. It is indisputably true that reflective awareness in *Homo sapiens* is associated with a functioning brain, although other possibilities may exist for evolutionarily more distant species, such as crows, octopi or even plants (Godfrey-Smith, 2017). Ontologically, we can observe the emergence of self-awareness in the process of infant development, which is associated with maturation of left prefrontal language functions between the ages of 18-36 months (Schore, 2015). We can also see alterations of consciousness with pathophysiological changes in the brain such as dementia, or its total disappearance under ordinary anaesthesia. Yet, there are consistent accounts of active awareness and accurate perception of oneself and one's surroundings in a documented state of clinical death (Greyson, 2021; Holden, 2009). Many transpersonal, parapsychological, and near-death accounts tend to be rejected on the grounds that they are incompatible with the established scientific knowledge, but this may be an artefact of the materialist and reductionist perspective, ever since Rene Descartes' (1647) entrenched separation between *Res extensa* of material reality and *Res cogitans* of the immaterial mind.

Faith-influenced notions of gods, souls, or after-death reward/punishment paradigms fall outside the scientific domain. Agnostic schools of thought would consider these beliefs to be impossible to prove or disprove and therefore a matter of faith, while atheistic thinkers will rely on the principle of parsimony: "Pluralitas non est ponenda sine necessitate" – "entities should not be multiplied beyond necessity," seeing them as superfluous to the process of scientific discovery. It is the purpose of this essay to explore NDE experience from a rigorous information-theoretical perspective, which allows us to transcend the Cartesian split and enable a trans-material, *meta-reductive informational paradigm* (MRTIP) in natural and clinical sciences, where conscious experience ceases to be a mere reductive epiphenomenon and plays a causally efficacious part in the extended informational reality (Figure 1).



**Figure 1.** Reductive/materialist framework (RM) as a Successful Special Case, Preserved in a Wider Encompassing Meta-Reductive Trans-material Informational Paradigm (MRTIP). Within RM, consciousness can only be eliminated or incorporated as a reductive epiphenomenon (REC), while MRTIP may allow for a causally efficacious psychophysical brain/mind system.

### AN INFORMATION-THEORETICAL PERSPECTIVE ON CONSCIOUS EXPERIENCE

From a cosmological standpoint, most of the universe is nonmaterial: less than 5% of what we observe is composed of ordinary baryonic matter (protons, neutrons, and electrons with associated electromagnetic, weak and strong nuclear forces) that forms the building blocks of the stars, the Earth, and our bodies. Over 95% of the matter-energy content in the universe has been referred to as dark matter and dark energy, although at this point no one knows what they truly are. At its quantum roots, even conventional matter stops behaving like little billiard balls and dissolves into particle/wave probability fields which do not have a specified location or trajectory. Quantum processes display fundamental properties of *nonlocality* and *entanglement*<sup>2</sup> that transcend the classical Newtonian notion of a deterministic clockwork universe, whose components can be studied independently of the conscious observer. Classical principles of determinism and reductionism<sup>3</sup> no longer apply in the quantum domain, where the outcome of any measurement depends on the way in which it is performed (Gisin, 2014). Rather than being “independent observers of objective reality,” we form an inherent part of any quantum system we observe, acting as *participant observers* who co-determine the evolution of the quantum reality rather than stand apart from it.

The postulate of informational foundations for material reality goes back to John Wheeler’s seminal concept of *it from bit* (1990). In his words, “... every particle, every field of force, even the spacetime continuum itself – derives its function, its meaning, its very existence entirely... from binary choices, bits... In short, ... all things physical are information-theoretic in origin and this is a participatory

universe” (p. 312). From the perspective of quantum physics, matter is not the ultimate substrate of reality: instead, information is. Landauer (1991) made it clear that information is physical, although it does not have to be baryonic matter based. In other words, the information-theoretical perspective ushers in the *physics of the nonmaterial*, which helps open the gate to the main issue of this paper. It should be noted that the term “nonmaterial” does not imply “non-physical” or “supernatural” but simply informational processes beyond the domain of conventional matter.

The following equation illustrates the issue:

$$M \in E \in I.$$

It shows that matter (M) is an element of energy (E), which is an element of information (I). In other words, information has the largest expressive capacity to explain reality, and matter has the least expressive capacity. Differently stated, classical physics is included in thermodynamics, which is included in quantum mechanics (QM). The information-theoretical approach posits that at their core, *both material events and conscious experience are informational processes*. An American physicist David Bohm distinguished between the *implicate* (subquantum) realm, where everything exists as nonlocal active information; and *explicate* (classical) realm, which is in the process of continual unfolding from and re-enfolding back into the implicate. All observable reality, both classical and quantum, can be described in terms of unified informational flow. In the language of information, the superficial dichotomies of matter/brain versus consciousness/mind completely disappear, this eliminating the “hard problem” of how material brains give rise to non-material minds (Chalmers, 1995). In this view, both brain and mind arise from the implicate informational domain. Bohm (1990) described it as follows:

The answer that I want to propose here is that there are not two processes. Rather, I would suggest that both are essentially the same. This means that that which we experience as mind ... will, in a natural way ultimately move the body by reaching the level of the quantum potential and of the ‘dance’ of the particles. There is no unbridgeable gap or barrier between any of these levels. Rather, at each stage some kind of information is the bridge (p. 283).

Conscious and living phenomena at large can be understood in terms of the implicate order (Maldonado, 2022).

Thanks to quantum mechanics, physics is no longer about what the universe consist of, which was the traditional approach from Aristotle to Newton. Instead, it is about what we know and what we can say about reality (Bell, 2011). The concept of “*It from bit from qubit*” extends and synthesizes the idea, where qubit stands for a unit of quantum information.<sup>4</sup> While physical processes in the classical world operate through *local-interactive* causal chains described by classical physics (local interactions requiring spatial proximity, such as electrochemical reactions in the brain), quantum processes operate with *nonlocal-participatory* dynamics, acting as spread-out probability waves that show correlations irrespective of the distance between them. Experimental confirmations of Bell’s inequality theorem<sup>5</sup> demonstrate that our universe is fundamentally nonlocal, and no combination of local-interactive mechanisms can account for quantum entanglement effects.

While material processes and processes of the mind merge below the quantum-classical limit, the interaction between physical and conscious processes in the classical macro-world defines a *psychophysical domain*, forming informational brain/mind systems that are locally separate but nonlocally connected with each other and the world at large across porous informational boundaries that may allow for psi and NDE phenomena (Figure 2).

In his review of the quantum aspects in consciousness research, Georgiev (2020) points out that quantum physics distinguishes between two types of processes: *quantum state vectors*, which are unobservable and define what physically exists (c.f. Bohm’s implicate realm), and *quantum operators*, which define what can be observed. Within this framework, the unity and inner privacy of conscious experience are accounted for by the quantum state vectors, which are fundamentally unobservable and incommunicable, just like the qualia of subjective experience (the redness of red or a goosebump response to hearing one’s favourite piece of music). Far from being the evidence of its nonphysical nature (Gilbert Ryle’s “ghost in the machine”), the essence of subjective phenomenology may thus lie in its implicate informational nature, which is still subject to physical laws, although these laws have to be *indeterministic* and *meta-reductive* to allow for a multitude of distinct conscious choices that have causal efficacy in the informational reality. Georgiev (2020) suggests that

Identifying “physics” with classical physics is the main source of confusion in consciousness research. ... The main principles (axioms) underlying classical theories are the

observability of all physical quantities, the communicability of classical information at most at luminal speed, and determinism governing the time evolution of physical states... In classical physics, reductionism cannot work because the conscious mind cannot be identified with anything physical (e.g. the classical brain) as everything physical is observable. In quantum physics, however, identification of the conscious mind with the quantum information contained in the quantum state of the brain  $|\Psi\rangle$  is possible, because  $|\Psi\rangle$  is unobservable and fundamentally different from the observable brain (p. 4).

One of the authors (Shapiro, 2020) recently proposed a *nonlocal neurodynamics* model of clinical interaction, which may explain some aspects of intuitive knowing and “uncanny” telepathic, precognitive, and synchronistic events in high-affect therapy settings (Freud, 1919; de Peyer, 2016). This model complements the conventional perspective of two separate, embodied subjectivities engaging in a local-interactive dialogue with each other and suggests the presence of nonlocal-participatory informational channels that transcend conventional sensory data. From this perspective, we are fundamentally connected through semipermeable *fractal boundaries*,<sup>6</sup> which simultaneously divide and unite our seemingly separate subjectivities, not unlike semi-permeable cell membranes that both separate and integrate our physiological structures (Marks-Tarlow & Shapiro, 2024).

From an integrated quantum/classical information perspective, brain/mind represents a unitary psychophysical system that continually adapts to its physical/physiological and cultural/psychological environments. In all cases, informational processes serve as the common denominator to both biological and conscious reality. In evolutionary terms, genetic evolution governed by genes and cultural evolution governed by memes (Dawkins, 1981) form a vital human crucible responsible for the rise of self-reflective awareness in *Homo sapiens*. At each level of evolutionary complexity, informational processes (both physiological and proto-conscious) intertwine to form the very foundation of life, from basic *sentience* of an amoeba navigating away from hypertonic solution; to *primary consciousness* of reflexive awareness of the environment in plant and animal species; to self-reflective *awareness of awareness* that allows us to lift over the landscape of stimulus-response dynamics and experience *hindsight* into the past, *insight* into the present, and *foresight* of the future (Edelman,



thus not immediately accessible to view (see Figure 3). It is the underwater part that determines the iceberg's stability, its floating capacity, melting time, etc. In similar terms, brain/mind can be conceptualized as a quantum/classical system, with its classical aspect of a physical brain and a "submerged" quantum informational aspect, which enables both the material reality of the brain and subjective experience of our sense of Self.

Within the informational model, the "hard problem" of how physical brains give rise to ineffable conscious experience and free will (Chalmers, 1995) becomes an artefact of treating a fundamentally quantum/classical brain/mind system from a reductionist classical perspective, which only acknowledges its material tip. If implicate informational processes give rise to *both* neurochemical events in the brains and subjective qualia in the conscious minds, a functioning brain/mind system no longer involves some mysterious interaction between material brains and non-material minds, but functions as a unitary informational matrix that cannot be understood without considering its quantum foundations. The American mathematical physicist Stapp (2005) explains the difference:

The great disparity within classical physics between the experiential and physical aspects of nature is resolved in the quantum approach by altering the assumptions about the nature of the physical universe. The physical world, as it appears in quantum approaches to consciousness theory, is transformed from a structure based on substance or matter to one based on events, each of which has both experiential aspects and physical aspects. Each such event injects information, or "knowledge," into an information-bearing mathematically described physical state (pp. 882-883).

In his later writings, Stapp (2011) clarified that "according to quantum physics all causal effects of consciousness act within the latitude provided by the uncertainty principle, and this latitude shrinks to zero in the classical approximation, eliminating the causal effects of consciousness" (p. 39). On the other hand, when we consider quantum processes at the core of synaptic transmission and neural network dynamics, such as Hameroff and Penrose's Orchestrated Objective Reduction (Orch-OR) theory (Hameroff, 2012), consciousness automatically arises as a property of nonlocal and multi-potential quantum coherence in neuronal subcomponents, which can have causal effects

on material processes in the brain in keeping with the quantum Zeno effect.<sup>7</sup>

## THE PUZZLE OF NEAR-DEATH EXPERIENCES (NDEs)

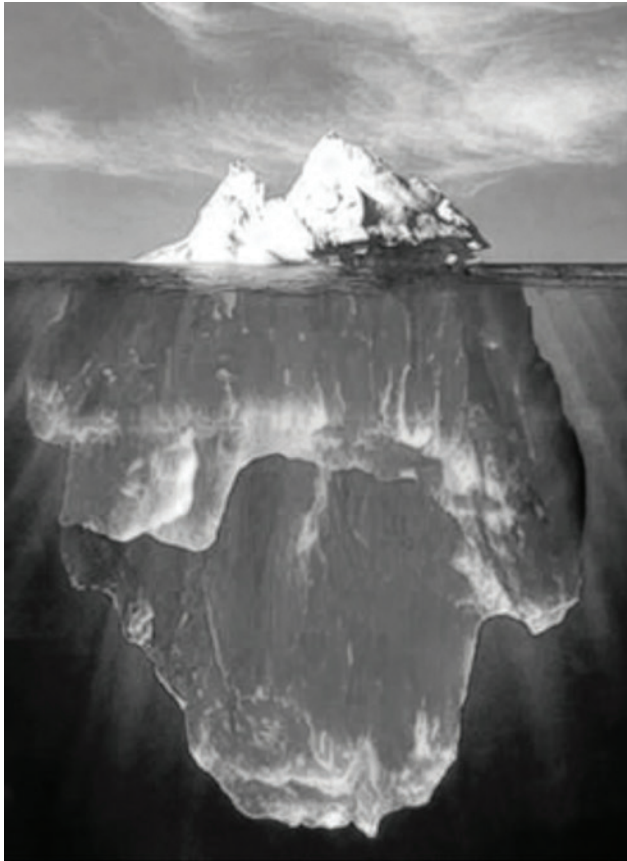
The term "near-death experience" (NDE) was originally used by Moody (1975) in his seminal analysis of clinical death survivors. The following vignette is taken from Greyson's (2021) extensive database of NDE experiences. It is a typical account of a 23-year-old female patient who hemorrhaged heavily after giving birth to her first child. She described it as follows:

When I heard the nurse say, 'Oh, my God, we are losing her,' I was out of my body and on the ceiling of the operating room looking down, watching them work on a body. I knew I wasn't dead. It took a while to recognize the person I was viewing was *me!* I ... heard conversations and saw my baby being born. ... It was a small hospital and I found myself over my mom in the waiting room. She was smoking. My mom doesn't smoke, but she admitted much later that she had 'tried' one or two because she was so nervous! I returned to the operating room and my baby was doing better. I was not... (p. 68).

The patient ended up going into shock followed by a documented state of clinical death but subjectively remained conscious, encountering her deceased grandmother and eventually being 'told' that it wasn't her time, and she had to return to corporeal existence.

The above vignette is typical of NDE accounts that have also been documented to occur while under clinical anaesthesia and during documented states of clinical death in the absence of heartbeat and brain EEG activity (French, 2005; von Lommel, 2011). It is estimated that there are over 10 million people that had an NDE experience in US alone (Hagan, 2017). Some universal features of such accounts include:

- i. A *preserved sense of subjective Self* with a capacity for curiosity/surprise and veridical memories of events external to the body.
- ii. A *disembodied sensory perspective*, such as looking at oneself from above, and/or observing other spatial locations.
- iii. Encountering a transition from darkness to a tunnel of light and/or other disembodied entities, such as



**Figure 3.** Visible Versus Submerged Parts of the Iceberg as an Illustration of Classical Versus Quantum Perspectives on the Brain/mind System (common domain).

deceased relatives or ‘guides,’ and communicating with them.

- iv. Specific and lasting transformative effects, such as a heightened sense of meaning and purpose, increased altruism for others and nature, a less materialistic attitude, and alleviation of death anxiety.

Note that these observations not only show consistency across different patient populations and cultural domains (Roberts & Owen, 1988), but can also relate veridical information, such as patients having knowledge of actual events in the operating room and other spatial locations while ostensibly in a state of clinical death (Fenwick, 2013; Holden, 2009). These experiences are called *veridical NDEs*, and over one hundred have been recorded and verified, including accurate visual recall by blind patients (Cook et al., 1998; Ring & Cooper, 1999). While some phenomenological aspects of NDEs have been dismissed as artefacts of cerebral hypoxia, the presence of veridical information strongly suggests access to informational channels unaccounted for in conventional neuroscience.

To recall a famous quote by Sherlock Holmes in Sir Arthur Conan-Doyle’s “A Study in Scarlet”: “If we eliminate the impossible, whatever remains, however improbable, must be the truth.” If we are not going to dismiss such accounts outright because they are a priori “impossible,” what scientific sense can we make of them?

We now have two alternative perspectives on the relationship between brain and conscious experience:

1. *Individual consciousness is identical with, or represents an emergent property of a functioning brain, therefore it fades away when the brain ceases to function.*

This view represents a standard position in modern neuroscience. The after-death experience, in this view, is a logical non-sequitur, like a square triangle: no such experience can exist. This position also gives rise to the reductive epiphenomenalism of consciousness paradox (REC) in classical science, where consciousness and free will are seen as illusions without any causal efficacy in the material world: “I think, therefore I am *not*.” As we have already seen, this paradox is an artefact of ignoring the common quantum foundations of both conscious and material processes.

The information-theoretical perspective adds another possibility to the question of the brain/consciousness interphase:

2. *Both individual consciousness and the functioning brain are based on implicate quantum informational dynamics, which is conserved after the brain ceases to function.*

Here, both material processes and conscious experience in the classical domain are enabled by the unfolding (decohering) active information, which eventually re-enfolds (re-coheres) back into the quantum domain. Therefore, an alternative explanation arises: if quantum information is conserved, could the informational content of the individual Self be preserved in the process of re-coherence?

Quantum information theory establishes that information is never lost in keeping with the first law of thermodynamics, although it can be quite difficult to re-condense in classical terms (Teixidó-Bonfill et al., 2020). Similar arguments apply for consciousness (Page, 1994; Di Biase, 2013). From this perspective, our material brain may serve the function of a “quantum-classical condenser,” enabling *coherent informational patterns* (CIPs) that form the foundation of our dynamic sense of Self. Recall that in information-theoretical terms, conscious experience is tied to the implicate “active information”: while it cannot be *established* without a functioning brain, once established – it may no longer depend on its material substrate and revert

to the implicate informational domain, utilizing nonlocal-participatory informational channels that would theoretically enable a disembodied sensory perspective while preserving its informational coherence.

## THE SCIENCE OF DISEMBODIED EXPERIENCE

Any discussion of the near-death experience has to involve both phenomenological (subjective) and ontological (objective) perspectives. Since subjective phenomenology is, by definition, unobservable – it has to rely on the personal experience of NDE survivors and any transformative changes it brings about. Irrespective of whether individual consciousness survives death, the evidence of NDE experiences can be therapeutic in alleviating death anxiety and bringing about constructive changes in the survivors' lives.

On the other hand, any ontological scientific perspective must utilize objectively observable empirical evidence to substantiate the reality of disembodied consciousness survival. Two lines of evidence are relevant here:

1. The presence of objectively verifiable information that becomes available to veridical NDE survivors while in a state of clinical death.
2. A verifiable and falsifiable scientific model of disembodied conscious experience.

Note that both phenomenological and ontological accounts of consciousness survival must preserve some sense of *personal identity*, or a sense of Self possessed of our life experience, to make a concept of “death survival” meaningful. Therefore, the notions of a “universal mind” or reincarnation, where personal identity is lost, are not directly relevant to this discussion. Death anxiety necessarily includes the loss of Self, even if general aspects of consciousness can be shown to persevere.

From a quantum information perspective, the classical world is a limit-case of the quantum world. It can be safely assessed that the sum total of the information that defines self-experience may be preserved after death. Here, we have to remember that many aspects of phenomenal consciousness, such as our subjective qualia, sense of Self, intuitive awareness, and free will are already tied to the implicate informational reality. In addition, we have consistent reports of disembodied awareness based on NDE accounts, where individual Self and cognitive/emotional content are preserved in the absence of demonstrable brain activity. Coupled with documented instances of veridical NDEs, it is the authors' contention that individual

experience can persist after death, albeit not in classical terms. Death would be experienced as a metamorphosis from an embodied state of decoherence to the implicate active information domain, where subjective experience no longer operates through classical local-interactive channels, such as visual or auditory perception, and no longer relies on the electrochemical brain mechanisms.

What can quantum information science actually say about the aftermath of the death metamorphosis? Returning to Figure 2, dying involves a transition from a dual quantum/classical state of the brain/mind informational system to the coherent state of active information, without an associated material component. Since quantum information is never lost, the traces of individual consciousness may still be preserved, although they would no longer operate in the classical domain. What is lost in the process of dying is the local-interactive component that supports corporeal processes, while the nonlocal-participatory pathways would still be operating. This may account for prevalent NDE reports of communicating with deceased relatives and other entities.

Non-classical logic sheds very suggestive light onto this in that there are numerous ways of conveying information without necessarily obeying the principles of identity, non-contradiction or exclusion of the third.<sup>8</sup> Kurt Gödel (1931) formulated two incompleteness theorems proving that any consistent logical system of sufficient complexity is inherently incomplete and contains undecidable propositions that can only be resolved in a more encompassing logical system. As applied to natural sciences, the reductive paradigm in classical physics is one example of such incompleteness: consciousness appears incompatible with the physical substrate of the brain, resulting in the REC paradox and the hard problem, where conscious beings are apparently unable to act as causal agents in the material world. However, these paradoxes can be resolved by shifting to a more encompassing meta-reductive information-theoretical approach, where quantum information gives rise to both material and conscious reality, and consciousness can be causally efficacious without violating energy conservation laws (Scott, 2020). The existence of disembodied consciousness forms an undecidable proposition in the limit case of the classical material reality. However, from a wider MRTIP view, the experience of dying can be seen as shifting the coherent informational pattern that encodes our self-experience from the explicate to the implicate domain. This opens the door to developing an information-based science of after-death experience as a valid scientific pursuit.

Thinking and feeling are organic informational processes that encompass the living experience as a whole (Castellanos, 2023; de Liuca et al., 2013). For instance, subjective awareness of novel informational content tends to elicit feelings of interest or curiosity unless the situation is judged to be unsafe, when the feeling of fear is activated (Panksepp, 1998). It is notable that most NDE accounts reference feelings of pervasive peace and surprise, and even patients riddled with terror of dying tend to settle into a peaceful state in the last several hours of life (Roberts & Owen, 1988). In addition, there are consistent observations that NDE experience has lasting transformative effects, which is not the case in cardiac arrest survivors without NDEs (Parnia, 2014; von Lommel, 2006). It therefore appears that NDE experiences can serve as a potent cure for the ubiquitous experience of death anxiety.

## APPLICATIONS TO UNDERSTANDING AND TREATING DEATH ANXIETY

Every known society has elaborate attitudes to death and dying, with culture-specific burial and grieving rituals. In fact, evidence of burial ceremonies is one of the criteria for assessing the evolution of self-awareness in prehistoric societies. The earliest evidence uncovered in both *Homo sapiens* and Neanderthals goes back to 120,000-125,000 years ago, although even earlier burials point to *Homo Naledi* in South Africa some 250,000 years ago (Pettitt & Wood, 2024). It has also been argued that one of the core functions of over 100,000 religions in human history has been to negotiate death anxiety (Dawkins, 2006).

Death anxiety is a universal human experience (Yalom, 1980). While its expressions vary across existing cultures, anxiety itself is a consequence of evolving self-awareness, i.e. our ability to experience a conscious sense of Self and to anticipate our future (Marks & Nesse, 1994). Death is the ultimate threat, the threat of disintegration and non-existence, which activates emotional systems of fear/terror and sadness/grief (Panksepp, 1998). In ontogeny, children become aware of death after the age of 4, first as a sense of permanent separation from the primary caregivers, and later as an irreversible termination of the Self (Menzies & Menzies, 2023). Both perspectives are associated with anxiety, which is initially contained by magical thinking of death reversal and later by internalizing self-regulation capacity from the primary caregivers. Like any emotional regulation, it is linked to attachment security, where individuals with insecure-avoidant attachment show lower self-reported fear of death but heightened death anxiety on projective

testing tied to the loss of personal identity/control. By contrast, individuals with insecure-anxious attachment report higher death anxiety that correlates with abandonment and loss of social identity (Miculincer & Shaver, 2003). Finally, individuals with secure attachment tend to resort to symbolic immortality (such as thinking of their children or creative contributions) and proximity/intimacy strategies with significant others when death anxiety is activated.

Although the term “death anxiety” may appear self-explanatory, Cicirelli’s (2002) research revealed two principal components: *existential death anxiety* (EDA) that focuses on what happens after one dies, and *tangible death anxiety* (TDA) that deals with fears of premature death, the dying process, the impact on significant others, etc. While psychosocial and cognitive-behavioural interventions have shown efficacy in TDA (Menzies et al., 2018), it is EDA that presents the biggest therapeutic challenge. Early psychoanalytic perspectives on death and dying involved Freud’s (1959/1915) view that the awareness of death is denied and repressed to contain death anxiety, which is then pushed into the unconscious and may manifest in neurotic conflicts. Later humanistic and existential perspectives highlighted freedom and responsibility that stem from the awareness of our impermanence and drives for self-actualization and the search for meaning (Frankl 1946/1985; Rogers, 1943/1980; Sartre, 1943/1966). Erickson (1982) identified the aging stages of *generativity vs. stagnation* and *ego integrity vs. despair*, which allow for a sense of meaning and purpose as an antidote to death anxiety (Fortner & Neimeyer, 1999). This perspective is echoed in Yalom’s (1980) existential framework, who argues that the best way to integrate the awareness of death is to live life to its fullest, minimizing the experience of regret.

In contrast to psychoanalytic thinkers, Becker (1973) addressed death anxiety as a real and basic fear that underlies many forms of anxiety and phobia. He argued that humans manage this anxiety by living in accord with their cultural worldviews that “offer immortality either literally (belief in an afterlife) or symbolically (“identification with entities greater and longer lasting than an individual life, such as achievement, families, or nations” – cited in Strachan et al., 2007, p. 1138). Becker’s work led to the development of the Terror Management Theory, which proposes that while humans strive for self-preservation, they are also aware of the inevitability of death. When reminded of their mortality, their need for structure and meaning increases, and this results in enhanced focus on personally and culturally valued goals. Kübler-Ross (2002) described 5 stages of the dying process, ranging from



denial of imminent death, to anger, bargaining, depression, and acceptance.

Death anxiety can be pathological if it causes persistent distress or interferes with daily functioning. Clinical research repeatedly demonstrated links with DSM-IV/5 anxiety disorders including hypochondriasis (Furer & Walker, 2008). In their hypochondriasis study, participants reported very high levels of death anxiety, with 93% reporting that they were very much afraid of dying, 87% afraid of dying a painful death, 84% obsessing about how short life is, and 75% afraid of news that reminded them of death. Death anxiety is now seen as a trans-theoretical factor for a diverse range of psychopathology including panic disorder, phobias, social anxiety disorder, somatic symptom disorder, obsessive-compulsive disorder (OCD), post-traumatic stress disorder (PTSD), depressive, and substance use disorders (Menzies & Menzies, 2023).

A recent review of 15 randomized controlled trials of death anxiety (Menzies et al., 2018) showed some effectiveness of psychosocial and cognitive-behavioural interventions, although most only have small to moderate impact. Traditional humanistic-existential approaches to alleviating EDA focus on bringing our terror of personal annihilation to conscious awareness and utilizing our despair in the service of fostering meaning, creativity, and social connections in our lives. It involves radical acceptance of our impermanence best exemplified in Lord Bertrand Russell's position that "only on the firm foundation of unyielding despair, can the soul's habitation henceforth be safely built" (quoted in Dossey, 2017).

It is existential death anxiety (EDA) that remains particularly resistant to existing treatments. Yalom (1980) describes it as a "dread of death that resides in the unconscious, a dread that is formed early in life at a time prior to the development of precise conceptual formation, a dread that is terrible and inchoate and exists outside of language and image" (p. 189). As such, its impact is similar to implicit preverbal trauma, which can never be fully integrated and resolved because it cannot be put into words. The treatment of preverbal trauma involves careful attention to the bodily experience of traumatic affective templates in the context of a nurturing therapeutic relationship, where the patient's distress can be "metabolized" and gradually brought into the intersubjective space (Mancia, 2006). Yalom (2009) advocates a similar attitude of "staring at the sun," where the terror of inevitable non-existence is addressed in the context of a supportive therapeutic relationship and mitigated by actualizing our fullest potential

and minimizing on inevitable regrets. He relies on Epicurus' symmetry argument that the after-death state of non-existence is identical with the non-existence before we were born, therefore one should not be any more terrified of the former than of the latter.

The information-theoretical perspective introduces an asymmetry in the Epicurus' argument. Our personal identity can be seen as a coherent informational pattern established in the course of our lives that had not existed prior to our birth. Each living experience introduces informational novelty into the world – the novelty that may be preserved in the quantum informational domain after bodily death. Our brain allows for the acquisition and storage of novel CIP configurations in the material (classical) domain. We develop our unique sense of Self throughout our lives by engaging with the world and other Selves in it, fostering attachments and the awe of discovery, and creating our unique purpose and meaning. In the process of dying, the coherent informational pattern comprising our sense of Self would shed its material aspect and re-cohere in the implicate domain, preserving its accumulated lifetime novelty.

Consistent observations of lifelong decrease or total absence of death anxiety in many NDE survivors suggests that an information-theoretical model, such as the CIP approach suggested here, can be used as a clinical tool to deal with existential death anxiety. A consistent trans-materialist informational model rooted in meta-reductive science can transform Bertrand Russell's "unyielding despair" and Irvin Yalom's "dread of death" into an attitude of curiosity about this universal transformation. This approach would benefit a wide range of secular and psychiatric population, providing an alternative to religious beliefs in the afterlife and assisting those who opt for medical assistance in dying (MAID), while tangible anxiety about suffering in the process of dying would continue to be addressed with existing supportive and psychosocial interventions.

## **CONCLUSION: TOWARD A META-REDUCTIVE INFORMATIONAL PARADIGM IN PSYCHOLOGICAL SCIENCES**

Our primordial distress of personal annihilation has been traditionally soothed by resorting to religious beliefs in the likeminded community of believers. While possessed of considerable social value, this venue also has its drawbacks, often fostering fears of afterlife punishment, shame over real and perceived sins, and social intolerance, such as

in the case of LGBTQ+ or alternative religious perspectives. On the secular side, increasing number of people are left to face death anxiety with a certainty of permanent annihilation affirmed by the materialist science.

In his editorial review of the subject, Dossey (2017) writes that “the implications of consciousness research that have accumulated over the past few decades pointing to a nonlocal quality of consciousness... are perhaps the best opportunity we have to annul the terror and denial of death in our modern era” (p. 84). He suggests expanding the materialist-based clinical approaches to incorporate nonlocal consciousness research, suggesting that “it is essential that we take this step, because the failure to relieve ourselves of death terror will continue to damage not only our own psyche but also the Earth itself as a consequence of the destructive wealth-status-power behaviours we now employ in denying death” (p. 85).

The information-theoretical CIP model outlined above is consistent with Dossey’s proposal. It relies on the emerging physics of the nonmaterial, extending the established materialist paradigm of psychological sciences into the nonmaterial informational domain. It also introduces several research and clinical objectives:

1. It offers potential resolution to a number of current paradoxes including the unobservable and incommunicable nature of subjective experience, the hard problem of consciousness, and causal efficacy of “free will” in the physical world, although detailed mechanisms of information-based causality remain to be elucidated.
2. It provides a potential model for the existence of psychophysical phenomena, such as psi, OBEs, NDEs, and “uncanny” psychoanalytic communication, which can be understood as nonlocal phenomena that operate through nonlocal-participatory informational channels, although their precise nature remains unclear at this time.
3. It highlights the inadequacy of the reductionist materialist perspective in the domain of consciousness studies. Far from being epiphenomenal or non-physical, the quantum-based understanding of the mind ushers in the promise of trans-materialist science (Tart, 2009), where informational reality extends the notion of the physical into the domain of nonmaterial quantum processes that form the basis of classical reality.
4. It provides an alternative to faith-based and humanistic/CBT approaches for managing death anxiety in

both healthy and clinical populations, particularly its existential variety (EDA), which is most resistant to psychological interventions.

In his recent review of the field, Beauregard (2018) states that “we are now approaching another crucial paradigm shift, namely the transition from materialist science to postmaterialist science. We may be witnessing the end of materialism... at least as originally conceived. Holding great promise for science, this transition may be of vital importance to the evolution of the human civilization” (p. 31). The goal of this essay is in showing that consciousness and Self cannot be reduced to the current materialist understanding of physical reality, and we can enlarge the scope of scientific understanding beyond matter/energy interactions to incorporate quantum information, which has a deeper descriptive capacity. A physics of nonmaterial phenomena exists and has the potential to elucidate the first-person subjective experience.

This is an exciting time in the evolution of post-materialist science, but a number of questions are waiting to be explored. For instance, if we see the material brain as an evolutionary mechanism to transduce quantum into classical informational templates (qubit-to-bit) that enable the acquisition of self-awareness and a subjective Self – what happens to these acquired informational templates after the brain ceases to function? Since information cannot be destroyed, it would theoretically re-fold back into the implicate domain. However, the process and outcome of this metamorphosis, and the scientific perspective on after-death experience, remain to be elucidated.

Further, while there are multiple accounts of veridical information being obtained by extra-sensory means, such as through telepathic, precognitive, and disembodied NDE states, the mechanisms of such information acquisition remain unclear, particularly in view of the fact that conventional entanglement only allows for information correlation, not information transfer.

The vital part of the information-theoretical argument is that we can now look at material reality in informational terms, approaching death with a sense of curiosity about this universal metamorphosis rather than dread of personal annihilation requiring denial or refuge in faith-based beliefs. This essay argues that post-materialist science establishes the concept of after-death experience as a scientifically valid alternative to material annihilation. While a full information-theoretical account of conscious experience remains to be formulated, the scientific possibility of



after-death experience can serve as a potent therapeutic tool in alleviating existential death anxiety.

## DEDICATION

We dedicate this paper to J. Rowan Scott (1953–2025) – psychiatrist, colleague, brilliant consciousness researcher, whose feedback has been invaluable in preparing this manuscript.

## END NOTES

- <sup>1</sup> We use capitalized “Self” to denote a dynamic, coherent informational pattern that forms the basis of our personal identity throughout out lifetime.
- <sup>2</sup> The classical (Newtonian) world is subject to the laws of physics and chemistry, which are local and deterministic. By contrast, quantum processes are fundamentally nonlocal and indeterministic. As we descend to subatomic scales, particles cease to follow *local-interactive* dynamics and increasingly display wave-like properties that define the *nonlocal-participatory* domain, where relevant events may not have a specified location (*nonlocality*) and show informational correlations irrespective of the distance between them (*entanglement*). While in the classical macro-world such quantum processes are largely ignored, it is becoming increasingly clear that a wide range of biological systems, including synaptic transmission, utilize quantum dynamics (Maldonado & Gómez-Cruz, 2014). That said, nothing in the corpus of quantum mechanics demands that quantum phenomena are exclusively subatomic; there are many macroscopic quantum phenomena, such as laser lights, superconductivity, superfluidity, etc.
- <sup>3</sup> Reductionism as a foundation for empirical science goes back to Rene Descartes, who proposed a 3-step process for studying complex phenomena: reducing them to their fundamental components (*reduction*), studying the components (*analysis*), and re-assembling them back together (*synthesis*). While seminal in bringing about the technological advances since the Age of Enlightenment, reductionism encountered fundamental limitations in the XX century in the domains of quantum and complexity sciences, where the systemic whole transcends the sum of its parts. Quantum processes are *indeterministic* in that the state of a quantum system remains unspecified until a measurement is performed, while the outcome of any measurement is fundamentally dependent on the observer.
- <sup>4</sup> Generally said, classical information measured in *bits* stands at either as 1 or 0, meaning that a message is sent and received. Qubit is expressed as 1 and 0, or also as the spin upwards and downwards at the same time, which allows for a wide range of superpositions in calculating a solution. This approach forms the basis of quantum computers.
- <sup>5</sup> The Irish physicist John Stewart Bell formulated his Inequality Theorem in 1964, which defines experimentally verifiable domains where local versus nonlocal variables can account for quantum entanglement effects. It has since been tested in multiple experiments, which demonstrate that our universe is fundamentally nonlocal, and locality only applies as an approximation in the classical macro-domain.
- <sup>6</sup> Fractal geometry was developed by Benoit Mandelbrot in the 1970s. It displays the principle of *evolving symmetry* that results in unique properties of *self-similarity* and *scale invariance*, where the patterns of the parts repeat the pattern of the whole. Living systems display fractal self-similarity at different scales of complexity, such as semi-isolated living cells coalescing into semi-autonomous multicellular organisms, which aggregate into semi-independent sociocultural groups, and so forth. A principal feature of fractal boundaries is their infinitely deep, interpenetrating nature, with no clean separation between the interacting domains (see Mandelbrot zoom at <https://www.youtube.com/watch?v=b005iHf8Z3g> for an example).
- <sup>7</sup> Quantum Zeno effect refers to the fact that quantum measurements repeated in quick succession inhibit transitions between quantum states. It derives from the ancient Greek philosopher Zeno of Elea’s “arrow paradox”: if at any given instant a flying arrow is motionless, how is it that it can move? Zeno effect has now been experimentally verified and provides one of the best frameworks for genuine biological autonomy and free will. Repeated readouts of neuronal state superposition in the brain have the potential to preference a specific neural pattern without violating energy conservation laws.
- <sup>8</sup> These three principles form the basis of classical logic, where a thing is inherently identical to itself (the principle of identity); something cannot be true and untrue at the same time (the principle of non-contradiction); and a statement can be either true or false but not both (exclusion of the third).



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