

The near-death experience: implications for a *more complete* theory of consciousness

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Abstract

The near-death experience (NDE) raises important unanswered questions about the nature of human consciousness and relationships between consciousness, the brain and space-time. Certain NDE features are probably explainable by neuroscience and probably *take place* in 4-dimensional space-time while apparently remarkable NDE features such as confirmed cases of veridical perception and other so-called ‘anomalous’ experiences may be associated with postulated quantum-level processes that *take place* in higher order space-times. Current neuroscience models of NDEs are briefly reviewed. The implications of confirmed claims of veridical perceptions are discussed. An *integral* theory is proposed in an effort to reconcile established and emerging theories. The integral theory will provide a more robust conceptual framework for investigating consciousness in all its aspects, resulting in novel hypotheses and research methods that will yield more complete explanations of ‘ordinary’ functions and states of consciousness, disorders of consciousness, transpersonal experiences, and so-called ‘anomalous’ phenomena.

Key Words: Near-Death Experiences, Consciousness, Transpersonal, Anomalous phenomena

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Introduction

Current scientific theories *describe* states or features of organisms that appear to be conscious, but science cannot explain what *causes* consciousness or how consciousness *causes* physical or mental processes. Ideally, efforts to develop a *more complete* theory of consciousness (i.e. a theory capable of providing more adequate explanations of the nature of consciousness in all its aspects) should invite dialog from multiple perspectives including anthropology, psychology, neuroscience, psychiatry, transpersonal psychology, and physics. A truly integral theory of consciousness will permit multi-level analysis of complex dynamic systems and will be capable of demonstrating relationships between classical and non-classical processes at different hierarchic levels in the body-brain-environment system.

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Such an integral theory will permit rigorous scientific investigation of a multiplicity of experiential states and objective phenomena including ‘ordinary’ perceptual and cognitive functioning, disorders of consciousness, postulated quantum-like processes, and so-called ‘anomalous’ states such as the NDE and confirmed claims of extra-sensory perception.

1. The Near-Death Experience

1.1 Core features of the near-death experience

NDEs can be characterized as “unusual, often vivid and realistic, sometimes profound life-changing experiences reported by people who have been either physiologically close to death, as in cardiac arrest or other life-threatening medical emergencies, or by people who *believed that death was imminent* (Greyson, 1999).”

The majority of persons who experience a life-threatening illness or injury do not report NDEs while a significant percentage—possibly the majority—of persons who report NDEs are never at risk of dying (Stevenson, 1989, 1990; Roberts & Owen, 1988). Features commonly described by persons who report having NDEs include a sense of “being outside of one’s body,” profound feelings of peace, the feeling of “moving through” a dark tunnel, the sensation of “seeing” a bright light, experiencing a vivid review of life memories (the so-called “life review”), and “encounters” with deceased relatives, loved ones or supernatural beings. Although the same features are reported in many NDEs *no particular feature* is universally described by all NDE experiencers and each NDE is unique in terms of both the features it contains, the relative complexity of features, and the sequence or “pattern” in which visual imagery or other features *are experienced or recalled*. Near-death experiencers frequently report significant changes in values and beliefs, including increased spirituality, greater concern for others, a heightened sense of purpose and appreciation of life, and decreased fear of death (Noyes, 1980; Ring, 1980; van Lommel, 2001).

Disparate physiological, psychological and transpersonal models have been proposed in efforts to explain the phenomenology of NDEs (Kelly & Kelly, 2007; Siegel, 1980; Grosso, 1983; Roberts, & Owen 1988). The vivid mental imagery and strong emotions that characterize NDEs have been reported in diverse ‘states’ of consciousness including ‘normal’ waking consciousness, dreams, during trance states, *depersonalization* in response to intense fear, medically induced unconscious states such as general anesthesia, prolonged coma and persistent vegetative states, in documented cases of ‘clinical death’ during which the heart has temporarily stopped beating or there is complete cessation of cortical brain electrical activity as evidenced by a ‘flatline’ on EEG recordings, and during the temporary loss of consciousness due to a variety of factors or medical conditions in which there was never risk of serious injury

or imminent death. While existing models offer valuable insights into physiological, psychological and cultural aspects of NDEs to date no single model has been more substantiated than any other model. Further, current scientific models *cannot potentially explain* carefully documented cases of veridical perception that take place in the context of NDEs (Kohr, 1983; Ring & Lawrence, 1993).

1.2 - What neuroscience can teach us about the NDE and other transpersonal experiences

Findings from functional brain imaging studies support the view that consciousness is not localized in discrete brain regions but can be more accurately characterized as a set of distributed processes of dynamically coordinated activity between multiple brain networks. The number of possible permutations of configurations of *dynamic* functional networks in the brain far exceeds the number of *static* networks corresponding to structural connections at the level of synapses, discrete neural circuits or networks of circuits. This fact suggests that a particular structural network can *potentially* manifest as a multiplicity of functional networks associated with different cognitive processes depending on the unique circumstances and factors that activate, modulate and maintain dynamic connectivity within and between networks. Network activity underlying perception or other ‘ordinary’ cognitive tasks in awake resting brain states may ‘shift’ spontaneously or in response to inputs from other networks manifesting in a variety of unique ‘states’ or experiences.

Alterations in the *normal level of consciousness* that take place in the context of physiological or psychological trauma, dreaming, or so-called *altered states* of consciousness activate dynamically interconnected neural networks or groups of functionally related networks (i.e. *connectomes*) that constrain and determine the relative complexity or depth and structure of NDEs as well as their actual or ‘apparent’ duration. The complexity and *quality* of imagery reported in NDEs, out-of-body experiences (OBEs) and other

kinds of transpersonal experiences may reflect the diversity of *available permutations* of dynamically interconnected networks involved in the generation, encoding, decoding and interpretation of mental imagery. Relationships between dynamically interconnected networks at multiple levels including neuronal function, network dynamics and postulated quantum-level processes unfold in relationship to initial conditions and modulatory processes that take place on different temporal and spatial scales. The mental imagery associated with a particular injury, insult or transient alteration in the *level* of consciousness may reflect changes in both *top-down* (cortico- limbic) and *bottom-up* (limbic-cortical) processing in neural networks or groups of functionally related networks involved in imagery (Kosslyn, 2006). Inter-individual differences in NDE features may be consistent with the consequences of ‘decoupling’ of functionally related brain structures (Baars & Franklin, 2007). Particular ‘shifts’ in dynamic brain connectivity may favor a transition from ‘small i’ to ‘big I’ manifesting as subjective experiences reported during NDEs, OBEs and other kinds of transpersonal experiences. Some NDEs precipitated by psychological trauma may “unfold” almost instantaneously in contrast to NDEs reported following resuscitation after a near-fatal illness or injury, which may require *longer real time* in which to “unfold.” Cases of ‘timeless’ NDEs do not support simple linear correlations between the relative *depth*, complexity and *apparent duration* of NDEs, and the actual duration of a period of loss of consciousness or alteration in the level of consciousness during which they are *reported* to take place (Sabom, 1982; Ring, 1980).

Network theoretical analysis is a recently developed tool in functional brain imaging used to compare and integrate data obtained across different spatial and temporal scales using different imaging techniques including EEG, fMRI and magneto-encephalography (MEG) (Stam, 2014). Using network theoretical analysis to investigate brain function in minimally

conscious states, vegetative states or in the moments before death may yield valuable insights about changes in micro- or macro-level networks associated with the NDE, out-of-body experience or other kinds of transpersonal experiences. Applying fractal theory to brain network theory may add an important new dimension to models of brain function (Bieberich, 2012). It is conceivable that the neural dynamics associated with NDEs—and possibly transpersonal experiences in general—will be found to behave in ways that are analogous to infinitely recursive fractals that may exist in both 4-dimensional space-time and hyperspace depending on the factors and circumstances in each unique case.

1.3 - Natural selection cannot explain the persistence of a NDE ‘trait’

25% of individuals who survive a critical illness and between 4 and 9% of the general population report having NDEs (Cant, 2011). From an evolutionary perspective the NDE can be conceptualized as a highly patterned and predictable “behavioral response” in the final critical moments before death.

It is plausible that the narrative retelling of NDEs could confer fitness advantages on human populations assuming that insights or transformative experiences resulting from NDEs result in adaptive changes in values or behaviors. Similar changes in beliefs and values across cultures and demographic groups suggests that the *content* of NDEs or *shared interpretations* may be beneficial to the experiencer or the population as a whole, possibly enhancing fitness by replacing negative beliefs or fears about death with positive attitudes and beliefs. Prior to the wide-spread availability of life-saving medical technologies NDEs precipitated by life-threatening trauma could not have *directly* benefitted populations as the overwhelming majority of NDE experiencers presumably did not regain consciousness before dying (Grosso, 1982).

Although *direct* selection of a NDE predisposition or trait seems unlikely, plausible evolutionary arguments for

indirect selection, drift or its persistence as a neutral trait have been advanced. The evolutionary dynamics of a postulated NDE *predisposition* are examined in a separate paper (Lake, *in press*).

1.4 - The significance of verified claims of veridical perception during NDEs

Surveys of NDE-survivors reveal intense visual imagery, typically positive emotions and—less often—claims of “encounters” with deceased persons, real objects or events that are subsequently verified (Greyson, 2010). Confirmed case reports of such “veridical perceptions” in the context of NDEs pose difficult research challenges and have been variously interpreted as evidence for both extrasensory dimensions of NDEs or human “survival” of bodily death. Reports of veridical perceptions by congenitally blind near-death experiencers make this phenomenon even more puzzling as such cases exclude all plausible neuroscientific explanations and provide compelling evidence that extra-sensory perception takes place *at least in some* NDEs (Kohr, 1983; Ring & Lawrence, 1993). Accumulating evidence that veridical perceptions take place in out-of-body experiences (OBE) *unrelated* to NDEs, and robust findings from rigorously conducted investigations of remote viewing confirm that veridical perception is a widely shared human perceptual ability that occurs both spontaneously—including in some NDEs and OBEs—during other altered states of consciousness, and in gifted individuals under controlled laboratory conditions (Holden, 2009; Ring & Cooper, 1997; Paquette, 2012).

Most NDE models assume that NDEs take place in the moments coinciding with a traumatic event that precipitates the NDE. However for the majority of NDE case reports an exact correspondence between the subjective experiences retrospectively labeled a NDE and the exact ‘timing’ of trauma associated with a NDE, is impossible to verify. Carefully documented NDEs that include claims of veridical perceptions during a period of complete loss of consciousness demonstrate that at

least *some* NDEs “take place” exactly when near-death experiencers believe they do.

While such cases provide evidence for a close temporal relationship between states of consciousness in which NDEs take place and extrasensory perception the majority of NDEs do not include claims of veridical perception and thus do not provide ‘time anchors’ to verifiable external events. The human capacity for veridical perception may be consistent with the postulated ability of ‘big I’ to access information in the Universe outside of ‘normal’ perceptual boundaries and 4-dimensional space-time that constrain ‘small i.’ An adequate explanatory model of NDEs must address this *extra-sensory* dimension of consciousness that takes place in specialized “states” of consciousness including NDEs, OBEs, remote viewing and other transpersonal experiences.

1.5 - The debate over the relationship between brain function and consciousness

Only a single confirmed case of a NDE that ‘takes place’ in the complete absence of brain function is needed to support the hypothesis that consciousness is *possible* in the absence of a functioning brain, and, by the same token, to confirm that an intact fully functioning brain is *not always* a *necessary or sufficient* prerequisite for at least some kinds of conscious experiences including the experience of complex mental imagery typical of NDEs. Cases of cortical blindness in which the capacity for visual imagery is preserved provide evidence that complex visual imagery does *not always* require an intact visual cortex (Ring & Cooper, 1997, 2008; Ganis, 2003).

Documented cases of intact visual imagery in cortically blind persons are consistent with an evolutionary model in which recurrent imagery is generated by ‘old mammal’ limbic brain structures (Lake, *in press*). These findings suggest that visual imagery not only *does not depend on* intact visual cortex but would be *expected to take place* even in cases of acute cerebral hypoxia impairing ‘normal’ functioning in neocortex. In view of well documented cases in which complex NDEs take place in unconscious but

physiologically and neurologically intact persons or in awake fully conscious persons, it seems plausible that humans—and possibly other species—have different ‘kinds’ of NDEs involving disparate physiological, psychological and possibly also anomalous mechanisms.

2. Models of Consciousness

There is still no adequate theory of consciousness. However we expect a future *more complete* theory of consciousness will emerge from a synthesis of models describing ‘normal’ functions or states of consciousness, ‘disorders of consciousness,’ and so-called transpersonal experiences including the near-death experience, the out-of-body experience and others. The future theory will *more accurately* characterize neurophysiological processes and postulated quantum-like and other biophysical and energetic processes associated with brain function and demonstrate the respective roles of disparate processes in various ‘states’ of consciousness at the level of neurons, neural circuits and networks. Until now there are no falsifiable theories of consciousness. Nor is there consensus on a *most complete* conceptual framework or optimal research methodology for investigating consciousness. We are left with multiple non-commensurate models that purport to *describe* the nature of the brain in time and space, and the relationships between brain structure and function. These seemingly intractable issues have led to the current state of affairs in which philosophical debate over the nature of consciousness may prove almost as useful as scientific inquiry (Lake 2014).

2.1 - Explaining paranormal aspects of near-death experiences and other transpersonal experiences

Some models of consciousness discussed in the parapsychology literature rest on assumptions of non-local quantum mechanical effects on living systems, are inherently indeterminate and are not falsifiable using available technologies and current research methods (Vannini, 2008). Models that purport to explain ‘paranormal’ dimensions of consciousness

depart from scientific theories of perception and cognitive functioning by postulating concepts about space-time, energy and information that are not endorsed by *current* science.

Quantum field theory may permit more complete descriptions of the dynamics of complex non-linear systems than classical quantum mechanics (QM) and thus may provide a more adequate framework for modeling consciousness (Vitiello, 2001; Freeman & Vitiello, 2011). Quantum field theory is the basis of the theory of Quantum Brain Dynamics (QBD) which posits that symmetry-breaking in the brain’s electromagnetic field caused by ionic fluxes in axonal membranes, results in the formation of sub-atomic particles classified as Bosons, which form meta-stable “condensates on transitioning to a stable ground state (Jibu, 1995). Boson-condensates subsequently merge into highly ordered macroscopic states that manifest as tightly coupled correlations of microscopic *non-local* brain states that take place *independently* from synaptic connectivity. Correlated non-local states are massively in phase fulfilling the classical QM definition of ‘coherence.’ The net result is that the entire brain or particular networks behave as a *coherent macroscopic quantum system*. In this model the properties or “qualia” of consciousness are manifestations of coherent macroscopic quantum states created during symmetry-breaking when electromagnetic fields interact in the brain. QBD provides a new synthesis of complex systems, neuroscience and quantum field theory however, like other QM models of brain function, QBD is not falsifiable using existing technologies and research methods.

Any discussion about the nature of consciousness evokes perennial uncertainties about the fundamental nature of reality. It has been suggested that consciousness, matter and space-time ‘are equal ontological partners,’ i.e. all three exist as fundamental kinds of ‘things’ in the universe (Smythies, 2003; Linde, 1990). Theoretical physicists have argued that the 3 dimensions used to describe space in Newtonian mechanics may be an arbitrary

and incomplete description of the universe and that 'reality' is *hyperdimensional*.

Superstring theory, for example, postulates that the universe consists of at least 10 spatial dimensions and that gravity 'extends' into a kind of higher dimensional space. In the same vein Hawking has proposed that physical objects and processes take place in 4-dimensional space-time structures called *branes* that are *embedded* in higher-dimensional space-time manifold that reflect the actual structure of the universe (Hawking, 2001). Assuming that *brains* or other complex systems capable of manifesting consciousness are 'embedded in' 4-dimensional *branes* which are in some sense *related to* or 'projected on' a higher-dimensional space-time *background* in which they have existence, the properties of a higher-dimensional space-time would be expected to constrain the nature and functions of consciousness.

Starting from Plato's allegory of the cave, Sirag proposed a hyperspace model of the universe according to which our 3-dimensional bodies are 'shadows' of a higher dimensional world in which consciousness plays a primary role (Sirag, 1997). Targ has argued that anomalous phenomena are explainable and even *expected* in the context of an 8-dimensional space-time metric, a *hyperspace* model of the universe that is more consistent with contemporary interpretations of quantum mechanics than the conventional Newtonian model of space and time from which current biomedical models of consciousness are constructed. Greene and Krippner proposed a hyperspace model for 'separation experiences' including out-of-body experience commonly reported in the context of NDEs (Greene, 1999; Greene & Krippner, 1990). Starting from six scientific and metaphysical propositions Audain's extraneuronal hyperspace theory builds on the work of Greene and Krippner arguing that information contained in signals (sic 'cognons') that the brain transduces into a form of energy and space that exists outside of 4-dimensional space-time in a *hyperneuronal matrix* (Audain, 1999).

Quantum brain dynamics and other quantum-like theories of consciousness

provide conceptual models that may help explain relationships between consciousness, space-time and information in hyperspace that manifest as 'veridical perceptions' reported in NDEs, remote viewing and other so-called anomalous experiences.

2.2 - Proposal for an integral model of consciousness

An *integral* model that *reconciles* the perspectives of hyperspace theories, conventional neuroscience models and quantum-like models may provide a robust conceptual framework in which to construct future models of consciousness. An *integral* framework that is inclusive of emerging theories in physics, neuroscience and transpersonal psychology, may yield more complete explanations of both 'ordinary' functions and states of consciousness, disorders of consciousness, transpersonal experiences, and so-called 'anomalous' phenomena taking into account the range of complex factors and processes that influence and constrain consciousness. In this vein I am proposing an integral model that encompasses both classically described and postulated non-classical mechanisms. In this model some—probably the majority—of *states* or *dynamic patterns* of brain activity are associated with conventionally described neurophysiological processes, while some states or functions are associated with transient, highly coherent macroscopic quantum fields. In the former case, conventional theories in psychology and neuroscience provide adequate descriptions and explanations of perception, cognition and memory, which take place in the domain of 'ordinary' space-time. In contrast, in the latter case, certain factors or conditions that take place only in the context of changes in the *background of local 4-dimensional space-time to higher-dimensional space-times* manifest as functions or states of consciousness that are regarded as 'anomalous,' 'paranormal' or 'transpersonal.' Those functions or states may involve discrete neurons, networks or groups of functionally related networks that "resonate with" other (non-living or living) systems situated in higher-dimensional

space-time domains including the special case of *space-time domains enfolded by other brains or machines*. In other words, certain *states* or *state changes* that take place in the brain may be associated with coherent macroscopic quantum fields that ‘condition’ space-time manifesting as higher dimensional space-times permitting *resonance* between state spaces that are non-local with respect to each other in 4-dimensional space-times with the result that ‘information’ is co-extensive in two or more networks or brains.

Baer (this journal issue) proposes an integral model of consciousness that requires a distinction between what humans *directly* perceive and the mechanism underlying phenomenal experience. Baer describes immediate perceptual experience related to the senses as the “small i,” while the mechanism that generates phenomenal experience is called the “Big I.” The model proposed in this paper is consistent with postulated differences between ‘small i’ and ‘big I’ in Baer’s model, and may provide a general framework for conceptualizing physical mechanisms in the brain and relationships between consciousness and space-time that permit both *ordinary* perceptions and phenomenal experience as well as so-called *anomalous experiences* including carefully documented reports of direct ‘brain-to-brain’ communication (i.e. telepathy), clairvoyance, remote viewing, and veridical perception during NDEs or OBEs. According to Baer the NDE, OBE and anomalous experiences may take place when there is a breakdown of communication between the classical object body and the consciousness generating mechanism underlying the ‘Big I.’

To date efforts to falsify all quantum models of consciousness have been impeded by seemingly intractable methodological problems associated with detecting and measuring postulated quantum-like processes in biological systems. These issues have precluded study designs that can *potentially confirm* the existence of quantum-level processes in brains and postulated relationships between QM-like phenomena and disparate functions or states of consciousness. In

view of the absence of a falsifiable quantum theory of consciousness and the absence of evidence linking quantum-like processes to brain function including confirmed reports of anomalous experiences, at this time the proposed model should be regarded as scientifically informed speculation.

Conclusion

The theories and research methodologies of current science cannot answer basic questions about the nature of human consciousness. A *more complete paradigm* of consciousness is emerging from the scientific study of NDEs and other so-called ‘transpersonal’ experiences. The future paradigm will be derived from a synthesis of neuroscience, quantum mechanics, and new understandings of relationships between space-time, information and complex living systems. In the coming decades novel research methodologies will confirm that human consciousness *may take place* independently of the brain and has access to information outside of the *ordinary* space-time. The theories and technologies that emerge from future research efforts will yield valuable new insights into the fundamental nature of consciousness and relationships between the brain and space-time associated with ‘ordinary’ conscious states, transpersonal experiences and so-called anomalous experiences. Solving basic problems related to the postulated role of quantum-level processes in consciousness await future research methodologies that will make it possible detect and measure quantum-like processes in complex biological systems.

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