

Introduction to the Self-Conscious Mind

Robert G. Mays, B.Sc., and Suzanne B. Mays

Consciousness, the brain and the “hard problem”

The prevalent view in neuroscience is that the brain produces consciousness. We are conscious because the electrical activity in our brain's neurons works in a complex way and consciousness somehow “emerges” from that complex neural activity. The difficulty with this view is that it doesn't really explain our interior, subjective *experience* of consciousness, as pointed out by David Chalmers (1996), which is really the “hard problem” of consciousness.

Chalmers argues that conscious experience can't be explained solely from physical phenomena and offers several arguments to support this:

- The brain's neurological activity alone does not explain the *qualities* of our internal experience – why a red object appears *red* to us. A person brought up in a totally black-and-white environment may know everything there is to know about how the brain produces color experience but still would not know what it is like to see color (the qualia or knowledge argument).
- It is logically conceivable that a physically identical duplicate of a person can exist which behaves identically but which lacks conscious experience. This possibility implies that conscious experience is not logically dependent (“supervenient”) on the physical (the zombie argument).
- It is conceivable that in a world physically identical to ours, conscious experience is *different*, for example, that color experience is inverted – where we see red, people in the identical world see blue, and vice versa (the inverted spectrum argument).
- The facts of physical causation in the world (in physical objects, biological systems, etc.) alone do not suggest that there should be any consciousness. The only way I know about consciousness is because I experience it (the epistemic asymmetry argument).
- The phenomenal “feel” of conscious experience cannot be explained as a functional property of a physical system through functional analysis – only the *effects* of conscious experience play functional roles (the absence of analysis argument).

Chalmers advocates the view that everything including conscious experience is a consequence of basic properties and laws. Because conscious experience can't be reduced to physical processes, it necessarily involves some new fundamental properties and laws beyond the existing physical laws. The new laws will be “psychophysical” laws which specify how the phenomenal properties of consciousness depend on physical laws. Chalmers calls this stance a “naturalistic dualism” in that consciousness can be explained by basic natural laws, not through transcendent elements or mystery. But the current natural laws need to be expanded.

Chalmers rejects all forms of interactionist dualism, which hold that a non-physical consciousness could be causally effective in influencing the brain. Even if a mechanism for causal interaction could be found, the mechanism for interaction itself would not explain conscious experience any more than neurological mechanisms do.

The fundamental problem of a theory of consciousness then is bridging the “explanatory gap” between the physical level and conscious experience. Tim Bayne and Chalmers (2003) further suggest that a theory of consciousness must be compatible with the idea that a subject's conscious states are necessarily unified, that is, the conjunction of all of a subject's phenomenal states at any time is itself a phenomenal state. The notion of the unity of consciousness implies the concept of a *subject* in whom the phenomenal states are unified. Consciousness would then be viewed as a total phenomenal state: what it is like to be a subject at a time.

In earlier research (Mays & Mays, 2008a), we introduced the idea of the *self-conscious mind* * or simply “mind”, an autonomous, non-material field of consciousness, spatially coextensive with the body which is intimately integrated with the body and brain. The brain mediates cognitive faculties; the brain’s neural electrical activity is required for consciousness. On the basis of this model, we propose a theory of consciousness that addresses the issues of the “hard problem”.

A. The human being consists of (1) an energetic, spatially extended, non-material “mind” that is united with (2) a material brain and body. The mind is a “field of consciousness”; it is non-material (does not consist of material atoms, etc.) but rather is a structured, energetic region of space that can interact with physical processes, in particular with neurons, and thus has physical attributes. The mind is united and co-extensive with the brain and body and interacts directly with the brain, probably via electrical interactions with cortical and other dendritic structures. **The basic evidence** for this idea derives from the phenomena of the near-death experience (NDE) (Moody, 1975; Greyson, 2000) and various neurological phenomena including phantom limbs:

- **The mind is a separate entity, a “field of consciousness”:** (1) During NDE, the locus of consciousness appears to separate from the physical body and operate independent of the brain, having heightened, lucid awareness, logical thought processes, and vivid perceptions including veridical perceptions of the surroundings; (2) during the out-of-body component of NDE, the locus of consciousness has a particular position in space and a particular visual perspective; (3) phantom limbs appear to be fields of sensation extending beyond the body in the space where the physical limb was present, such that when the phantom limb is “touched”, the amputee can feel sensations and when the phantom limb “touches” another person, that person experiences sensations (Mays & Mays, 2008b); (4) amputees generally can feel “touch” during Therapeutic Touch therapy of their phantom and the therapist can generally “feel” the presence of the phantom limb (Leskowitz, 2000 and 2001).
- **The mind is non-material, but has the character of a structured energy field, interacts with physical processes, and thus has physical attributes:** (1) The out-of-body mind appears to pass readily through solid objects and is invisible to ordinary sight, but it also appears to interact in subtle ways with physical processes: physical objects, light, sound, and other persons’ bodies; (2) the out-of-body mind entity can apparently be “seen” by animals; (3) phantom limb “touch” on another person’s head in the region of the brain can elicit visual and other sensations similar to electrical brain stimulation (Mays & Mays, 2008b); (4) at least two phantom limb subjects (M.G. and A.Z.) report being able to “see” their phantom limbs as a faint glow against a dark background or in the dark (Mays & Mays, unpublished report, 2009; Brugger, et al., 2000); (5) a field (region of space) which entails interaction with physical processes, itself has physical attributes, although it is not like any currently known physical fields.
- **The mind is united with the brain and interacts directly with it, probably via electrical interactions:** (1) People generally feel that their locus of consciousness extends throughout their physical body; (2) electrical brain activity is correlated with conscious experiences (e.g., electrical brain stimulation, EEG, brain imaging technologies); (3) some NDE accounts include a report of the NDEr “merging” with an in-body person in order to see and hear through them (Mays & Mays, 2008a); (4) some NDEs suggest an electrical nature to the NDEr’s “body” (e.g., interaction with fog); (5) one after-effect of NDE is abnormally high electrostatic charges around the person's body, which can interfere with watches and electronic equipment.

B. The mind is the seat of conscious experience. All cognitive faculties (perception, thinking, feelings, volition, memory and self-awareness) reside in the non-material mind entity, not in the brain. However, the mind ordinarily is completely dependent on brain structures and neural activity for consciousness. Mental events become conscious only when there is sufficient electrical brain activity. If the electrical activity is not sufficient, the percept or other

* Our concept of the “self-conscious mind” is different from that of Karl Popper and John Eccles (1977) who also used the term in a dualist interactionist theory of mind.

mental event remains subliminal. On the other hand, the mind can initiate electrical brain activity and thereby serves as the agent that initiates volitional activity, exerts “mental force”, alters brain neural patterns plastically, and is the unified phenomenal field resulting in the sense of the unity of consciousness.

- **All cognitive faculties reside in the non-material mind, but ordinarily need the brain’s neural activity for conscious awareness:** (1) During NDE, the locus of consciousness retains all cognitive faculties while apparently operating independent of the brain; (2) in the ordinary case, if a person loses brain electrical activity, they become unconscious.
- **Consciousness requires sufficient electrical brain activity, else sensations remain subliminal:** (1) Sensations become conscious only after a sufficient duration of electrical brain activity (Libet, 1973; Libet, et al., 1975; Libet, et al., 1991); (2) lower than liminal stimuli do not rise to conscious awareness but forced-choice responses are accurate (e.g., Libet, 2004, cases of blindsight, etc.).
- **A mental agent appears to initiate electrical brain activity:** (1) People generally sense that “their” volitional activity results in their physical movement, speech acts, etc.; (2) cognitive behavioral therapy for obsessive-compulsive disorder implies an agent that generates a “mental force” which causes neural changes (Schwartz, 1999); (3) “plastic” changes in neural structures can occur rapidly when fine motor movements are practiced mentally (e.g., Pascual-Leone, et al., 1995), which implies an agent that exerts purely endogenous mental effort can effect neural reorganization and physical performance improvement.
- **A mental agency appears to serve as the unified phenomenal field:** (1) Subjective backward referral of sensation, in which a person appears to “antedate” the time and specific body location of a stimulus even though awareness of the sensation comes 500 msec later (Libet, 1973; Libet, et al., 1975), implies an agency that “holds together” the time and location until the sensation comes to consciousness; (2) large-scale phase-locked neural synchrony occurs cross-hemispherically from posterior to anterior brain regions during arousal, sensorimotor integration, attentional selection, perception and working memory (Lutz and Thompson, 2003), and implies an agency that effects the synchrony and produces the subject’s unified phenomenal experience.

C. When brain structures are damaged, mental faculties dependent on them are partially or totally impaired.

For example, memory content resides solely in the mind entity but memory formation, consolidation and recall require hippocampal and other structures, and when the latter are damaged, memory function is impaired. Impairment is due to interference with the interface between the neurons and the corresponding structures of the mind. The field of the mind has an internal structure which corresponds to the cortical and other neural structures of the brain. In fact, it is likely that the internal structure of the mind’s field directly maps to the neural structure throughout the body. The mind depends on brain neural activity in particular cortical locations for particular cognitive activities.

- **Brain damage causes mental impairment, by interfering with the neural interface to the mind:** (1) There are numerous examples connecting brain damage to cognitive impairment, in addition to memory impairments; (2) damage to neurons implies that the neural interface to the mind is impaired such that sensory, motor, affective and thought processes may be altered or impaired; (3) during anesthesia, the anesthetic agent suffuses the brain and the patient loses consciousness, implying that the anesthetic agent interferes with the neural interface with the mind.
- **Field of the mind has an internal structure:** (1) In at least some NDErs, the out-of-body “body” appears to have an intricate, luminous structure, for example with tiny structures in the hands and tubes of light up the arms (Moody & Perry, 1988, p. 10); (2) (from a previous point) the interaction of the mind with the body is probably via electrical interactions with neurons; (3) in order to selectively interact with specific neural activity, the mind needs to be in close proximity with specific neurons; (4) some NDE accounts include a report of the NDEr “merging” with an in-body person in order to see and hear through them (Mays & Mays, 2008a), which implies that the mind’s internal structure can interface with the brain in a similar way from one person to another and therefore the mind’s internal structure is similar from person to person; (5) there is an unusual relationship between phantom limb sensations and neural activity in the

stump, implying a connection between stump neurons and mind structures in the phantom: sensations can be modulated by stump manipulations, temporarily abolished by local stump anesthesia, or altered by changes in stump blood flow, and altering the sodium channel conductance in stump neurons can increase or block phantom limb pain (Nikolajsen & Jensen, 2001).

- **Interaction of the mind's field with the brain occurs in particular cortical locations:** Brodmann areas have distinctive cytoarchitectures (Brodmann, 1909), which generally map to cognitive functional areas, and other structural differences exist between functional areas, which implies that particular mind structures interact with particular cortical and other neural structures in the brain.

D. This theory solves the “hard problem” of how conscious experience can arise from physical brain activity – conscious experience depends on a second entity with physical attributes, the conscious mind, which interacts with the brain to produce phenomenal experience. Subjective experiences of qualia are an effect in the mind resulting from neural electrical activity in specific regions of the brain. A philosophical zombie duplicate of a person is impossible because a physical duplicate would necessarily include a conscious mind as well as a physical body and thus would entail conscious experience. The unity of consciousness results from the unity of the mind's “field of consciousness”. The mind *is* the subject in whom phenomenal states are unified.

- **The conscious mind, a second entity with physical attributes, interacts with the brain:** (earlier points) (1) The mind is a separate entity, a “field of consciousness”; (2) the mind is non-material but interacts with physical processes and thus has physical attributes; (3) the mind is united with the brain and interacts directly with it, probably via electrical interactions; (4) all cognitive faculties reside in the non-material mind
- **Interaction with the brain produces phenomenal experience:** (1) There are at least five situations in which phenomenal experience occurs: (a) during NDE, the out-of-body person has phenomenal experience by apparent direct interaction with physical processes (light, sound, etc.) without apparent involvement from the brain or body, implying that the brain and body are not necessary for phenomenal experience; (b) a limb deficient person has phenomenal experience by apparent “touch” of the phantom limb by an object or another person (Mays & Mays, 2008b; Leskowitz, 2000 and 2001), implying that phenomenal experience can occur with interaction by physical processes with the non-material field of the phantom; (c) a person has phenomenal experience by apparent “touch” in the brain region by another person's phantom limb (Mays & Mays, 2008b), implying that the phantom limb can induce phenomenal experience in another person through interaction with the brain; (d) a person has phenomenal experience by direct cortical electrical stimulation (Penfield & Rasmussen, 1950), implying that electrical brain activity imposed from without can produce phenomenal experience; (e) a person has phenomenal experience by ordinary sensory stimuli, implying that phenomenal experience occurs in this case by the electrical brain activity interacting with the mind's field. (2) Thus, interaction of the field of the mind in a variety of ways always entails phenomenal experience, including interaction of the mind with the brain.
- **Experiences of qualia are an effect in the mind resulting from electrical activity in specific regions:** (1) (previous point) Interaction with the brain produces phenomenal experience; (2) (previous point) interaction of the mind's field with the brain occurs in particular cortical locations; (3) particular cortical locations are associated with phenomenal experience of particular qualia, which implies that electrical activity in a particular location affects the mind's field in that location and produces that specific associated quale.
- **A philosophical zombie duplicate of a person is impossible:** (1) (previous point) The mind is non-material but interacts with physical processes and thus has physical attributes; (2) a physical duplicate would necessarily include a conscious mind as well as a physical body; (3) (previous point) all cognitive faculties reside in the mind, but ordinarily need the brain's neural activity for conscious awareness, implying that the duplicate would have phenomenal experiences.
- **The unity of consciousness results from the unity of the mind's “field of consciousness”:** (1) During NDE, the locus of consciousness appears to be in a single location with a particular visual perspective; (2) during NDE, the out-of-body “body” appears to be a single field which is never divided, implying that the mind's “field of consciousness” is a singular entity.

- **Phenomenal states are unified in the mind as subject:** During NDE, the mind “field of consciousness” is the locus of all phenomenal states and is felt to be the person’s self.

E. All interactions in the mind have two sides: they entail both phenomenal experience *and* a physical causal role. Physical causal closure is maintained because the mind is a non-material entity with physical attributes, whose structures can act causally on neural processes. The domain of what constitutes “the physical” must necessarily be expanded. The conscious mind entails new fundamental properties and is a fundamental aspect of reality, namely a person’s seat of consciousness.

- **Interactions in the mind always entail phenomenal experience:** (1) (previous point) There are at least five situations in which phenomenal experience occurs: (a) during NDE, (b) “touch” of a phantom limb region, (c) “touch” of the brain region of a subject by a phantom limb, (d) electrical brain stimulation, and (e) ordinary sensory stimuli, each involving interactions with the mind; (2) there are no known interactions with the mind which do not entail phenomenal experience.
- **Interactions in the mind always entail a physical causal role:** (1) (previous point) The five situations involving interaction with the mind include a physical causal role by (a) direct physical processes (light, sound, objects), (b) direct physical processes (objects or another person), (c) the brain of the second subject, (d) electrical pulses to the patient’s brain, and (e) physical stimuli acting on sensory neurons; (2) there are no known interactions with the mind which do not entail a physical causal role, except possibly telepathy, which may still require neural activity to be received.
- **Causal closure of the physical is maintained:** (1) (previous point) The mind interacts with physical processes, and thus has physical attributes, implying that at some level, the field of the mind becomes a physically causal entity.
- **The domain of “the physical” must necessarily be expanded:** When phenomena are discovered which imply new physical entities or forces, the domain of what constitutes physical reality has historically been expanded. The case of the mind as a new aspect of reality is no different.
- **The mind is a fundamental aspect of reality with new properties and is a person’s seat of consciousness:** (1) conscious experience is a fundamental aspect of human beings and (we can infer) some animals; (2) (previous point) the mind is non-material, but has the character of a structured energy field and interacts with physical processes, implying that it has properties that are unique; (3) (previous point) all cognitive faculties reside in the non-material mind, implying that the mind is the seat of the person’s consciousness.

Objections to dualism

The present theory is a form of “interactionist dualism”, which posits the mind and the body, and a mechanism for the interaction between them. **The main objections to dualism**, and responses relating to this theory, are:

- **How can mind-brain interaction occur?** There is no conceivable mechanism whereby a totally non-physical mind could affect the material body. If the mind and body are totally different types of things, how can they intermingle and interact with each other? **Response:** The mind is not totally non-physical. It is non-material, but has the character of a structured energy field that interacts with physical processes. The evidence supporting this view, presented earlier, includes phenomena from NDEs and from phantom limb interactions. In addition, see the following section on “Interaction of the non-material mind with physical processes”.
- **How does brain injury also impair the non-physical mind?** When the brain is damaged in some way, mental faculties are always compromised or impaired to some degree. If the mind is a completely separate substance from the brain, how does brain injury also impair the mind? (Churchland, 1988). **Response:** The mind is not a completely separate substance from the brain. It has the character of a structured energy field that interacts with physical processes, in particular with neurons. Impairment is due to interference with the interface between the neurons and the corresponding structures of the mind.

- **How can the mechanism for interaction between the brain and mind explain phenomenal experience?** Even if a mechanism for causal interaction could be found, the mechanism for interaction itself would not explain conscious experience any more than neurological mechanisms do (Chalmers, 1996). **Response:** The mind is itself the locus of phenomenal experience. All interactions with the mind entail phenomenal experience. The evidence supporting this view, presented earlier, includes phenomena from NDEs and from phantom limb interactions.
- **How does this view avoid the Cartesian Theater in the brain?** An interactionist dualist theory posits that the brain informs the mind of perceptions and the mind directs the brain in appropriate action. The mind is thus like a “homunculus” in the brain. There is no interior homunculus observing the results of neural activity and giving commands in a “Cartesian Theater in the brain”, as such theories imply (Dennett, 1991). **Response:** The mind’s structures unite directly with neural structures without an intermediate stage of “interpretation”. All neural activity interacts directly with the mind, resulting in phenomenal experience. Even stimuli of very short duration result in phenomenal experience, albeit subliminal.
- **How is this view not a category-mistake? How is this not just a “ghost in the machine”?** A theory that places “mind” and “body” together in relation to one another as terms of the same logical category makes a category-mistake, since they are not of the same logical category. There is no hidden entity, the “mind”, inside a mechanical “body” (Ryle, 1949). **Response:** Both the mind and the material body are objective, spatially extended entities, one a non-material field and the other a material object, which unite together to form a cohesive unity. There is no category-mistake of relating entities belonging to different logical categories: both mind and body are objective aspects of reality that relate to each other through physical interaction. There is no “ghost in the machine” because the mind is closely united with the body through a physical interaction relationship.
- **Doesn’t this view violate causal closure of the physical?** Causal interactions between a non-physical entity and a material body would violate the “causal closure of the physical world”. The interaction of a non-physical entity would introduce an influence on a physical system which would violate the principle that all physical effects can be ultimately reduced to physical causes. **Response:** The mind is a field (region of space) that interacts with physical processes, and thus has physical attributes, implying that at some level, the field of the mind acts as a physically causal entity. As a consequence, the domain of what constitutes “the physical” must necessarily be expanded to include minds. Causal closure of the physical world is maintained.

Aren’t NDEs just the result of abnormal brain function?

A number of physiological factors are generally cited as explanations of NDE (Greyson, et al., 2009). None of these explanations is adequate to explain NDE, because (1) the reported experiences bear only slight resemblance to NDE, (2) many NDEs occur under conditions without the suggested physiological factor, or (3) in cases where the physiological factor is present, NDEs are not reported in even a large percent of cases.

- **Altered blood gas levels:** Cerebral hypoxia or anoxia (too little or no oxygen), especially in cases of induced rapid acceleration (G-force loss of consciousness), and hypercarbia (elevated carbon dioxide) are cited as factors resulting in NDE-like experiences. While hypoxic conditions do sometimes involve NDE features (tunnel vision, bright lights, sense of floating, brief fragmented visual images), their primary features include symptoms not found in NDEs – jerking movements, compromised memory, tingling sensations, confusion upon waking, etc. Similarly, while hypercarbic conditions apparently produce some features commonly found in NDEs, these features are rare and other NDE features are absent. Furthermore, NDEs occur in conditions without hypoxia or anoxia (non-life-threatening illnesses, falls, etc.) and NDEs occur in patients where measured blood levels do not reflect lowered oxygen or elevated carbon dioxide levels. Finally, NDEs occur in only 10-20% of cardiac arrest cases where anoxic conditions are very likely to occur.
- **Neurochemical factors:** Release of endorphins or similar chemicals in the brain at the time of stress may produce cessation of pain and feelings of peace, both common in NDEs. However, injection of endorphins tends to produce long-lasting effects, whereas these effects in NDEs begin and end abruptly, with

separation from and return to the body. An endogenous ketamine-like anesthetic agent may produce effects similar to low doses of ketamine (sense of being out of the body, travel through a tunnel to a light, believing one has died, etc.) However, unlike the vast majority of NDEs, ketamine experiences are usually frightening, having bizarre imagery and are felt to be illusory. Other important features of NDEs (meeting deceased friends and relatives, life review) are absent from reported ketamine experiences.

- **Temporal lobe seizure or other abnormal electrical activity in specific brain regions:** Abnormal electrical activity or dysfunction in the temporal lobes are claimed to produce all or most NDE phenomena (out-of-body sensations, panoramic memories, mystical visions, vivid hallucinations, etc.). Electrical brain stimulation studies by Wilder Penfield are commonly cited as evidence. However, electrical brain stimulation is not the same as seizure or dysfunctional electrical activity in the temporal lobe and the experiences cited are dissimilar to those reported in NDEs (fragments of music, isolated scenes from memory, fear or other negative emotions, bizarre imagery, etc.) Transcranial magnetic stimulation (TMS) has also been cited as inducing all of the major components of NDE (out-of-body experiences, being pulled toward a light, hearing strange music, etc.). However, the experiences reported were unlike typical NDE features or were too vague to compare, and other researchers were unable to replicate the results. Finally, temporal lobe seizures themselves do not result in experiences that resemble NDE features.
- **Induced out-of-body experiences (OBEs):** Out-of-body experiences have been claimed to result from seizure activity or electrical stimulation in the region of the temporo-parietal junction (TPJ), which is thought to involve integration of vestibular information with other sensory information regarding the location of the body in perceptual space (Blanke, et al., 2002 and 2004). The interpretation of the results of these studies, involving a total of six patients, is controversial. In one patient no overt anatomical defect or specific diagnosis could be identified, so identifying even general localization is completely speculative for this case. Further, there is no clear evidence of lateralization, for example to the right TPJ, because the remaining cases are split between the right (n=2) and left hemispheres (n=3). The generalization of cases of moderate to severe neurological pathology to *all* persons experiencing OBE is conjectural when such pathology is apparently absent in the vast majority of persons experiencing OBE. Further, the cases of OBE associated with TPJ seizure and electrical stimulation are not typical of spontaneous OBEs, especially those associated with NDE: TPJ induced OBEs are more fragmentary, distorted and illusory, involving incomplete or non-veridical elements. (*Veridical* in this sense includes both the patient's subjective sense of being real *and* verification that what was observed had actually occurred.) In spontaneous OBEs, there is a strong sense of the reality of the experience, body image disturbances are unusual, veridical perception of events, including those occurring at a distance, are present in many cases, and non-veridical perceptions are rare.

While none of these physiological factors is adequate to explain NDE, such factors may play a role, for example in triggering the onset of NDE. The similarities which are observed may be an indication of this role. However, no single physiological factor is present in all cases of NDE: the NDE appears to be a phenomenon with multiple possible triggers.

Interaction of the non-material mind with physical processes

How does the non-material mind interact with the physical processes of the brain and body? The NDE “body” appears to be non-material: it readily passes through solid objects, cannot be seen or heard, etc., and has no apparent interaction with physical processes. However, the NDE literature includes a number of reports of NDErs interacting with physical processes. The interactions are *subtle* but do occur. Furthermore, a phantom limb appears to be a “field of sensation and touch”, where the physical limb once was, and also exhibits subtle interactions with physical processes.

Evidence of interaction from NDEs: In NDE, the NDEr's “body” appears to be a thing (a field) with a shape and location (Mays & Mays, 2008a). The “body” may appear luminous to the NDEr, with a luminous interior structure, and can be “seen” by animals and fellow NDErs. There is apparent interaction with physical processes such as light and sound, because the NDEr reports veridical visual and auditory perceptions. There is apparent interaction with

physical objects, because the NDEr can bob on the ceiling, and feels slight resistance when passing through objects such as walls. There is one account of an NDE involving apparent interaction of the NDEr's "body" with fog on a cold night. The NDEr jumped up and down and the "jumping fog" was seen by another man.

The NDEr "body" can interact with another person's body: an NDEr's hand went through the doctor's arm, which felt "gelatinous"; an NDEr could tickle the nose of another patient until she sneezed. There are at least three cases where an NDEr "merged" with another person to see and feel what they were seeing, feeling and thinking. These cases imply that interaction with and influence over neural activity in the brain is possible, in particular, "merging" implies that the mind readily joins with and interacts with the brain, even another person's brain.

Evidence of interaction from phantom limbs: A phantom limb is the vivid subjective experience of the presence of a limb that is absent congenitally or through amputation. The phantom limb also appears to have objective reality as a "field of sensation and touch" in the region where the physical limb was (Mays & Mays, 2008b). Phantom limbs appear to be the exposed "mind limbs" extending beyond the physical body.

We have observed interactions with one subject (M.G.), born without the fingers of her left hand. Her phantom fingers "touching" physical objects evokes physiological sensations in the finger buds, in the left palm and along the left arm, and presents physiological reactions (increased skin color, twitching of the finger buds). In experiments "touching" a number of other subjects, especially in the region of the brain, the "touch" evokes subtle but definite physiological sensations (warmth, pressure in the head and sinuses) and distinct, unusual inner visual images. M.G. also reports that "massage" of her phantom fingers (i.e., the therapist passing her hand over the finger area) evokes tickling sensations. Finally, M.G. reports that she sometimes can "see" her phantom fingers as a faint whitish or bluish light when held up against a dark background. (Another congenitally limb deficient subject, A.Z., reports similar ability: "In darkness, I have noted a faint glowing of my phantom body parts", in Brugger, et al., 2000.)

A number of case reports appear in the literature (e.g., Leskowitz, 2000 and 2001; Sheldrake, 1995, pp. 152-153) involving Therapeutic Touch treatment of amputee phantom limb pain. The common features of these cases include: (1) the therapist can usually feel the phantom limb as "present" in the expected location, sometimes having a distinctive "energy"; (2) the patient can usually feel the presence of the therapist's hand in the phantom limb area that the therapist is working in, despite the fact that the patient cannot see what the therapist is doing (the eyes are closed, the patient is looking away or the patient's eyes are bandaged); and (3) the patient experiences immediate and dramatic reduction in the subjective pain; the pain reduction is usually long-lasting after several sessions.

Evidence from both NDE and phantom limb phenomena thus suggest that interaction occurs between the non-material field of the person and physical processes (objects, light, fog and sound), as well as another person. The interactions evoke phenomenal sensations in the subject and in the other person. In addition, evidence also suggests that the non-material field can appear luminous at times, both to the subject and to animals.

Implications of this theory

There is a process of "coming to awareness": Benjamin Libet's "time-on" principle (Libet, et al., 1991) proposes that about ½ sec (500 msec) of brain electrical activity is required before a person becomes aware of a sensation, regardless of its content. The person adjusts for this delay by "antedating" the subjective sensations back to their actual time. For example, a person can process and react to an emergency before becoming conscious of it (Libet, 2004). In Libet's view, sensations are first subliminal. Visual stimuli that are presented too quickly for conscious awareness are nevertheless "seen" and "interpreted" if the subject is forced to give an answer. Subjects show greater accuracy for longer presentation times. A person can be (emotionally) affected when shown an emotionally evocative picture, even if the perception remains subliminal. These cases imply that there is subliminal cognitive processing (detection, recognition) which occurs prior to awareness. We propose that *all* conscious experience requires at least 500 msec of brain electrical activity to come to consciousness, including endogenous mental acts such as thoughts, images and decisions. This proposition is similar to Libet's own proposal (1993, p. 385). The thought, image or decision remains subliminal for the time-on period but is *not* antedated to its time origin.

Libet's delayed awareness of willed action: In a series of experiments to time the relationship between the subjective sense of willing to move and the actual movement, Libet told subjects to flex their wrists at a time freely chosen (Libet, 1985; Libet, et al., 1983). The neural response to a subjective command to move is measured at the top of the head and is called a "readiness potential", a slow rise in electrical negativity which indicates preparation for the movement.

In these experiments, Libet found that the readiness potential neural response (RP) typically started 550 msec before the actual muscle movement measured at the wrist by an electromyogram (EMG). Libet asked subjects to note the time they first became aware of *wanting* to move, by noting the position of a revolving spot on a circular electronic "clock". Ironically, the subject's *first awareness of the intention or wish to move* (W) was on average about 350 msec *after* the onset of the readiness potential. This delay makes it appear that the brain has decided to move *prior* to the subject's actual conscious intention to move.

The apparent "decision" by the brain to act prior to the actual awareness of the intention to act is counterintuitive and implies that people do not act out of free will, even when they subjectively feel that they do. However, if one accepts the proposition that people's awareness of their own endogenous mental acts is delayed (see previous section), Libet's result is less enigmatic. We propose that the initially subliminal wish to move requires a time-on of about 500 msec before the awareness of the wish to move (W) and, thus, occurs some 150 msec prior to the onset of the readiness potential. The relative times of events from Libet's experiments would thus be as follows:

- -700 msec: wish to move, initially subliminal (proposed)
- -550 msec: readiness potential begins (RP)
- -200 msec: awareness of wish to move (W)
- - 85 msec: awareness of moving (M)
- 0 msec: muscle movement (EMG)

How can people subconsciously intend to do something and then a half second later become aware of the intention? In our view, a freewill decision originates in the conscious agency of the self-conscious mind, but the neural activity reflecting this mental act must meet the 500-msec time-on requirement before there can be awareness of the decision. This explanation is consistent with people's subjective experience that their decisions are purely their own and arise from the conscious context they are in: They would be very surprised to find that they have decided something contrary to that context.

The time-on delay of awareness of endogenous mental acts thus helps explain the apparent disconnect between volition and action in this experiment, and in other cases such as William James's (1890) introspection of the process of getting out of bed on a freezing morning. Libet's counterintuitive result points to the unusual way we are organized: a non-material mind interfacing through the relatively slow electrical activity of the brain.

The mind plays an active role in brain development: In postnatal brain development, significant "regressive events" occur during infancy in which many neurons die off, and there is gradual "myelination" of other neurons. Myelin is an electrically insulating sheath that covers the axon so the neuron can efficiently transfer neural impulses. The first brain areas to be myelinated are the motor, olfactory, and somatosensory areas. The last areas, myelinated, in teen and early adult years, are complex visual functions, executive functions, and working memory. We propose that the mind's activity of interfacing with neural electrical activity, especially during infancy and early childhood, influences which neurons are retained and myelinated, and thus become available for use. This view has implications for child development and education. Child development entails the child's mind integrating with and re-forming the brain and body through its own activity. Educational programs should thus be formulated in attunement with the child's and teen's brain development, and use age-appropriate mental and physical activities to enhance mind, brain and physical development at each developmental stage.

Memory resides in the mind, not in the brain: Brain structures and pathways, especially in the hippocampus, are needed to form, consolidate and recall memories. Bilateral damage to the hippocampus results in the inability to form new memories (anterograde amnesia). In contrast, memories that are formed during NDE are accessible

afterward. They generally are vivid, long-lasting and not subject to embellishment over time. This result implies that memories can be formed and “stored” without the brain. Moreover, memories prior to NDE are accessible during NDE, which implies that memory content is accessible without the brain.

The results of NDE accounts imply that memory formation and recall are both functions of the mind and are only supported by brain functions while in the body. In addition, memory content resides in the mind, not the brain, which suggests that profound retrograde amnesia (loss of long-term memory), such as in dementia, is probably due to the destruction of brain structures that mediate memory recall rather than destruction of memory content itself. In this view, existing memories are not destroyed in dementia patients with the deterioration of cortical structures and would return with even a slight reversal of certain cortical deterioration. Rather than *lose* the past, people with Alzheimer’s disease gradually become *blind* to it.

Just what is the self-conscious mind?

What is the self-conscious mind exactly? Is it “transcendent” or mystical? In our research, we rely on the phenomena to define the boundaries and extent of the theory. We prefer not to speculate beyond what the phenomena indicate.

The mind presents itself as a field, that is, a region of space with specific properties. The essential property of the mind is consciousness, more precisely the conscious experience of a particular individual. The mind has energetic attributes in that it appears to interact with physical processes, especially with neurons, and appears to exhibit electrical effects and luminosity. The mind appears to have a complex internal structure that probably directly maps to the neural structure throughout the brain and body.

There are three modes in which the mind can be conscious: (1) during ordinary consciousness, the mind is united with the physical body and is conscious because of interactions with the brain and body; (2) during NDE, the mind is separated from the physical body and is conscious because of direct interactions with physical processes, such as light and sound; and (3) in a phantom limb, a portion of the mind’s field is exposed as a kind of “mind limb” – the region where the physical limb was present – and the person can sometimes experience conscious sensations of “touch” when an object or another person’s body interacts with the mind limb field.

Is the mind a kind of subtle substance? The self-conscious mind does not appear to have properties of a substance, in particular because it appears to be unitary and indivisible, although it has extension and location in space. The mind readily interpenetrates ordinary matter and, thus, is not material in any ordinary sense. Rather than a subtle substance, the mind appears to be more the seat of consciousness and the essential selfhood of the person.

Can the non-material mind be studied scientifically? What the mind is and how it functions with the brain are ultimately empirical questions. Objective, non-material entities can be studied scientifically through their effects on other entities. We propose that further scientific investigation can be profitable in the following areas:

- **Phantom limb phenomena:** The phantom limb provides direct access to a “mind limb”, its inherent internal structure and how that structure interacts with the body and brain, in particular with the neurons in the stump. The phenomenal experience of phantom limb sensations and phantom limb pain are directly reportable, as are interactions of the phantom limb field with other subjects. Direct physical interaction of the limb field in measurement devices may also be possible. Research in this area also has the potential to develop effective treatment modalities for phantom limb pain, which has hitherto proved intractable.
- **NDE phenomena:** More thorough surveys of NDE accounts should provide additional cases and data about interactions with physical processes and “merging” of the NDEr with in-body persons. These data should provide additional information about the nature of the mind “body” in its out-of-body state. More detailed evidence of veridical NDE perceptions will strengthen the case for the non-material mind.
- **NDE physiological aftereffects:** When the mind has reunited with the brain and body following NDE, there generally are striking physiological aftereffects (heightened sensitivities, electrical effects, etc.).

which probably result from the incomplete reintegration of the mind with the physical body. A direct study of unusual physiological aftereffects, especially just following NDE, should provide further insight about the mind in relation to the body.

- **Other neurological phenomena:** In principle, all neurological phenomena should be explainable in terms of the self-conscious mind interacting with the brain. There are particular phenomena that might provide interesting insights and confirmation of this theory, for example, phenomena which might better be explained by the principle of “coming to awareness” such as the cutaneous rabbit, blindsight and split brain phenomena. Additionally, the interface of the mind with neurons might be unraveled through a detailed study of the intercellular structures of specific regions of the cortex such as M1 and V1-V4.

Mind is a fundamental entity, a new dimension of reality

The self-conscious mind as conceived in this theory does not fit other known physical phenomena or known physical laws. It follows then that mind must be a fundamental entity, a new dimension of reality, and the domain of what constitutes “the physical” must necessarily be expanded to include minds. The proposition that a non-material mind interacts with electrical brain processes means that there must be some sort of force which brings about the interaction. We expect that this force must ultimately induce or translate into electrical effects in the neurons.

The essential property of the mind is the conscious experience of a particular individual. The mind is the seat of the essential selfhood of the person; *it is* the person. Conscious experience arises necessarily within the mind’s field of phenomenal experience, through the direct interaction of the mind with the person’s brain.

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