THE QUALION HYPOTHESES

Some New Proposals on the Physical and Supraphysical Bases of the Mind

Abstract: Cogent objections to explaining mental phenomena solely in terms of the *known* components of the brain indicate that new ways of confronting the problem may be needed. The approach taken here is to consider whether physical processes could endow the brain with something unexpected, elusive to detection, and "mindful."

This article presents two mechanisms that deserve scrutiny. One or the other may transform energy from the body's 310 K thermal background into a brain-wide microcosm of localized, spinning quanta that are stable and immune to absorption—a highly versatile microcosm with perhaps 10^{24}–10^{26} massless components.

Logic suggests these energy structures exist and are the ultimate psychophysical nexus. Essentially, they are proposed to generate *highly variable* levels and states of *supraphysical consciousness fields* into the virtual emptiness of the brain region. (Recall that all matter is 99.99+% empty space.) These fields are attributed an inherently protean, manifold character and the ability to superimpose network-wide into a single ultracomplex field.

When these and other postulates are then added to what is known about the brain's involvement in cognition, they provide a coherent framework for understanding the *genesis* of the conscious mind, its continuity as a relatively autonomous, higher-level system, its content and processes, and its ability to exert volitional controls. The basics of these proposals are testable in described ways.

Are the conscious states we experience ultimately made up of complexes of fundamental elements? Is there, say, a mental analogue of the quark? — Colin McGinn (1993)

Introduction

Ever since the scope of scientific inquiry expanded in the late 1980s to include the enigma of consciousness, there has been a procession of attempts to explain it. Dennett (1991) sees the brain as a virtual machine and claims that consciousness is simply a property of whatever pattern of neural activity is "dominant" at any particular time. Edelman (1992) has suggested that it emerges when groups of interconnected neurons bristling with revisions work to produce accurate representations of the world. Crick (1994) and Koch view it as an electrophysiological by-product of the synchronized, high-frequency firing of vast assemblies of neurons in different parts of the brain. And turning to the most basic level, Penrose (1994) and Hameroff have taken the position that consciousness arises from indeterminate quantum physical processes occurring in microtubules.

None of these or any other hypotheses (e.g., Baars, 1992; Chalmers, 1996; Dretske, 1995; Gazzaniga, 1988; Humphrey, 1992; Lycan, 1996; Scott, 1995; Stapp, 1994) has generated much enthusiasm. While these works have been widely praised for their eloquence, their erudition, and their courage, when it comes to their positions on *consciousness,* reviews and reactions have been almost uniformly negative[1] and quite often hostile. Dennett is generally thought to have explained it away. Edelman does not explain *how* mere structures and functions become conscious. Crick and Koch to some degree share the general view that their ideas are inadequate. And Penrose, too, has faced a barrage of criticism—with two reviewers (Grush and Churchland, 1995) in this journal calling his position a "caterpillar-with-hookah" hypothesis.

Why These and All Similar Hypotheses Regarding the Physical Basis of Consciousness May Be Misguided

The apparent reason for the extent of the Rodney Dangerfield syndrome[2] among existing hypotheses is that none of these proposals really feels right or goes far enough. Typically open to decisive objections, they generate in whatever it is in us that thinks more of a "gong" than a resonant ring of truth. This sense is often accompanied by a twin feeling that *something fundamental eludes us* (Güzeldere, 1995; Chalmers, 1996)—in the words of Güven Güzeldere, there may be "a missing ingredient in the make-up of the world" (p. 126). These twin reactions arise for some combination of the following reasons (hereinafter referred to as the *Standard Objections*):

1. **The Humdrum Neuron Objection.** In terms of physics and chemistry, the processes that have been observed in nerve cells are very ordinary. Slightly polarized neural membranes, depolarizations, and flows of ions are, in fact, about as remarkable as rain in Seattle. Indeed, nothing about neurons, as presently understood (hereafter, *APU*), genuinely suggests the potential for generating the added property of consciousness in an organism (McGinn, 1991). This is accentuated by the fact that there are no essential differences between those neural systems whose activity is known to *accompany* consciousness and systems, such as the cerebellum, whose activity is unrelated to this phenomenon.

   Vague assertions that consciousness somehow arises from complexity per se only evade and confuse this central issue. There is no more reason to believe that consciousness would emerge from a mere complex arrangement of nerve cells (APU) than it would from a complex structure of Tinkertoys® or Legos.®

2. **The Unity of Conscious Experience Objection.** Neurons (APU) are completely separate from one another. They are *islands* whose events may be also be separated by time; but subjective awareness, including the perception of

selfhood and sensations, is typically experienced as a complex, but unified, *whole.* This objection has come to be known as *the binding problem*. No one has yet proposed a satisfactory solution.

3. **The Monotonous Neocortex Vs. the Disneyland Mind Objection.**
   Observation A. Both the brain and its neocortex (APU) are built of very simple, repetitive units (Shepherd, 1994). The only observable difference known to exist between them are generally inconsequential variations in shape and there are less than a dozen of these. Neurotransmitters differ but in effect they *all* simply promote or inhibit neural impulses. All the fifty or so regions of the neocortex are virtually identical in structure and organization. Each has the same neural hardware and the nature of neural impulses within each region is also identical. In short, monotony reigns throughout the neocortex (APU).
   Observation B. Over a typical human lifetime, we experience an extraordinary variety and range of subjective phenomena. We experience technicolor images such as those in a Spielberg movie or the fireworks on the Fourth of July. We hear shouts and whispers and the music of Mozart and Andrew Lloyd Webber. We can tell what's cooking in the kitchen with our sense of smell and then savor it even more when we begin tasting it. We know that a kiss feels one way and a slap in the face another. We know the difference between hot and cold, hard and soft, sharp and dull. On a Saturday, we may be on cloud nine; and on the following Tuesday, we may be bluer than blue. If someone insults us, we get angry; and if our car starts sliding on an icy highway, we feel the grip of terror. At other times, we may feel serene, anxious, lonely, bored, obsessed, guilt-ridden, grief-stricken, infatuated, inebriated, envious, confident, or triumphant. We laugh and cry and believe and hope and love and dream. And just when we've think we've experienced it all, there's always something new.
   Conclusion. There is a staggering contrast here. William James (1890) observed over a century ago that the difference is the "strongest contrast in the entire field of being. The chasm which yawns between them is less easily bridged . . . than any interval we know" (vol. I, p. 134). More recently, Ned Block (1978) has reminded us that *"no* physical mechanism seems very intuitively plausible as a seat of qualia, least of all a *brain"* (p. 293).

4. **The How Could There Be an Engram? Objection.** Established knowledge about brain activity in general makes the possibility of cogent neural (APU) theories of memory seem very remote. As E. R. John (1967) has noted, the vast majority of neurons are incessantly discharging during the waking state, but there is no infusion of the information fragments these neurons purportedly contain into conscious awareness. More poignantly, he notes that neutral signals and signals hypothetically containing information content for encod-

ing would affect a neuron in exactly the same way. How then could information be properly isolated? Even if a neuron received nothing but "data bearing" signals for a given time-interval and they were properly encoded, later signals would presumably initiate the same recording processes. How then, he asks, could individual memories be segregated and maintained rather than overlayed and distorted?

5. **The Where Am I? Objection.** One of the most universally held views is that each of us is a very complex individual. When you read this paragraph, for example, you do so with the sense that you're a *person* with an intricate and multidimensional personality embodying motives, drives, values, inhibitions, and a great variety of other qualities. *No* neural features have been identified, however, which could account for the self. And while this has led some to simply deny that the self exists, personal experience makes it impossible for most people to accept this conclusion.

6. **The Mechanistic Brain (APU) Vs. the *Seemingly* Freely Active, Volitional Mind Objection**.
   Observation A. The conscious mind (although influenced by its own content) *seems* to be essentially free. People don't *seem* to be automatons or robots. And we *seem* to experience this freedom directly—so much so that we wonder about the sanity or motives of those who deny it. We can think about virtually anything we want, in any way we want, and change our mind as often as we please. And in the next few minutes, we can, it seems, *somehow* direct our body to do almost anything. We can get up, start shadowboxing, bark like a dog, or take a ball-point pen and place a tiny blue dot on any of a billion places on the walls around us—simply by acting on a choice to do so. And while some scholars continue to deny freedom of thought and action, it is so strongly intimated by experience that it has become enshrined in our psychology, our legal systems, our histories, and our humanities. If people cannot do other than what they do, then the members of ISIS and Boko Haram are as blameless as newborn infants. (How would you like to make an argument like this to a jury?)
   Observation B. The brain (APU), as an operative system, is a physically determined mechanism. It is a choiceless, machine-like organ. Certainly on the quantum level there is some indeterminate or random activity. But this represents only minor (and uncontrollable) *chance* fluctuations from a determinate course of events, not the freedom we seem to experience (Popper, 1973). The more randomness governs a system, the more chaos, not freedom, reigns. This is one reason random activity on the quantum level is not thought to significantly impact events on the macroscopic (or neuron) level. If it did, the result would a brain that operated randomly or chaotically. Regardless of the extent of the random effects, however, chance alone offers a

basis for neither freedom of thought nor the kind of coordinated broad-scale *control* effects required for an efficient volitional mechanism.

Summation. The brain (APU) is a physically determined mechanism with the possible exception of some mere randomness or chaos in its activity. The mind, by contrast, *seems* to be free.

Conclusion. If our commonsense impression that the mind is free is correct, then it *must* have some other basis than the known components of the brain.

Because of the very formidable nature of the Standard Objections (especially the last one), it is somewhat puzzling that more experts do not take seriously the following conclusion: it is impossible to explain the conscious mind in terms of the *known* components of the brain.

Some have already come to this conclusion. A number of eminent neuroscientists (Eccles, 1970, 1989; Kety, 1978; Page, 1957; Penfield, 1975; Sherrington, 1950) and other critical analysts of the mind-body issue (Beloff, 1962, 1994; Blanshard, 1970; Burt, 1961; Carrier and Mittelstrass, 1995; Ducasse, 1951; Foster, 1991; Jaki, 1969; Kelly and Kelly, 2007; Lewis, 1969; Lowe, 1996; Madell, 1988; Margenau, 1984; McGinn, 1997a; Polten, 1973; Popper, 1973; Popper and Eccles, 1977; Shaffer, 1966; Swinburne, 1986; Thorpe, 1978) have rejected the neuronal doctrine and become dualists. But this position is now problematic because no one has yet explained the origin and nature of a second entity and how it would interact with the brain.

Others (Jackson, 1982; McGinn, 1991, 1997b; Nagel, 1979, 1986) have thrown their hands up and become "mysterians" (a term adapted by Flanagan, 1992). They think that because all hypotheses so far have been knocked to the canvas by some sort of fatal (or near fatal) objection—and because of unique difficulties inherent in the problem—the issue may never be solved. To them, a solution to the mind-body problem is either centuries away or beyond human understanding.

A Completely New Approach to the Problem of Consciousness—A Response to a Possible Need for Something "New"

The position taken here is not so pessimistic. Approaching the mind-body problem in a *completely* new way, this article probes the following questions: Are there any physical processes that might endow the brain with something unexpected and elusive to detection—something that may account for consciousness, form a higher level subjective realm, and is correlated with but essentially disengaged from mechanistic cerebral processes? And if nature does provide a "quark" of consciousness, can a model based on this concept surmount the Standard Objections? The answer to both questions may be *yes.*

In terms of fundamental concepts and with special reference to man, this article will describe two potential endowment mechanisms and their derivatives,

and then propose characteristics that would allow these derivatives to implement a wide variety of mental phenomena. To demonstrate the explanatory power of the system as a whole and its transcendence of the Standard Objections, these concepts will then be developed more fully—largely in a series of footnotes—into a *rough* but coherent explanation of various kinds of mental phenomena.

Finally, ways of testing these proposals will be described.

General Summary of Hypotheses

Nature may provide two mechanisms with mind-making potential: *an anomalous thermal emission process* and *quantum entrapment.* The first mechanism would consist of a direct emission of the body's 310 K thermal energy in an anomalous form due to certain unique features and interactive processes of biological molecules. The second may occur when ordinary thermal emissions interact in their various potential states with biological structures or processes.

One of these mechanisms may engender a brain-wide network of localized microphysical energy-structures that are stable and immune to absorption. Designated *qualions,* these quanta, if they exist, may be the ultimate substrate of mental activity. Essentially, they are proposed to generate highly variable states of supraphysical *consciousness fields* into the virtual emptiness of the brain region. (Recall that all matter is 99.99+% empty space.)

Based on the inference that these fields have an inherently protean, freely active essence that allows them to self-configure and assume a superordinate role over their energetic sources, several other properties, such as field-intensity variation, can be attributed to these quanta. As the means of achieving subjective unity, consciousness fields from distinct qualions are proposed to merge by superposition into a single ultracomplex field.

When these and other postulates are added to what is known about the brain's involvement in cognition, they provide a coherent framework for understanding the *emergence* of the conscious mind, its continuity as a relatively autonomous, higher level system, its content and processes, and its ability to exert volitional controls.

The Body's 310 K Thermal Energy Background: a Possible Basis for the Provision of a Higher Level Emergent

All matter that is warmer than absolute zero exhibits thermal agitation in its atoms and molecules and constantly emits this energy in the form of electromagnetic radiation over a broad range of frequencies. Human tissue does not represent the hypothetical ideal of a blackbody, but its characteristics are close enough that blackbody formulas may be applied (Cossins and Bowler, 1987). Thus, the total emission of radiation by a cross section of the human body at its temperature of 310 K occurs nearly at a rate expressed by the Stefan-Boltzmann law; and

the spectral energy distribution of this radiation is described by Planck's radiation law. A 310 K background has a photon density of slightly more than $6x10^8/cm^3$ (see Born, 1969; Kittel and Kroemer, 1980; Reif, 1965; Riedi, 1988).

These photons are almost exclusively in the infrared and microwave range. Every molecule in the human body continually emits and absorbs this radiation. It's everywhere inside us.

Two Prospects for Emergent Generator: An Anomalous Thermal Emission Process and Quantum Entrapment

Electromagnetic radiation is generated when an electric charge undergoes some form of acceleration. At a temperature of 310 K, such energy-yielding motions exist because molecules are periodically vibrating, bending, inverting, or rotating. The energy levels associated with these motions are closely spaced; and quantum transitions, when they occur, result in small energy changes that reduce the amplitude of these movements. Such transitions give rise to the thermal emission of photons in the infrared-microwave range.

It is important to bear in mind that these emissions result not from instantaneous "quantum jumps" but from smooth, progressive, time-varying changes in the electric and magnetic properties of a unit or system undergoing a transition (Macomber, 1976; Henderson, 1979). Consequently, any factor affecting the kinetics, thermodynamics, and/or electric and magnetic properties of the emitting unit or system may in turn affect the character of the radiation emitted.

In organic tissue, biological molecules and their events display a great variety of distinctive features capable of affecting an emission process, especially those molecules involved in bioenergetics. Unusual charge configurations and electromagnetic environments, enzymatic mechanisms, electron-transfer processes, the formation and breaking of energy-storing bonds, and isomerization reactions are examples of these phenomena.[3] In most cases, single biological events incorporate a composite of distinctive features; and often such events involve reactions between extremely complicated molecules undergoing transitions.

These conditions and processes may result in unusual patterns and interactions of the charges constituting emission systems. They may also affect the dynamics of the charge acceleration as well as the interplay of electric and magnetic fields during the course of a transition. They may therefore significantly affect the manner in which thermal energy is emitted. Briefly stated, some combination of factors may operate together to generate, and emit as quanta, a stationary, stable, rotating energy structure.

Several intriguing scenarios and related questions are presented in a footnote;[4] but these represent only a few possibilities. Indeed, the variety and interplay of factors relevant to an anomalous thermal emission process may be much more complex than these suggest. Whatever the degree of complexity, however, it is not feasible to present an exhaustive list of conjectures as to which blend of

factors may be involved. The observation here is simply this: in a biosystem there is a broad range of emitter motion-patterns as well as intricate interplays of charges during an emission process. And the inference is simply that a localized structure of electromagnetic energy may emerge.[5]

A second and more remote possibility is that photons in their various potential states and biophysical systems may interact in ways that entrap and transform the photon's energy.

It is anticipated that physicists will be able to probe these new conjectures systematically,[6] but at this early stage it seems sufficient to simply open an inquiry.

How Likely Is It That Either Process Actually Occurs?

To get a feel for the likelihood that either process succeeds in adding something "new" to the brain, it is first helpful to recall that since the moment of the Big Bang, Nature has shown itself to be a prodigious innovator. Anything that *can* happen usually does. There are some processes, like stellar formation, that flow as easily from the physical laws and constants as day after night. Then there are processes that have physicists shaking their heads in awe—fortuitous processes that just *barely* manage to occur, like the formation of carbon atoms in stellar cores.

Although it's too early to provide a mathematical assessment of whether the proposed mechanisms face a high natural hurdle or an easy path, a simple commonsense analysis strongly suggests that *one* of them may well be another of Nature's success stories. There are two alternative hypotheses: either subjective phenomena can be accounted for by the known components of the brain or they must be accounted for by something "new." Unless we deny some seemingly self-evident facts about our existence, we are forced to conclude that the first hypothesis is badly undermined by the Standard Objections. Nature, therefore, may have to provide something new; and modern physics may be limited to the two alternatives described in this paper. One or the other, then, would seem more likely than not to be one of Nature's modes of innovation.

The Qualion: The Proposed "Quark" of Consciousness

What then could emerge from these mechanisms? Plausible configurations of stable, localized electromagnetic fields-structures include spherical shells (Barut, 1975), balls (Barut, 1975), strings (Barut and Bornzin, 1974), spinning loops of magnetic flux (Jehle, 1972), a torus composed of closed and spinning loops of electric flux (with magnetic fields), or a soliton-like structure.

In light of these and other possibilities,[7] it would be premature at this time to commit to any specific position on the structure of the derivative quanta. Until these proposals become further developed, it is best to leave this matter open.

It may, nevertheless, be surmised that these energy structures *would* be massless and therefore would rotate at light-speed with the portions nearer the axis of rotation (i.e., having a smaller circular path) revolving progressively more times per second than the outer portions. In the following sections, they will sometimes be exemplified simply for conceptualization as a spinning toroidal structure with an average diameter of 10^{-12} m.

Whatever their ultimate character, these hypothesized microphysical energy-structures are designated *qualions* to characterize them as the ultimate source of qualia in biological organisms. The distribution patterns and rate of qualion formation are, of course, incalculable at this time; but since most of the potentially relevant factors described earlier are ubiquitous in any biosystem, it seems plausible that these quanta may be evenly distributed in immense numbers (perhaps 10^{26}–10^{28} in the human body)[8] throughout all life-forms.[9]

Qualions and Consciousness Fields

There are sound reasons for supposing that qualions would be steady tenants within our bodies,[10] immune to absorption,[11] and mobile;[12] so these matters needn't be belabored here. Let us turn instead to the most critical postulate to be made in this article. It is this: *qualions continuously generate highly variable levels of consciousness fields.* And to be more precise, these fields are *supraphysical* fields (real but not governed by physical laws).

The idea that consciousness is a field has been proposed before (e.g., Greenfield, 1995; Kinsbourne, 1988; Libet, 1994; Margenau, 1984; Rosenberg, 1996; and Searle, 1993) and makes good sense. This is the way it *feels* to be conscious and—harking back to the binding problem—the only way for mental elements separated by space to be truly *bound* is to share a common field.

A New View of Cosmic and Supra-cosmic Reality: C↔E↔M

An explanation of *why* qualions would generate consciousness fields entails a multiple-interrelated-potential view of cosmic reality. It views mass, energy, and consciousness as fundamental interrelated potentialities. Mass (M) has the potential of energy (E) and energy the potential of mass; and further, energy has the potential of consciousness (C) and consciousness the potential of energy. Hence, C↔E↔M. If this is so, then perhaps the qualion is one particular energy-structure in which this potentiality becomes realized. This view also suggests that consciousness *engendered* the energy of the Big Bang (i. e., the cosmos is a creation *ex Deo* rather than *ex nihilo*) and that the ultimate explanation of our awareness is as follows: **C** (God) → E (the Big Bang) → M (mass or matter-based structures) ›› E (a special type of energy, i. e., qualions, emitted by matter) → C (human consciousness as *derivative God-stuff*). Given the ample evidence of intricate *fine-tuning* in the genesis, structure, and dynamics of the universe (see, e. g.,

Corwin, 1983; Leslie, 1996), it is not surprising that a growing number of distinguished scientists (e. g., Adair, 1987; Davies, 1992; Dyson, 1979; Ellis, 1993; Gingerich, 1994; Harrison, 1981; Hawking, 1985, 1988; Hoyle, 1993; Jastrow, 1992; Lovell, 1990; Misner, 1977; Pagels, 1985; Parker, 1988; Polkinghorne, 1987; Sandage, 1998; Thompson, 2011; Trimble, 1977) now take very seriously—or openly embrace—the concept of a divine origin.

Further Proposals Regarding Consciousness Fields

The distribution of consciousness fields. Consciousness fields may be capable of penetrating space unimpeded, permeating not only regions devoid of particles (including the virtual emptiness—99.99+%—of atoms and molecules), but also co-occupying the spaces in which particles exist. Like the electron's Coulomb fields, consciousness fields are conceived to emanate evenly in all directions from either the midpoint of the qualion's rotational axis or from a spherical region centered on this point. Similarly, we may consider the intensity of the consciousness fields at a particular locus to be inversely proportional to the square of the distance from the point or region of emanation.

The autoconfiguration of protean consciousness-field lines. It is now postulated that the freedom we seem to experience is authentic and that two factors may account for it. The first is that qualions are bundles of energy disengaged from mechanistic brain processes. The second is that consciousness fields have an inherently protean, freely active essence that enables component field lines to self-arrange into limitless varieties of configurations and/or to assume a wide variety of dynamic activity-patterns.

Such freedom may be thought to exist in its purest and simplest form. As a corollary, once such a property has been exercised, the resulting configuration or activity pattern becomes locked in until the property is again used to change them.

Superposition of consciousness fields. Consciousness fields may be designated a *linear system*. This means that the fields generated by distinct qualions would *superimpose* upon (i.e., merge with) each other to produce a single complex field. We'll explore later how qualions may underlie phenomena such as sensory perception, focal mental activities, and the self; but the important thing to note here is that each of these would be *regional* processes or structures within a single whole. Our conscious experience can thus be pictured as a unified multiphenomenal field occupying definite regions of space.

Consciousness fields as exercising control over the qualion as a unit. Due to the proposed interrelation between consciousness fields and their energetic sources, it is postulated that these fields can control the spatial dimensions of qualions. They may expand or contract these quanta and in so doing affect their own intensity.

If the qualion is a torus, for example, an expansion or contraction of the

toroidal circumference would result in an inverse variation in both the amount of energy flux in a cross section and in the number of revolutions per second (RPS). More concretely, if the average circumference is doubled, then both the cross-sectional flux level and the RPS will be halved (i.e., half the number of rotations are needed to maintain c). In so doing, the generative energy-configuration becomes *diffused;* and therefore the consciousness-field production process is reduced in magnitude (and vice-versa when qualions are contracted). To be more specific, the proposed consequence is a direct inverse effect on the intensity of fields generated.[13]

A spectrum of consciousness. To continue the current line of thinking, let us simply suppose the following: the diameters which a single qualion can adopt range in size over three orders of magnitude from about 10^{-13} m (about fifty times the diameter of a proton) to about 10^{-10} m (the radius of a typical atom). Within these limits, the intensity of consciousness fields generated would vary from extremely strong to very weak and such variance would be reflected in either the contribution of a unit to a regional field or, when exercised microcosm-wide, in the general level of subjective awareness.

On the small-diameter end of the spectrum, there may be a limit on qualion compactness. Near this limit, the qualion may generate *supraluminous* consciousness fields. Still within the high compactness zone but less so, the qualion may generate the phenomenon perceived as *luminosity.* As qualions further expand, the fields generated would reduce to high subluminous intensity, to moderate intensity, to low intensity, to extremely low (or subliminal) intensity.

On the microcosm scale, the contribution of qualions would average out to generate, without sharp transitions, the following spectrum of possible conditions (all subluminous): hyperconsciousness, average waking-levels of consciousness, hypoconsciousness (or stupor), and absence of waking (or subliminal) consciousness.

A quick exercise. Consider taking a minute now to imagine a cubic module of a billion qualions forming a static hologram-like image of a dove in flight. Such an image would be formed by various intensities and patterns of field lines within the module. A good metaphor for these field intensities would be very light to very dark shades of "gray".

Initially, this module would be a uniform medium of qualions generating moderate—or "gray"—levels of consciousness fields. The first of two concurrent processes would be a "chiseling" out of the medium to achieve relatively vacant or "dark" areas. To do this, the relevant subpopulation of qualions and their field intensities would be damped down to a low—or "dark gray"—level. These would envelop the ultimate image with increasing precision.

Complementing this injection of "darkness" would be an interfacing infusion of "light." Starting perhaps as an amorphous concentration of qualions generating high intensity—or "near white"—consciousness fields, this group would

then arrange itself to realize its intended form. These quanta would exact their positions and converge their protean field lines to form a head, the protrusion of eyes and a beak, a breast and a back, a pair of extended wings, then legs, feet, and tail feathers. In a brief elapsed time-period, the image of the dove is complete. (Ideas developed in Appendix I will suggest how this plain "white" dove might be turned into a multicolored talking parrot, but let's be content with the dove for the time being.)

States of Consciousness and Unconsciousness

In this article, the term *conscious state* will refer to any condition in which the qualion microcosm generates a sufficient level of consciousness fields to produce a subjectively discernable state of awareness in an organism. *Unconscious state* will refer to the absence of such a condition (i.e., consciousness fields are at a subliminal level).

General activation and arousal and the base-level conscious state. In describing the processes that eventually lead to consciousness, *activation* will refer to the initiation of broad patterns of cerebral activity; and *arousal,* to a *contractive response* by individual qualions in key areas of the brain that "lifts" them into a fully conscious state.

Neuroscientists have some understanding of the general form of activation leading to full waking consciousness. This is a process involving the reticular formation, many nearby related structures, and their ascending pathways (Shepherd, 1994). Initially, some required degree of sensory input triggers a complicated chain of events involving these structures, which causes progressively greater numbers of neurons to discharge and eventually results in a general activation of the neocortex.

Billions of neurons are continually firing when activation is achieved, and each of the thousands of channels in individual neurons can pass 100 or more ions during impulses lasting about one millisecond (Keynes, 1979). Arousal may occur when the magnetic fields of ionic currents act upon the magnetic fields of qualions constituting the *ego* (similar, as described in footnote 20, to the one proposed by Hilgard, 1977) and achieve a certain threshold level of agitation. In effect, this may provoke spontaneous qualion contractions and thereby "noise" within the system that serves as a "wake-up call." The qualion components of the ego that were at a subliminal level then respond and *contract* into a conscious state and we begin tending to the problems of the day.

Simultaneous to the arousal of the ego, it may be surmised that a *base-level* subjective system also responds and emerges into a fully conscious state. In accord with some combination of innate and learned adaptive-disciplinary processes, this base-level system would include *only* those elements that would subserve an efficient, coherent, and responsive subjective realm. In addition to the ego, it is proposed that the other primary components of

this realm are a reality orientation data-system, the finished products of sensory perception, and a central mental arena (similar to the global workspace of Baars, 1988) where focal mental operations are conducted. It may also be surmised that a peripheral arena of semiconscious short-term memories would exist to provide context for ongoing experience.

General deactivation and the downtime response. When the transmission of signals from the brain's activating system is significantly reduced, cortical activity in general falls dramatically and the subject becomes unconscious.

This may be viewed as the consequence of several processes. In terms of direct effects on the qualion microcosm, the cessation of the arousing or galvanizing influence alone would probably have a strong depressant effect in a distinct but correlative system that is intimately attuned to it. On a second level, as the brain becomes relatively inactive in certain critical areas, the bridge to external reality, and hence externality itself, may be said to "collapse." This decline would deepen as the outside world is replaced by an isolating void—a *self*-consuming limbo with a caveat: do not linger here. There is but one exit, unconsciousness; and a state of rest has both an attractiveness and usefulness of its own. All these subverting factors then are conceived to work together to trigger a subconscious reaction, the *downtime response,* which compels the ego and possibly the base-level subjective system to retreat (via an *expansion* of their constitutive qualions to a subliminal level) to a neutral state of unconsciousness.

Restful unconsciousness, or "downtime," may thus be viewed as the inevitable result of a radical subjective decline and is partially due to the preferability of such a state to the dangers of total existential deprivation.[14]

This proposed reaction may be either an innate response or a learned response with roots in the prenatal-infancy period and would have the added utility of preventing qualion activity from interfering with vital sleep. For all the above reasons, the downtime response may be considered an essential adaptive mechanism.

The Content and Processes of Our Minds

In addition to the properties of qualions and consciousness fields proposed up to now, it must be surmised that they also have a number of other innate qualities and potentials. Variations in intensities and field-line configurations, of course, would give consciousness fields the ability to create *forms* ranging from simple symbols like the number *two,* to hologram-like images such as the dove in flight, to animated figures; but there is more to our subjective life than symbolic or geometric representations of reality, however complex. There are sounds and technicolor images, pleasure and pain, love, joy and sadness.

In appendices I-V, this paper will attempt to make a rough but hopefully tantalizing beginning in the area of subjective phenomena—many of which may ultimately be adaptive mechanisms.[15] It will take on sensory perception and

qualia as well as thinking, memory, selfhood, and volition. It will, for example, propose that the experiences of the colors *red, yellow,* and *blue* are constituted by (and identical with) different intensities of consciousness fields in the luminosity range. It will propose that the experience of sounds occurs when qualions vibrate. It will propose that thinking is essentially consciousness-field information structures undergoing change. It will suggest that the person is a very complex cognitive superstructure with a highly concentrated "nuclear" core.

Readers are asked to approach these footnotes with an open mind because much of what will be proposed runs contrary to today's "conventional wisdom." They are asked to remind themselves that heliocentricism, microorganisms, general relativity, and quarks also contradicted popular viewpoints of the past. And they are asked to remember that the basics of this paper rather than amendable details are what ultimately counts. What is presented is merely one of many possible series of derivative hypotheses.

Testability of Hypotheses

Let us now turn to the issue of testability. As a prelude to doing so, it is worth noting that these new hypotheses have already undergone some *antetesting.* This means that they predict certain results that have already been discovered about the mind-brain relationship—results that currently exist as puzzling anomalies in neuroscience. For example, they suggest that conscious experiences will lag slightly time-wise behind the brain events that evoke them. This has been demonstrated by Libet (1966). And they predict that during the performance of tasks requiring higher levels of directed mental effort and activity than the average waking state there would be no significant increase in the energy utilized by the brain. This has been demonstrated by Kety (1957).

Looking ahead, these hypotheses are testable in other ways. In regard to the proposed substrate of consciousness fields, it must be remembered that qualions are conceived to be *real* energy-structures that are derived from and reduce the energy in biological tissue. One obvious prediction then is that there exists in living tissue some small unaccountable loss of thermal energy. If it is determined that this is not so, the qualion hypothesis would be falsified.

Further, since qualions are anticipated to have an electromagnetic character, it seems plausible that methods could be devised for detecting them. In an age when scientists have devised ways of detecting something as miniscule and elusive as a quark and can provide compelling evidence for something as "ghostly" as a neutrino, it seems likely that the same could be done for the qualion.

One tantalizing possibility involves phantom-limb patients. Amputees commonly report that the removed limb still seems to be "out there"—as real, lifelike, and part of themselves as a normal limb (Bowser, 1991; Melzack, 1992; Ribbers et al., 1989; Shreeve, 1993). One part of a *complete* explanation for this still mysterious phenomenon[16] may be that the qualion component of the origi-

nal limb remains *in the phantom region* when the material limb is removed. If so, these invisible quanta (recall that *air* is also invisible) could be the target of a detection experiment.

Another possible area of investigation involving phantom-limb patients could involve various kinds of stimuli to the extrasomatic phantom region. If it could be demonstrated that subjects completely shielded from the process can detect stimuli occurring in the region, it would constitute compelling evidence that a field bridged to the body exists there and subserves awareness. Stimuli could involve hot and cold temperatures, mild electrical shocks, passing various forms of matter through the region, and other forms of "intrusion."

Jensen and Rasmussen (1994) report that sensations of *touch* are a "common" experience in phantom limbs. More remarkably, Vilayanur Ramachandran has reported that an amputee may assert the ability to grip and feel the contours of a material object with a phantom hand (see Shreeve, 1993). This purported ability could be tested by placing behind a screen objects with different shapes, such as cubes, balls, cylinders, and a spindle and determining whether the patient can correctly identify them.

Once the formidable practical and ethical issues involved have been addressed, another detection experiment could involve a second puzzling phenomenon that has been widely documented. There is already a very large body of evidence that *something* (something conscious and *self*-embodying) *somehow* may detach from the material body when *clinical* death occurs (Corcoran, 1988; Fenwick and Fenwick, 1995; Griffin, 1997; Grosso, 1981; Manley, 1996; Parnia et al., 2001; Ring, 1980; Sabom, 1982; Schoenbeck, 1993; Schröter-Kunhardt, 1993; Stevenson and Greyson, 1979; Van Lommel et al., 2001).

Reports of this phenomenon typically involve hospitalized patients who undergo cardiac arrest or some other acute form of trauma. They lose their vital signs and are later revived. Although their material bodies are unconscious during their ordeal, they report a keenly aware and vivid *out-of-body* observation of resuscitation efforts. A good designation for this phenomenon is the *virtual* death experience, but it is commonly called the *near-death* experience.

Some (e. g., Siegel, 1980, and Blackmore, 1988) have argued that the phenomenon is a hallucination; but the universal similarity of the experience (Grosso, 1981; Ring, 1980; Stevenson and Greyson, 1979), the common absence of medical factors that could trigger hallucinations (Grosso, 1981; Ring, 1980; Sabom, 1982), the verification of detailed "visual" accounts by patients of resuscitation efforts (Sabom, 1982), patient reports of "seeing" other later-verified events or objects that couldn't have been observed by normal means (Corcoran, 1988; Ring and Lawrence, 1993; Schoenbeck, 1993), and the sometimes presence of flat electroencephalograph readings[17] or a non-functioning brain (Grosso, 1981; Parnia et al. 2001) seem to weigh very heavily against such a position. When actual events are later described in detail by a resuscitated patient, these experiences can hard-

ly be designated hallucinations.[18]

The view that virtual death experiences have an objective reality is gaining increased acceptance by the medical community. When 143 physicians were recently surveyed regarding patient reports of out-of-body experiences, a clear majority (65%) held the view that these were veridical events rather than hallucinations (Moore, 1994).

Whether illusory or not, however, there is enough evidence to at least come to a commonsense conclusion that something *probably* does detach from the material body and, if it does, there may be ways of detecting this something and determining whether it has the energetic character hypothesized for qualions.

A variety of other predictions and methods of testing will likely emerge as these proposals undergo refinement and elaboration; but even those offered here suggest that verifying or falsifying the *basics* of this new model are *presently* within our reach. And while it is not clear at this point how we can test some of the higher-level hypotheses, Farber and Churchland (1995) have argued persuasively that we should "avoid prohibitive speculation on the ultimate limits of our understanding" (p. 1302). Problems that seem "intractable at an early stage may well become much clearer and more approachable in the context of an advanced, experimentally grounded understanding" (Id). Thus, there is no reason to conclude a priori that any of the higher level hypotheses are ultimately untestable.

Conclusion: Could There Be a "Ghost" in the Machine After All?

In his *Principles of Psychology,* William James (1890) considered the various positions on the mind-body problem and concluded that "[to] posit a soul influenced in some mysterious way by the brain-states and responding to them . . . seems to me the line of least logical resistance, so far as we yet have attained" (vol. I, p. 181). These words were written more than a century ago, but in modern times preeminent analysts such as Karl Popper, John Eccles, Wilder Penfield, Curt Ducasse, Brand Blanshard, Jerome Shaffer, and others have come to the same conclusion.

Why is this seemingly unscientific position still so attractive? Because even now it makes good sense. The conscious mind may be likened to a glass slipper, and our desire to understand the world demands that we find something to fill it—to explain it. Unlike the feet of certain haughty stepsisters, those offered by the neuronal components of the brain may simply be *too small* to fill this slipper. A parallel image is that of a toddler who comes stomping into the living room wearing her mother's dress shoes.

The doctrine that the conscious mind can be explained solely in terms of neurons has essentially only one strong argument in its favor: What else is there? Because there *seems* to be nothing else, we have imagined the little girl's feet to be larger than they are and struggled incessantly to stretch them to fit some very

sizable shoes. But this hasn't worked. There is little about neurons that suggests the ability to generate consciousness. The neuronal doctrine hasn't explained the unity of conscious experience. It hasn't explained qualia and the variety of human experience. It has failed to explain selfhood. Nor does memory seem possible in a neuronal model. And the determinism inherent in this model is directly at odds with our experience of a freely acting, volitional mind. Perhaps never before in the history of science has logic so strongly suggested that something "new" may exist in nature.

The position that something "new" must account for the conscious mind has essentially only one argument *against* it: What else is there? Unlike the arguments against the neuronal doctrine, however, this one may be easier to address.

This paper has presented two natural mechanisms with mind-making potential. One or the other may provide us with a brain-wide network of localized, microphysical energy-structures that are stable and immune to absorption. These quanta have the potential to account for consciousness. They could account for the unity and diversity of human experience. They could account for memories, our sense of selfhood, our freedom, and our volitional ability.

Cinderella, it seems, may have been there all along. This Cinderella is a *ghost* so to speak, but a ghost with a biological origin that is a composite of the *physical* and the *supraphysical*. Even those who are repulsed by ghosts must acknowledge that the qualion hypothesis is testable—and falsifiable—on a basic level and therefore is entitled to the the scientific minimum of a wait-and-see attitude.

Some final perspectives on this model may be derived from history's emphatic reminder that the problem at hand is unique in its multilayered complexity. Even if the basics of these hypotheses prove to be true, there may be a limit on how far they can take us. Still, we would have a better understanding of who we are, and our place in Nature would never seem quite as mundane—and as inextricably linked to matter—as it did before. The neuronal view of man would be replaced by one far more conducive to a sense of transcendence in our species—one that would reflect back upon, and perhaps elevate the meaning of, the entire cosmos.

APPENDIX I: **Sensory Perception**

Sensory perception refers to the entire continuum of processes whereby physical stimuli are processed and translated into organized subjective experience. Much has been learned in recent years about how neural activity *contributes* to sensory perception, especially to vision, and it would take many pages to summarize this data; so there will only be a brief proposal here that qualions complement this activity and serve as the ultimate source of qualia.

To try to make this a little clearer, let me demonstrate how such a system can provide explanations for such things as say the experience of *blueness* or the musical note middle C.

In the former case, due to a broad spectrum of elastic states, qualions were proposed to generate a similarly broad spectrum of intensities and states of consciousness fields. To make this clearer, suppose that twenty years from now a spectral scale—let's call it the omega scale—is devised for measuring consciousness fields. On this scale, 0 is the point at which consciousness fields are subliminal and 100 represents the highest possible intensity of these fields. Now somewhere in this 0-100 scale would be the luminosity range. Let's just suppose that this range occupies the scale from 87.273 to 92.186 omegas. At the lower number consciousness fields have crossed a threshold from being merely highly intense to a luminous level; and after the higher number c-fields become supraluminous. Now in regard to *blueness* it is proposed that in the luminosity range there is a point, say 91.252 omegas, at which luminous c-fields rise from a mixed color state to a state of pure blueness. If there is no ego occupying the system in which this 91.252 omega phenomenon occurs, then it will exist unperceived; but if there is an ego within the unified microcosm, then there will additionally be a perception by the ego of blueness. In this latter case, such phenomena become *qualia.*

Similarly, when qualions and the consciousness fields they are proposed to generate *vibrate* it is proposed that this is the *fundamental* basis and embodiment of the qualia of sounds we experience. For example, a qualion generating c-fields at a 20 omega level and vibrating at 256 Hz may be the fundamental basis and embodiment of a faint experience in our minds of middle C. A qualion operating at a 50 omega level vibrating at the same frequency may engender a stronger or "louder" experience of the same note, and so on.

Returning now to the broad general model, vision, hearing, and other sensory phenomena would be regional processes that are joined by superposition with other mental components into an integrated whole. And part of this whole, of course, would be the ultimate beneficiary, the *ego* or *self.* We thus experience sensations directly as they arise and use the information they provide to learn about and cope with the outside world.

APPENDIX II: **Thinking**

Thinking typically involves organizing, associating, modifying, or transforming items or structures of information in order to produce new configurations of data. The proposed characteristics of qualions would endow a subjective system with great potential for conducting these processes. This potential may be inferred to culminate in the ability to regulate the number of qualions in a region as well as their concentrations and geometric patterns; to graphically structure—as was done earlier in forming the dove—consciousness-field intensities and

lines into extraordinary varieties of configurations (such as straight lines, letters of the alphabet, numbers, diagrams, line drawings or pictures, or three-dimensional images); to formulate analogues of sensory phenomena; to generate dynamic motion-patterns among qualions or consciousness-field lines (thereby implementing such processes as the combination of information structures into larger configurations or the animation of graphical representations); or to modify any information structure or transform it into other structures.

APPENDIX III: **Memory**

Memory is the fairly automatic process of recording and storing the data contained in subjective experience. As many may have inferred by now, memory may involve the reduction of conscious information configurations to the unconscious level by expanding the circumferences of the qualions constituting the data group.

A plausible overall scheme would be as follows. Initially, primary data configurations exist in the various sensory areas and the central mental arena where qualions involved in sensory perception and focal mental activities create ongoing experience. Short-term memory (STM) may represent a dynamic process, occurring in the periphery of the central arena, that uses the primary data as a model and makes *temporary* replications of the most prominent features of the information. STM then holds these replications in a semiconscious state for a short time to provide context and dimension for ongoing experience and to serve as a more persistent model for long-term memory. Long-term memory , by contrast, may involve a secondary reformulation, abridgment, and synthesis of the data at a locus near its storage site, and its integration therein.

Search and retrieval may be accomplished by "waves" of semiconscious activity spreading out in various widths and depths within the unconscious "oceans" of qualions constituting memory. Useful items are kept available, whereas other data may be eliminated, changed dramatically, misplaced or "buried," or sequestered by boundaries. Memory may occupy many diverse regions relative to the brain.

APPENDIX IV: **Personal Identity**

At birth, our awareness can probably best be described as a simple sense of being something to which things happen. Afterwards, a growing sense of *"me"*-ness results from the continuing development of body awareness; from the experience of separation and vulnerability; from biological needs and frustrations; and from novel sensory and emotional experiences (see Gordon and Gergen, 1968; Honess and Yardley, 1987). These accompany a greater interaction with external reality and create a gradually fulfilled demand for control features within the qualion microcosm. As controls increase, so also does the rate and quality of the transformation of data into permanent information structures.

During this developmental process, self-reference information, which becomes the basis for personal identity and self-awareness, is probably compartmentalized into many accumulated and somewhat distinct components. By adulthood, these components may include a body-image; information structures representing needs, drives, and desires; a self-concept and related insights and attitudes regarding the self; inhibitions, aversions, and defenses; beliefs, values, moral standards, and a philosophy of life; satisfactions and frustrations; priorities, commitments, and goals; a self-ideal; and other individual qualities. Each of these components, of course, would be very complex in structure. Such components could conceivably be arranged in a cluster representing a dynamic, interconnected whole.

This evolving complement of information is designated *the personality-identity (PI) complex*. It may be inferred to contain a large and unusually dense integrative-center that constantly extracts and abridges the most significant, useful, and timely PI data and organizes it into a highly symbolic and interrelated pattern.

Further inward in a focal region with the highest levels of abstraction, integration, and density, would be the *ego* or *self,* the innermost and most dynamic portion of the PI integrative center. As the ultimate nucleus of the personality-identity complex, this cognitive superstructure would constitute the agent of experience and exercise a certain amount of control over the rest of the subjective microcosm.

APPENDIX V: **Volition**

In terms of fundamental processes, the most plausible volitional mechanism would be one involving a moderate instantaneous reduction of the effective strength of electric charges in general across areas the size of neurons or larger. The consequence would be a reduction of the slight voltage across neural membranes sufficient for depolarization; and by thus activating a neural impulse that triggers a particular motor function, such a depolarization would constitute the basis of volitional control.

Qualions might produce such electrical effects in any of the following (and possibly other) different ways:

1. As quanta, qualions would probably manifest the photon's capacity to make transitions to electron-positron pairs (i.e., *to polarize a vacuum*). By converging in large numbers on a target area and intermingling with the local molecular constituents, qualions making transitions to such pairs could "screen" and thereby diminish local charges. The peculiar character of the qualion might even allow such brief transitions to be made in coordinated patterns rather than randomly.

2. Because of their own interrelated link to electromagnetic fields, consciousness fields of certain configurations and/or intensities may be able to screen electric charges directly. This could involve either the generation of a "sink"

or a barrier to halt electric fields.

3. Consciousness fields of certain configurations and/or intensities may be able to temporarily generate their own contravening electric charges or fields.
4. Consciousness fields of certain configurations and/or intensities may be able to "damp" directly whatever process exists in particles to generate charges *ab initio*.

None of these mechanisms would likely involve the performance of *work* in the technical sense, so energy would not be transferred. Each may require a convergence of qualions on a trigger site composed of an individual neuron or a group of neurons, and the site activated may be either excitatory or inhibitory in subsequent effects.

The volitional system as a whole may be inferred to exist as a three-dimensional network composed of legions of qualions, groups of which can congregate and achieve their effects at a number of coordinates simultaneously. In terms of its origins and growth in the prenatal-infancy period, such a system would be developed by the forming ego in a steady fashion largely on the basis of experimentation.

What eventually become precise qualion trigger mechanisms may begin as a small number of much larger qualion groups operating spontaneously in haphazard patterns to activate random neurons. As volitional effects are discerned with increasing precision, these qualion groups may then subdivide and become specialized. The middle stage of development suggests a novice possessing a growing array of command buttons and engaging in progressively more skillful operations until efficient volitional patterns are learned.

Ultimate trigger sites may exist in many diverse brain regions. The development of mature volitional coordination would represent the ability to orchestrate these sites in the patterns required to accomplish desired tasks.

NOTES

1. See, for example, the reviews by Searle (1995) and McGinn (1997a) of many of these works.
2. Some may not know that Rodney Dangerfield is the veteran American comedian whose sad-faced humor bemoans the way people treat him. His classic lament is: "I don't get no respect. *No respect at all.*"
3. Other biophysical phenomena include: intramolecular oxidation-reduction transformations; dissociation processes releasing free energy of ionization; short- and long-range intermolecular force phenomenal, including antibonding orbitals and van der Waals forces; intramolecular phenomena such as hybridized orbitals, charge distortion due to the overlap of orbitals, and electric and magnetic hyperfine interactions; various forms of biosynthesis; and dynamic conformational changes in molecules such as proteins due to bond rotation.

4. Scenario one involves an isomerization reaction. During such a process, there is an ultraquick rearrangement of a molecule's components—one that may include the instantaneous rotation of a dipole emission system. Could such a process generate loops of electric fields that remain localized but rotate at light-speed around a stationary axis? (Rotational motion may of course substitute for radial motion as long as the velocity of rotation is c.)

Scenario two involves an emission process occurring in conjunction with an electron transfer, a phenomenon thought to involve quantum-mechanical tunneling between two potential wells and to be phonon assisted (Blumenfeld, 1981). Could such an unusual space-time event, representing movement through an energy barrier, possibly yield a spatially confined structure of electromagnetic fields?

A third scenario consists of interfacing emission processes by closely spaced repelling segments of various energy-storing molecules (see Hayes et al., 1978). Could these processes oppose each other in such a way that momentum can be imparted to the emitted quanta only in a circuitous fashion that results in spinning field structures? Could the opposing resonance also existing in some of these molecules contribute to such a process?

Other possible scenarios may arise from the fact that an electromagnetic field and its corresponding energy-stress tensor (based on Einstein-Maxwell equations) may, in some cases, satisfy viscous-fluid field equations (Tupper, 1981; Raychaudhuri and Saha, 1982). Because of this feature, it may reasonably be asked whether vortex lines may help generate centralized quanta with axial motion.

5. See Zajonc (1993) for a discussion of the historically elusive and still enigmatic nature of quanta.

6. Investigations may require the consideration of some of the concepts contributing to theorizing about soliton formation, the trapping of electromagnetic fields in certain types of media (Eleonskii and Silin, 1970; John, 1991; Daviss and Buchanan, 1998), magneto-optic and electro-optic effects, or other phenomen.

7. In selecting and evaluating alternative structures, the primary requirement is stability. For this reason, the voluminous literature of quantum field theory, which presents field structures such as *kinks*, *singularities*, *twistors*, *spinors,* and the like (See Barut, 1983; Castell, Drieschner and von Weizsäcker, 1975) may contain a number of useful concepts. A final thought on stability will become clearer when the following subsections have been read, but should be stated now. The idea is this: such a property could be newly endowed when the derivative's constituent field-patterns allow the emergence of secondary (timewise), but potentially superordinate, *consciousness fields*. In effect, a hybridization of the original fields could occur which may integrate, enhance, and stabilize an otherwise transient configuration.

8. There are approximately 10^{28} atoms in the adult human body. It seems plausi-

ble that the ratio of qualions to atoms in the body *may be* between 1:100 and 1:1; hence, 10^{26}–10^{28} qualions in the body. The brain comprises about 2% of body mass; hence, 2 x 10^{24}–2 x 10^{26} qualions in the brain region. All this is obviously guesswork.

9. Possibly only a very limited range of quantum energies are subject to transformation mechanisms (making all qualions fairly homogeneous) or the range of energies may be somewhat broad. Even in the latter case, novel qualion properties described below could facilitate such phenomena as qualion-splitting or the paring off of flux to attain a common energy-level.

10. Qualion containment by, and concurrent motion with, its bodily environment could result from any of several mechanisms. A nondisruptive interplay between the magnetic and/or electric fields of the qualion and the corresponding fields generated by biological molecules is one possibility. These quanta could thereby become lodged in an intermolecular position of greatest attraction and/or least repulsion. Other possible containment mechanisms may be based on some of the novel qualion properties described below. For example, the consciousness fields inferred to be generated by qualions could implement some sort of physical adhesion between these quanta and matter, yielding a similar result.

11. Since qualions are proposed to be integrated configurations of closed, spinning field-lines, they would be incapable of exerting a *work-performing* force or engaging in any other interactions that would result in their absorption.

12. A property of mobility, or self-movement, could arise from the following:

1. The superordinate control of the qualion by consciousness fields may allow these fields to convert some of the qualion's rotational momentum to radial momentum.
2. Consciousness fields of certain configurations may be able to effectuate qualion mobility by interacting directly with matter or with the electric or magnetic fields produced by matter.
3. The consciousness fields of a given qualion may be able to temporarily assume the character of a nonlinear system, allowing them to interact directly with the fields generated by other qualions.

13. Some might object to this model since it might suggest to them that the generation of progressively higher levels of consciousness fields would seem to require increasing levels of energy, while that of the qualion is a constant. Although the contraction-diffusion mechanism presented is probably sufficient to account for variations in the level of consciousness fields, an alternative model is available that many might find more appealing. In this model, the qualion is viewed as having a particular *potential* level, and this potential may manifest itself in inversely related levels of energy and consciousness fields. In other words, the qualion effects differing levels of *transformation* between one phenomena and the other. At one end of the spectrum, the qualion is in an

almost solely energy and generating only subliminal consciousness fields. At the other end, the energy of the qualion is almost completely transformed into the interrelated phenomena of consciousness fields—intense fields in the supraluminous range.

14. It is important to recognize that intricate and vital information structures *must be preserved* during this process. Later, there will be some discussion of the character of these structures. Each would be constituted by qualions in states and combinations appropriate to their particular phenomenal character; so the downtime response must be executed in a way that preserves these traits. It would have to be an expansion of the individual qualion constituents to the subliminal level in a way that preserves their *relative* positions, intensities, field-line configurations, and other distinctive features so that when the process is subsequently reversed (e.g., on awakening) the data structures reemerge unaltered.

15. It is reasonable to infer that the same innate drive that motivates a conscious being to nurture and protect its material embodiment would operate with even greater strength with regard to its subjective constituents. Not only is the self—whether primitive or highly developed—essentially constituted by nonmaterial components in the present model, but internal order and cognitive abilities must exist before there can be a response to physical needs and dangers.

Subjective aspects of preservation needs would also be more complex. On a basic level, there would be the need for self-definition. There would be the need for effective sensory processes, well-structured information systems, and response capabilities. And there would be a need for efficient overall organization. Consequently, it is postulated that in conjunction with brain mechanisms that evolved to help facilitate subjective functions, a mind will work instinctively and on many levels of consciousness not only to create these traits, but also to maintain and protect the system as a whole. This postulate may be referred to as *the adaptation-integration principle.*

16. No procedure has yet been devised which eliminates a phantom limb even though surgery has been tried at every level to control various forms of pain that may accompany it. As Melzack (1992) has observed, "treatments for pain have attempted to halt the transmission of signals at every level . . . The nerves from the stump have been cut . . . Pathways within the spinal cord have been cut as well, and the areas of the thalamus and cortex that ultimately receive sensory information from the limb have been removed. [These approaches may provide temporary relief from the pain but] none of these procedures abolishes the phantom limb itself" (pp. 121-2).

17. After an 18-year study, Dr. Fred Schoonmaker, alone, while chief of cardiovascular services at St. Luke's Hospital in Denver, Colorado, reported 55 cases in which flat EEG readings occurred (Grosso, 1981).

18. How patients can see without a retina and hear without a cochlea is a good question. One can only surmise that the material body may leave some kind of

physical imprint on the qualion microcosm—a physical analogue of bodily structures that is able to mimic many of their functions. Or it may be that the qualion microcosm has some residual powers that allow it to bypass normal sensory channels altogether.

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