ORIGINAL ARTICLES

Dreams, Time Distortion and the Experience of Future Events: A Relativistic, Neuroquantal Perspective

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Bokkon's hypothesis that dreams involve the generation and perception of biophotons offers a possible explanation for the occasional experience of future events during these states. The Lorentz temporal dilatation during dream periods for biophotons with THz frequencies (neuronal soma diameters) is 3 to 4 days which is an average value between dream experiences and later events. For 40 discrete cases, the global geomagnetic activity at the time of the dream experience was moderately correlated with what the geomagnetic activity would be two to three days before the actual event. The convergence of geophysical and cerebral properties indicates that intrinsic properties of biophotons may allow the experience of some process that precedes the apparent event (or influences its occurrence) rather than the event itself. **(Sleep and Hypnosis 2009;11(2):29-39)**

Key words: Time distortion, biophotons, geophysical interactions, geomagnetic congruence

INTRODUCTION

Bokkon (1) postulated that biophysical information contributes to or constitutes human consciousness and is mediated through biophotons. If this central involvement of such quantum phenomena in human experience is valid, then one of the apparent enigmas that occurs during the altered states of Rapid Eye Movement (REM) or dream sleep, hypnagogic and hypnopompic intrusions (2), and hypnosis (3) might be accommodated. This enigma is the subjective sensation of time distortion and the occasional putative experience of information about events that have not yet occurred (4,5).

The present article describes a possible process and supportive evidence by which these potentially important personal and public perceptions of future events might occur. That subjective time can be dilated or constricted during altered states, such as hypnosis (6), is well established and has been known since the late 19th century to be correlated with right hemispheric functions (7). It may be relevant that the activity of the right hemisphere responds more conspicuously to increases in geomagnetic activity (8) and shows characteristics of cerebral dominance during periods of dream sleep (9).

There is experimental evidence that the

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application of physiologically patterned magnetic fields can affect the experience of time. Counterclockwise rotation of weak, pulsed magnetic fields with rates of change of about 20 ms around the subjects' heads has produced reliable temporal dilatation (10) and spontaneous experiences of information beyond the usual temporal increment of the experience of "now" (11,12). These pulse durations, of about 20 ms, have been associated with the phase shift in the transcerebral electromagnetic fields recursively generated over large areas of the cerebral cortices in a rostral to caudal direction. The increment is also congruent with the "40 Hz" or gamma range associated with consciousness and dream sleep (13) as well as the re-entrant time for intracerebral processing suggested by Edelman (14).

Consciousness, Energy, and Photons

Contemporary neuroscience assumes that all experiences emerge from or are strongly correlated with neuronal structures and functions. From this perspective the principle of equivalence in psychophysics predicts that thought is simply the experience of action potentials. This statement is the logical extension that color is the experience of different wavelengths between 400 and 800 nm and brightness is the amplitude or numbers of quanta within this band.

The energy from a single action potential with a net change of 120 mV upon a unit electric charge of 1.6×10^{-19} A s is about 2×10^{-20} J (15,16). This value is very similar to the stacking energy of a nucleotide on a ribbon of RNA which requires about 1 msec, the approximate duration of an action potential (17). If action potentials are a primary correlate of thought then the average generation of 10 action potentials per s (10 Hz) for each of the approximately 10 billion neurons within the cerebral cortices (18) would produce a total energy of only a nanoJoule per sec or 10^{-9} Watts. This value is more than a billion times less than the energy output from the brain (about 20 watts) due to glucose metabolism. The latter value is involved with the energy required to maintain the physical substrate such as the integrity of cell membranes and the intracellular molecular pathways.

With increased activity in only 1 million neurons active at 40 Hz the amount of energy would be in the order of picoJoules during a percept of about 100 ms. This would be the same duration of the average cerebral microstate which is defined as time periods of coherent neuronal oscillations over larger areas of cortices that remain stable for about 80 to 120 ms (19). Reflected as consecutive strings of repeating short-lasting classes of brain electric states, microstates could correspond to the basic building blocks of human information processing (20).

The operational range of magnetic variations for the human brain is within the picoTesla (pT) range (21,15). This value allows a potential role of biophotons in temporal distortions from subjective, relativistic, and quantum perspectives. The product of the spin (magnetic moment) of an electron (9.28747×10^{-24} J/T) and a magnetic field of 1×10^{-12} T is 9.28747×10^{-36} J. The mass equivalence of this value is 1×10^{-52} kg. We considered the electron because photon energy and wavelength are intimately interrelated (as discrete shifts) over time within circumnuclear distances ("electron shells"). In addition, the positron (an electron with a positive charge) has been considered by some theorists to be an electron moving in the opposite temporal direction.

This value (10^{-52} kg) has recently been shown to be the upper limit of the rest mass of the photon (22). Spin has been considered the most important of the four quantum numbers (which describe the unique quantum state of an electron) for determining the location of particles and by extension aggregates of particles such as objects or the energies that affect serial

events. Thus, even at the simplest level there is a rational connection between the state of particle-wave as well as the domains of quantum phenomena and human thought as predicted by Neils Bohr (23).

This possibility is supported quantitatively by appreciating the different solutions for the wavelength of an electron depending upon the perspective of measurement (16). For example the classical width of an electron width is about 2.8 x 10^{-15} m while its Compton radius, based upon quantum values such as Planck's constant, h, (mc^2=h(c/wavelength and solving for wavelength) results in a value almost 1000 times longer (2.4 x 10^{-12} m). The differential velocity required to produce this relativistic compression of length is 0.9999995 c (velocity of light).

The difference between the energy equivalence of this mass moving at this velocity compared to c is in the order of 10^{-20} J, the value for the neuronal quantum (15). Although potentially a coincidence, this convergence of values indicates a special relationship between the action potential (and implicitly human thought) and the shift in extreme discrete velocities of the electron or its interactions with photons within very fine increments near the speed of light. The burst firing of a single cortical neuron (24) can affect the global brain state. Consequently the potential for the energy associated with a single neuronal spike modulating experiences and the access to information during special states such as dreams becomes a physical possibility.

From our perspective (25), the aggregate processes or "dynamic field" that emerges from billions of action potentials within a constrained volume, such as the human brain, are the phenomena of consciousness. McFadden (26) has suggested that the synchronous firing of neuronal activity and the concurrent electromagnetic field of the brain meet the criteria for an electromagnetic theory of consciousness. If the major physical correlates of consciousness and awareness exhibit the properties fields or temporally changing fields (tensors), then the energies required to influence it would be smaller and potentially influenced by relativistic and quantum effects.

Time Distortion

If we assume photons are associated with neuronal action potentials with a discrete quantity of energy, the frequency of the photon can be derived. With the energy of the action potential equal to 2 x 10^{-20} J, then according to J=hf where h=Planck's constant of 6.613 x 10^{-34} J s, the frequency (f)= 3 x 10^{13} Hz. Assuming the velocity of light, c, is 3 x 10^8m/s then the wavelength would be c divided by f or 10 micrometers. This is the average width of the neuronal cell soma. Hence, the photon's wavelength would be the width of the soma within which neuronal information is stored and with which the states of consciousness are associated.

An accurate estimate of time distortion must accommodate the discrepancy in velocity for EM fields within the 10^{13} Hz (GHz) range. According to Tu et al (22), the discrepancy between c and the velocity for a 72 GHz-range EM transmission is 3.3 x 10^{-7}. Most experiences involving prescient information occur during dreams (2,27). If Bokkon's (1) concept that dreams are photons and they move at a velocity related to frequency, the time distortion can be described with the Lorentz transformation as: delta t= [t/square root ($1-v^2/c^2$)]. This means that for every 1 s there is a potential 1/(sqrt (1-.999989) dilatation or about 10^3 s (15 min). Assuming a conservative average peak REM time of about 300 s, the dilation time would be in the order of three days.

This discrepancy is the median duration of the temporal disparity between the precognitive experience and the later event within the published literature. As can be see in Figure 1, the cumulative record for the total

numbers of cases as a function of the discrepancy in days between the experience and the event (27) displays a major inflection around three days. Most (about 75%) of these cases involved experiences about death or crisis to the experient or to someone known, usually a family member, to the experient.

The +/- two to three day window of anomalous experiences around significant

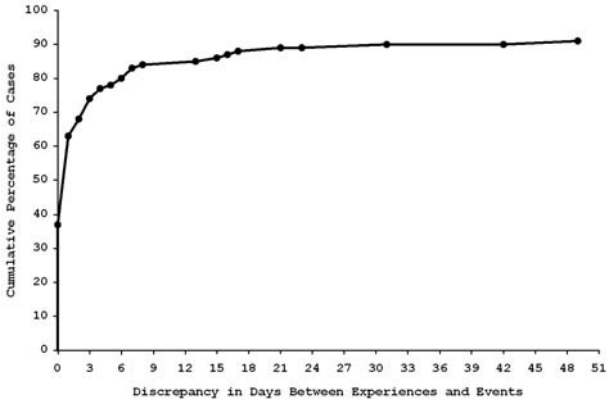

Figure 1. Cumulative number of precognitive reports as a function of the time between the experience and the event.

events is a distinguishing feature of many "paranormal" experiences that occur during dreams (2,5). This period also represents the source of information (from the previous two to three days) that often comprises the details of dreams (28). Déjà vu, the experience that a person has experienced (usually within the visual or auditory modalities) a present event previously, has been described as "remembering a forgotten dream". Some authors have implied that the déjà-vu experience is actually the experience of a forgotten precognitive dream "triggered" by the occurrence of the precognated event.

Time dilatation and constriction during hypnosis are well documented phenomena and can be easily demonstrated in clinical and experimental settings (29). The phenomenon of the "hidden observer", a predominantly right hemispheric process, is frequently associated with temporal alteration (30). An increase of right hemispheric temperature compared to the left hemisphere due to application of weak, physiologically patterned magnetic fields may enhance the awareness of this "hidden observer" as a "sensed presence" (31). Powerful changes in the experience of "now", which has been offered as support of the "specious present", could be created in suggestible subjects by removing either the past, the present, or the future.

The major theme of precognitive dreams involves death or crisis to the dreamer, family, or friends. The disproportionate occurrence of death or crisis to individuals known to the dreamer could be explained conventionally by their salience or to reinforcement history. However if photon-related information is involved, then entanglement (32) becomes an alternative explanation. Recently we (15) found that a history of experimentally-assigned spatial proximity of pairs of strangers, a condition (shared spatial proximity) that is normally correlative with the definition of family and friends, produced concurrence between the cerebral electroencephalographic activity of one of the pair during specific cognitions of the other.

Geomagnetic Factors, Brain Interactions, and Dreams

All human brains are immersed within the earth's magnetic field which has an average intensity of about 50,000 nT. However this steady state value is prone to spatial and temporal variabilities primarily within the 1 nT to 500 nT range, revealing a ratio that is very similar to that between the steady state electric fields (10 to 30 mV) of the human cerebral cortices and the time-varying electroencephalographic fields (10 to 30 microV). The usual frequency of these time-variations within the geomagnetic field is within the mHz range.

However electromagnetic fields with frequencies and patterns almost identical to classic electroencephalographic patterns within the delta, theta, and alpha bands are

generated within the earth-ionospheric cavity (33). The fundamental frequency of this cavity, the Schumann resonance (34), is based upon c divided by the earth's circumference (4 x 10^7 m). The fundamental frequency is about 7.5 Hz. This is the same fundamental frequency of the cerebrum volume assuming a bulk axon velocity of about 5.5 m/s and a circumference of 0.6 m (35). The spectrum of these natural frequencies is defined by the multiplication of the fundamental frequency by the square root of [n(n+1)] where n is the progression of integers 1, 2, 3...n. The frequencies of the first four spectra maxima are about 8 Hz, 14 Hz, 20 Hz and 26 Hz.

The second maxima or first harmonic is about 14 Hz, the range of Stage 2 sleep spindles (often concurrent with hypnopompic and hypnagogic states) and the interface between the classical EEG bands of alpha and beta activity. Minakov, et al (36) have shown that weak gravitational waves, an intrinsic feature of most relativistic and quantum models of space and matter, can be converted into electromagnetic waves. Unlike the strong electromagnetic fields that appear near stars and black holes which are usually required for these conditions, planets with much weaker fields (such as the earth's Schumann solutions) may behave as resonators to produce equivalent effects. Their equations indicated that the most powerful amplification region of a gravitational wave into an electromagnetic pattern would be with the second global Schumann resonance of 14 Hz.

There are also arguments for the transmission of relativistic information from global sources to the human brain during dream or related states. The phase shift for radiofrequency range transmission within the earth-ionospheric cavity according to classic formula using the del-c/c (22) for radio waves is about 16 msec which is the averaged empirical value for the phase shift in the highly spatially coherent, transcerebral electromagnetic fields associated with consciousness (13). Such similarity for a fundamental frequency (about 7 to 8 Hz) and phase modulation (about 16 msec) allows the potential for direct interaction of biophotons associated with brain function and those associated with geophysical variables.

The physical pathways by which this interaction might occur, from the perspective of energetic constraints, could involve the ion channels within the neuronal membrane. These channels, with widths in the order of 1 nm, are effectively topological extensions of the 0.6 nm thickness of charge adjacent to the membrane that determine its resting potential. A single channel involved with post-synaptic cholinergic transmission involves an elementary potential difference ("current") of about 2 x 10^{-7} V (37) which exerts an energy of about 3.2 x 10^{-26} J on an electric charge of 1.6 x 10^{-19} Amp-s.

If we assume the proton (H+) as the most fundamental charge carrier within the aqueous-based, proton-specific and other channels (38), then the velocity associated with this conveyance would be the square root of the energy (3.2 x 10^{-26} J) divided by the mass of the proton (1.6 x 10^{-27} kg) or approximately 5 m/s. This is well within the range of the bulk velocity of cerebral activity that mediates the 7-8 Hz fundamental frequency and would encourage resonance with the approximately 7 to 8 Hz standing wave within the earth-ionospheric cavity. With such quantitative convergence in wavelet frequency the diffusion of information from global sources could directly affect the individual brain.

Obviously the probability the person could experience these changes would be markedly influenced by competitive activity from the representation of other competing inputs. Because burst spiking of a single cortical neuron can modify the global brain state, the energies would not be prohibitive. The right hemisphere of the human brain, which is significantly more activated during REM states, appears to be more sensitive to minute

increases in geomagnetic activity (8,31). Given the introspective and visceral oriented sources for dreams, primarily from limbic (hippocampal) structures, information that would be normally obscured during the extroceptively saturating waking state would be more likely experienced.

During small increases (in the order of about 5 to 10 nT) in global geomagnetic activity circulating nocturnal melatonin is suppressed (39) and REM sleep, at least in cats, increases (40). This sensitivity of the rate-controlling enzyme, SNAT (serotonin, n-acetyl transferase), to mHz, pulsed magnetic fields has been shown experimentally (41). Electrical lability, such as seizures, is increased during increased geomagnetic activity (42) and has been attributed to the diminished anticonvulsant effects of melatonin upon hippocampal neurons (43) which have rich melatonin receptors (44). That this is specific to geomagnetic activity rather than to correlative variables was indicated by the similar magnitude of effect size when limbic seizures were elicited by experimentally-simulated "geomagnetic storms" (45). The threshold for anomalous experiences reported by volunteers exposed to weak, cerebrally-integrating magnetic fields within a quiet, dark setting is about 20 nT (46).

Precognitive Experiences, Geomagnetic Activity and Events

One test of the potential validity of an experience about a later event is to discern some physical correlate for both. Obviously the global geomagnetic activity at the time of the experience and the event would be highly correlated for discrepancies of one to two days because of the intercorrelations of activity within this interval. In order to minimize potential inflation of correlation coefficients, only those cases (n=40) from the major data base (27) where the discrepancy was greater than 6 days were employed. The strongest correlation (about r=0.50) occurred between the geomagnetic activity at the time of the experience and what the geomagnetic activity would be two days before the event.

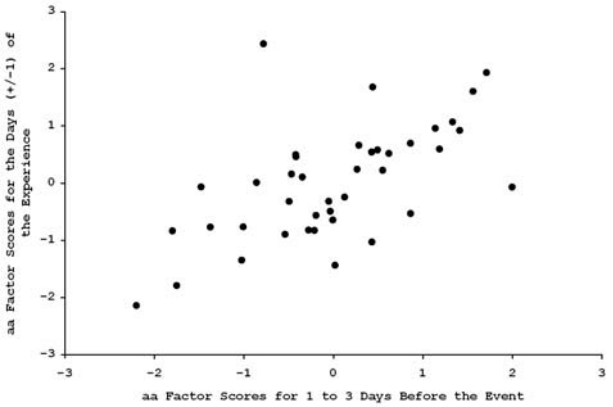

Figure 3. Correlation between the factor scores for the geomagnetic activity during the days that preceded the event and the factor scores for the geomagnetic activity during the period of the experience.

To clarify this process factor analyses were completed for 3 days before to three days after the event and for the 3 days before to three days after the experience for these cases. Two factors emerged for each. The strongest correlation of the factor scores was between geomagnetic activity on the day (factor loading scores in parentheses) of (0.70) and the two days (0.90, 0.87) after the experience (eigen value=3.19) and the geomagnetic activity on the third (0.82), second (0.86) and first (0.70) day before the event. Correlations between the two factor scores (Figure 3) revealed an r of 0.65.

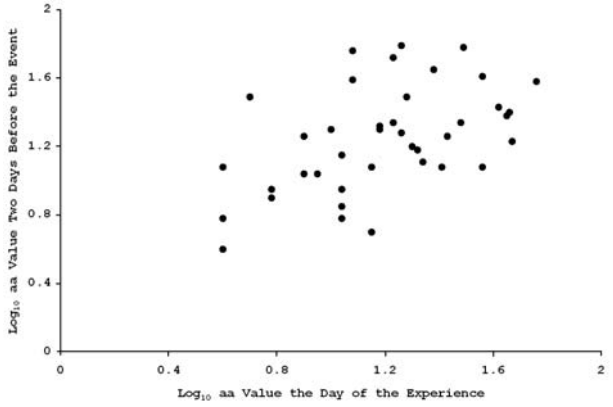

Figure 2. Bivariate correlation between the log (base 10) of the global geomagnetic activity on the day of the precognitive dream and the geomagnetic activity two days before the actual event occurred.

Is the Event or Some Pre-event Process Experienced in the Dream?

These results show an association, which accommodated more than a one third of the variance, between some process associated with the geomagnetic activity at the time of the precognitive dream and the geomagnetic activity within the period between two to three days before the event would occur. We suggest the precognitive experience reflects the detection, primarily during dreams or hypnotic-like states, of quantum processes occurring before the physical manifestation of the event which cause or are strongly contributing to that event.

We hypothesize that this process involves energies within the 10^{-20} J level generated by the GHz-range photons associated with experiences of dreams as suggested by Bokkon (1) and coupled to the time-distortions predicted by the Lorentz transformations when the most modern velocity estimates (22) for this frequency of EM fields are employed. Like the content of dreams, the duration of air masses and the interday correlations in geomagnetic intensity, there appears to be an intrinsic intercorrelaton of events with a duration of about two to three days. This is the same duration from which the intracerebral representations of events ("memories") are primarily represented as manifest content in dreams.

The existence of such a process would predict that experiences or events which occur within this three day interval are related and perhaps even show a variant of stimulus generalization, with the property of substitutability. This means that if one pattern of events does not occur other similar patterns determined by this antecedent process will occur for the experient during this "malleable" or "plastic" interval. From this perspective the perceived proclivity for aversive events to occur to an individual in temporal clusters or for different critical events to occur several times within a three day period may be not be completely related to randomicity.

The existence of this antecedent process that determines the physical events might offer an alternative explanation for Carl Jung's concept of synchronicity. It assumes there are parallel "patterns" of serial events that occur simultaneously leading to similar outcomes within different domains of experience. Traditional interpretation has attributed these "parallel patterns" to artifacts of cognitive processes or enhanced amygdaloid activity resulting in the infusion of sensory input with personal meaningfulness. However the present approach suggests parallel physical bases. That alterations in "randomicity", presumably associated with global cosmic ray (proton) densities, occur for minutes to hours before the manifestation of a publicly significant event has been discussed by Radin (47).

An antecedent process which is reflected in dreams leads to three obvious questions. Does the strong association between the experience and the geomagnetic activity two to three days before the actual event occurs imply there is "time" to modify the probabilities that will ultimately change the event? This concept would be compatible with Sheldrake's (48) hypothesis of morphogenic fields whereby a single thought might affect the direction of the organization of matter.

Or, does this correlation simply mean that during the precognitive experience one becomes aware of the "blue print", a type of energetic format that then determines the physical manifestation of the event for which there is no alteration. Or, does the awareness of the antecedent process, allow the avoidance of an aversive event? By knowing the detailed mechanisms and direction of hurricane one cannot stop the series of events but one can certainly avoid the path. All three of these options have been discussed frequently within philosophical contexts (49).

Additional Implications

The quantitative discrepancies between the putative precognitive experience primarily during dreams and the events exhibit a lognormal-like distribution. Although the majority of the temporal differences occur within about three days, some discrepancies (at least in our sample) were more than a year. The details of prophecies, assuming their accuracies are verified, could involve decades or even centuries. This could be accommodated by the assuming a comparable statistical distribution of higher frequency electromagnetic emissions (22) within the brain and environment.

The Lorentz solutions for temporal distortion for the del-c/c ratios (22) for visible light wavelengths would be in the order of weeks assuming a 300 s (5 min) REM period. For bursts of gamma rays from living tissue, which is theoretically quite possible in minute amounts for neurons, the dilatation could involve decades to centuries. Obviously the probability and intensity of such frequencies diminish exponentially as one deviates from the extremely low frequency and radio frequency bands most likely associated with the majority of cerebral activity.

If the correlation between the global geomagnetic activity at the time of the experience and what it will be about two days before the future event is generalizable to much wider temporal delays, such as months to years, then a type of temporal singularity should exist. The concept would be similar to the identity which emerges between two very similar complex spaces, separated by distance, because of resonance. From some perspectives they become "the same space".

This condition is responsible for the change in one Tesla coil when another identical coil separated by substantial distance is stimulated. The Tesla effect involves the movement of energy through space and matter, not just the creation of a voltage across a conductor. The more effective intercommunication distances of receivers and transmitters that originate from the same batch or series during manufacturing have been attributed to the shared although minuscule molecular changes uniquely associated with a single chemical reaction.

However for a "temporal identity" to exist different periods with very similar global geomagnetic configurations must be intercalated. Schnoll, et al (50) have shown the existence of discrete values in all processes across several levels of discourse. They concluded these values were due to intrinsic fluctuations of cosmophysical origins. Phenomena that show histogramic distributions exhibit highly probable similar-shaped distributions with periods, for example, of 24 hr, 27 days and 365 days. Similar intrinsic patterns are found in the variations in global geomagnetic activity (51).

Application of the principle of superposition of states (32) would require the two geomagnetic conditions or a physical process associated with those conditions (the one associated with the experience and the one before the event) to form a new state that shares some of the properties of both times. For the precognitive experience the state would be associated with dreaming. For the event, the state would be the alterations in matter that precede the event.

This hypothesis could accommodate the relative infrequency of veridical precognitive experiences. The probability of any two separate clusters of days displaying similar configurations in the intensity of geomagnetic activity would be low. Precognitive experiences would occur only for those conditions when the geomagnetic configurations preceding the event would be congruent with the configurations that happen to occur during the REM period. Because the right hemisphere is more responsive to geomagnetic activity and

dreams are dominated by the functions of this hemisphere, any intercalation between two similar geomagnetic configurations separated in time would be more discernable during this state.

Finally, the predominance in precognitive experiences of death or crisis (which could result in death during the "malleable" interval discussed previously) may simply reflect the stronger "signal" and hence detectability of these events. The termination of the time-line of a person, which results in sudden disorganization and entropy of the energetic conditions that define the person, would be a substantial increment of energy released as photons.

According to Popp (52,53) living systems, including human beings, emit about 1,000 to 10,000 photons/cm^2 per sec. The death flash which is a type of photon emission associated with the sudden depolarization of the membranes of the trillions of cells that compose the body as well as the release of energy from glucose-phosphorylation pathways within the cell into the environment. The emission wavelengths range from the ultraviolet through the visible into the far infrared where the value approaches the diameter of the cell (about 10 um). In many instances the "death flash" can be seen or measured (54).

According to quantum philosophy (55) it has been assumed that an astronomer's choice of how to observe photons from an astronomical source here and now determines whether each of two entangled photons took two paths or just one path around the gravitational lens billions of years ago. This occurs because at the speed of light there is no time for the photon. If there is an entanglement of photons over a person's lifetime until death, then the observation of the termination or near-termination of the person could result in a change in the characteristics of some of those photons across the person's time line. This would result in changes in the past that are effectively the present of the precognitive dreamer.

The involvement of the gravitational and electromagnetic factors in this process would reiterate the importance of Minakov (36) who showed a convergence of power spectra for resonance of about 14 Hz. This frequency is well within the range associated with dreaming, Stage 2 sleep spindles, and other altered states frequently associated with temporal distortions and precognitive experiences.

Short Summary

If dreams and related altered states are actually the experiences of biophotons within the brain as suggested by Bokkon (1), then the temporal discrepancies between precognitive experiences and subsequent verified events may reflect the relativistic and quantum properties of minute differential velocities in electromagnetic phenomena. The average discrepancy of about two to three days between the experience and the event in actual cases supported this hypothesis.

The moderately strong correlation between the global geomagnetic activity at the time of precognitive experiences, primarily during dreams, and the geomagnetic activity during the two days before the event in those cases where the discrepancy is more than 6 days suggests a variant of entanglement between photons emitted during the event and those experienced before the event. The marked congruence of gravitational waves, geomagnetic activity, the Schumann resonance and the peak power of brain activity during different states, particularly when the sensitivity of the right hemisphere is considered, indicates a physical substrate by which prescience could occur.

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