

# Potential Experimental Demonstration of the Entanglement Velocity of $10^{23} \text{ m}\cdot\text{s}^{-1}$ during Trans-Atlantic Excess Correlation of Paired Brain Activity

Nicolas Rouleau, Stanley A. Koren & Michael A. Persinger\*

Neuroscience Research Group, Human Studies and Biomolecular Sciences Programs,  
Laurentian University, Sudbury, Ontario, Canada P3E 2C6

## ABSTRACT

Two separate approaches have suggested that the diffusivity parameter or diffusion velocity of  $\sim 10^{23} \text{ m}\cdot\text{s}^{-1}$  may be the quantitative value for the latency for displays of excess correlation or the consequences of entanglement. We have shown that pairs of individuals separated by 6,000 km but sharing toroidal magnetic fields with changing angular velocities displayed clear excess correlations in specific theta and gamma frequency power values over the right caudal hemispheres. The effect occurred only during the component of the exposure that has revealed excess correlations in photon and pH reactions separated by non-local distances. The predicted latency for the entanglement effects over distances of 6,000 km would be  $\sim 10^{-17} \text{ s}$  while the time required for 1 orbit of an electron is  $\sim 10^{-16} \text{ s}$ . Specific values indicated that between 10 and 30 s would be required before the entanglement would emerge within the domain of electronic matter. Quantitative measurements of the indicator of excess correlation in brain activity during the optimal interval of magnetic field configuration indicated the emergence occurred between 20 and 30 s after the effector field (but not the primer field) had been activated around the cerebrums of both subjects. The effect was clear for all 5 pairs of subjects. The results suggest but do not prove that the latency for entanglement may display a real time value coupled to the velocity of a diffusivity term derived from the relationship between four-dimensional geometry and the weighted products of Gravity and the mass, width and duration of the universe.

**Keywords:** entanglement velocity,  $10^{23} \text{ m}\cdot\text{s}^{-1}$ , trans-Atlantic brain entanglement, circular magnetic fields; changing angular velocity; toroids.

## 1. Introduction

The concept of entanglement presumes that excess correlation between two events that have met specific conditions subsequent to a spatial-temporal contiguity can be displayed any time subsequent to this pairing at any distance. One perspective indicates that for this to occur there must be a pervasive process that permeates the universe such that distance between the two events or the time that has elapsed since their pairing does not determine the occurrence of the excess correlation (Vaziri, et al, 2002; Hotta, et al, 2014). The candidate for this permeating

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\*Corresponding author: Dr. M. A. Persinger, [mpersinger@laurentian.ca](mailto:mpersinger@laurentian.ca)

process that becomes apparent as a phenomenon when the entire set is considered, that is the entire universe and its total life time, has been related to the gravitational field potential connected through its quantized components such as the graviton. Hu and Wu's (2013, 2003) theory suggests that the entanglement became possible because the primordial events that lead to energy and matter were initially related by spin during pre-space-time. Their theory is a more quantitative extension of Mach's concept that moments of inertia relate all space to every single space.

The presumption has been that the latency for a response in particle A that has been entangled with particle B is instantaneous. This may be correct. However there may also be a component of the entanglement latency that is so small that it becomes negligible along distances that are much, much less than the length of the universe. While relating the fundamental geometries of a circle, because an action within a circle is infinite but bounded and accelerating, Persinger and Koren (2013,2014,2015) obtained the product of  $2\pi r$ ,  $4\pi r^2$ ,  $4/3\pi r^3$  and  $2\pi r f$  (time) which was  $21.3\pi^4 r^7 f$ . The dimensional solution was  $\text{m}^7 \cdot \text{s}^{-1}$ . The resulting aggregate of terms was solved by dimensional analyses for an equivalent form that was composed of the Gravitational constant (G), the mass of the universe (m), its duration (t), and its estimated width (d). The units for this solution was  $[\text{m}^6 \cdot \text{kg}^{-2} \cdot \text{s}^{-4}] \cdot \text{kg}^2 \cdot \text{m} \cdot \text{s}^3$ . The balanced solution was  $G^2 \cdot \text{m}^2 \cdot \text{d} \cdot \text{t}^3$ .

The solution for this diffusivity term ( $\text{m}^7 \cdot \text{s}^{-1}$ ) when converted to velocity was about  $2.8 \cdot 10^{23} \text{ m}\cdot\text{s}^{-1}$ . Persinger and Koren (2014) suggest that this diffusivity value might relate to the latency for entanglement effects to be manifested within the universe. For example across the extent of the entire universe about 7 to 8 min would be required. Between the earth and the sun about  $10^{-12} \text{ s}$  (the duration of the hydronium ion) would be required (DeCoursey, 2003). For the typical orbital heights for satellites the duration would be  $10^{-16} \text{ s}$  which is congruent with the values measured for drifts and drags in inertial time frames. Although the contemporary explanation for the inertial drag (Persinger and Koren, 2015) is based upon relativity approaches, this similarity would be also consistent with Mach's concept that the universe is connected by intrinsically shared moments of inertia.

A second approach (Persinger and Koren, 2014), converted the total energy in the universe based upon current estimates of mass to be about  $2.2 \cdot 10^{69} \text{ J}$  into equivalent magnetic field and electric field gradients ( $\text{V}\cdot\text{m}^{-1}$ ) through the two relationships. The first is:

$$B = \sqrt{(E \cdot 2\mu \cdot \text{m}^{-3})} \quad (1)$$

where E is the energy, B is the magnetic field strength,  $\mu$  it the magnetic permeability of a vacuum ( $4\pi \cdot 10^{-7} \text{ N}\cdot\text{A}^{-2}$ ) and m is the volume based upon a sphere with a diameter of  $18 \cdot 10^{26} \text{ m}$  for the final epoch. The solution is  $\sim 1.4 \cdot 10^9 \text{ T}$ . The second is:

$$V = \sqrt{(2 \cdot E \cdot \epsilon^{-1})} \quad (2)$$

where V is the voltage and  $\epsilon$  is the electric permittivity of a vacuum. The resulting value of  $2.2 \cdot 10^{40} \text{ V}$  when distributed over the current radius of  $1.26 \cdot 10^{26} \text{ m}$ , results in a voltage linear density of  $1.8 \cdot 10^{14} \text{ V}\cdot\text{m}^{-1}$ . The ratio of this value to the magnetic field strength is  $\sim 1.4 \cdot 10^{23} \text{ m}\cdot\text{s}^{-1}$ . This is the same order of magnitude as the value obtained from universal parameters.

Recently we completed an experiment where pairs of individuals each wearing a toroid through which specific changing angular velocity magnetic fields were delivered displayed excess correlation in theta and gamma patterns over the right caudal temporal regions. The two individuals in each of the pairs were separated by at least 6000 km. The onsets of the two fields were synchronized to the nearest 1 s. Measurement of the entanglement velocity would be very fast, that is in the order of  $10^{-17}$  s if we assumed this distance as linear or slightly curvilinear from the earth's surface. In fact the latency would be less than that required to complete one orbit ( $1.5\cdot 10^{-16}$  s) in a Bohr atom.

However we reasoned, simplistically, that we could infer the validity of the entanglement velocity by assuming that between the time of the activation of the effective weak (1 to 5 nT) magnetic field and its manifestation within the entanglement phenomena measured by the shared power of quantitative EEG between the two people separated by at least 6,000 km would reflect the time required to exact superposition within the time frame in which local matter is defined. In other words,  $1.5\cdot 10^{-16}$  s divided by  $10^{-17}$  s would suggest that between 10 and 20 s would be required before the entanglement effect was sufficiently manifested at the level of matter through electron orbits that define the human brain. At longer distances where the entanglement latency is equal to or greater than the time of a single electron orbit this lag to be manifested within matter would not occur. Here we present evidence to support this *a priori* prediction of this latency.

## 2. Method

The paradigm has been published in detail elsewhere (Scott et al, 2015). In summary five pairs of people served as subjects. The members of each pair were separated by ~6,000 km. Each pair of participants wore toroids around their heads. During the 42 min of the experiment weak magnetic fields (30 nT) were generated through the toroids with accelerating or decelerating velocities. The activation of the fields produced a 1 to 5 nT diminishment of the E-W component of the earth's magnetic field (Rouleau and Persinger, 2015).

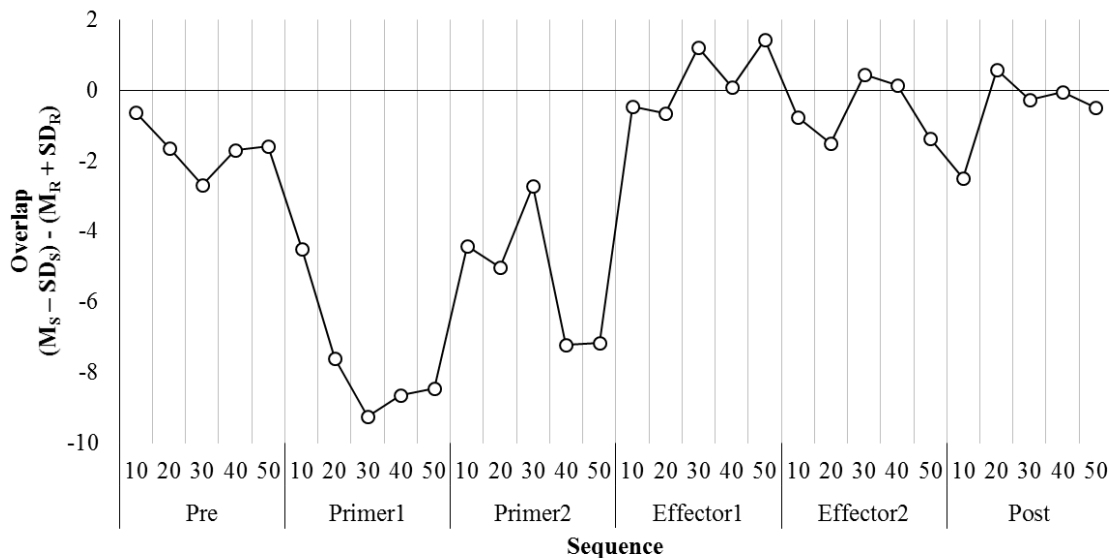
During the exposures each person wore a standard 19 channel sensor QEEG cap that was connected to a Mitsar EEG-201. Measurements were sampled at 250 Hz. During the exposure eyes opened and eyes closed conditions data were collected when tones were presented or instructions were given to imagine "white light". During the experiment there were two types of field conditions. The first was the primer field. The second was the effector field. The primer pattern consisted of 7 all or none, 3 ms point potentials that were continuously looped, separated by incrementally longer inter-stimulus intervals that began with 20 ms and increased by 2 ms every pulse. This re-cycled back to 20 ms after the 7<sup>th</sup> pulse sequence. The 3 ms pulse was based upon the derivations by Persinger and Koren (2007) and empirical support by Koren et al (2014) that the time required for a proton to expand one Planck's Length given the contemporary Hubble Parameters would be about 3 ms.

The effector pattern involved the same all or none potentials. However the interstimulus interval between the points began with 20 ms and decreased by 2 ms for each pulse. The signals were generated from a laptop through Arduino circuits to the solenoids. The primary pattern

began 11 minutes after the QEEG data began to be recorded and was presented for 6 min. The effector pattern began and was presented for 840 s (14 min). This second effector pattern is when the excess correlation phenomena have been shown for shifts in pH and photon emissions. Reversal of the order of the fields does not produce evidence of excess correlations between the cerebral activities of the separated subjects. This specificity minimizes the likelihood that any coherent effects between subjects were because they are simply sharing the same rotating magnetic fields.

To test the potential accuracy of our prediction regarding the latency of response of the brain to the onset of entanglement as manifested through the effector field, we selected the power within the gamma band over the right caudal temporal lobe (T6). This region has shown the most consistent evidence for reliable inter-brain coherence that is consistent with entanglement. In the trans-Atlantic excess correlation reported by Scott et al (2015) this region was also the one in which multiple measures of coherence and intercalation over the 6,000 km was most evident. The T6 region often reflects right parahippocampal activity which was shown to be activated when Sean Harribance displayed evident of excess correlation with the brains of other people (Persinger and Saroka, 2012). This same region was most affected for experiments designed to examine potential gravitational-electromagnetic interactions (Persinger and Saroka, 2014).

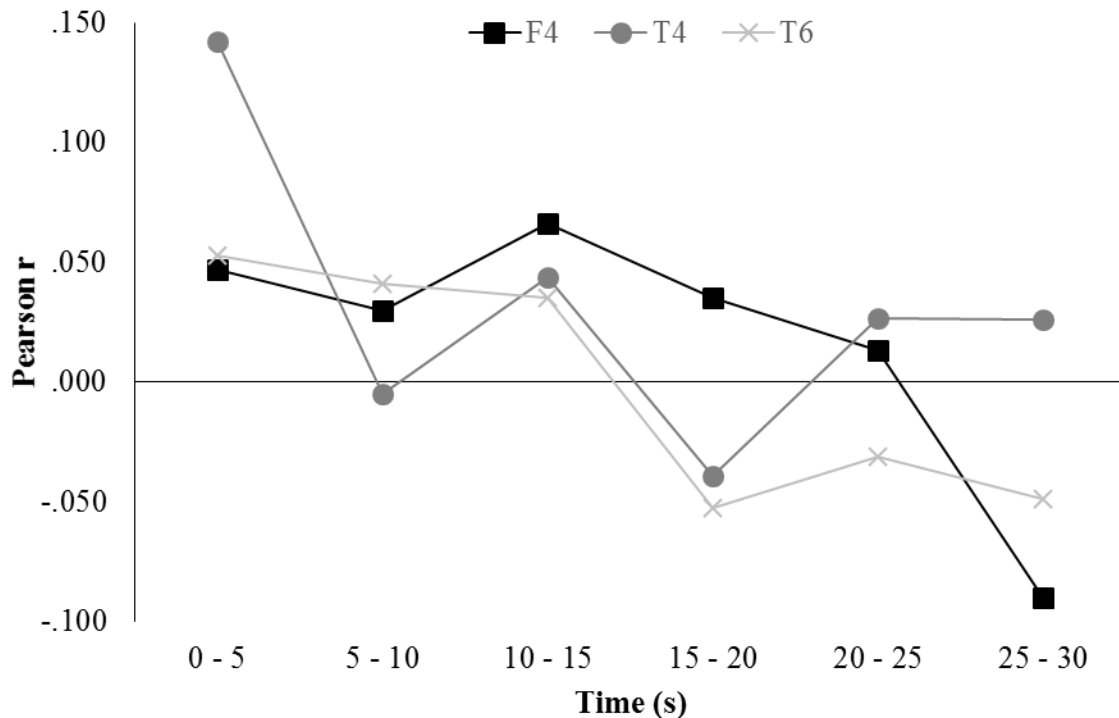
### 3. Results



**Figure 1.** Overlap of error bars as displayed in the graph showing T6 gamma differences between senders and receivers (previous analysis for tone periods). Note the separation between the overlap occurs only during the effector fields (values above 0).

The results of the overlap between the power within the gamma region over T6 (the right temporal region that most reflects right parahippocampal activity) of the five pairs of individuals each separated by more than 6,000 km is shown in Figure 1. The negative values indicated that the power values for the gamma frequencies overlapped between the two individuals in the five

pairs. The values above 0 indicate no overlap. Only during the effector component of the field but not during the primer fields was there a significant separation of power. It first emerged between 20 and 30 s after the onset of the effector field. This is consistent with prediction.



**Figure 2.** Inter-brain correlation of gamma power over the right frontal (F4; squares), right temporal anterior (T4; circles) and right temporal caudal (T6; crosses) over the 5 s blocks after the initiation of the entanglement (effector) field.

In order to discern the shift in polarity, which has been considered an indicator of the demonstration of entanglement, the correlations between the gamma power values over T6 for the pairs of brains were calculated for each of the 5 s increments after the effector field had been initiated. As shown in Figure 2 for F4, T4 and T6 (all right hemisphere) the significant reversal of correlations occurs between 15 to 20 s to 25 to 30 s after the initiation of the effector fields. Because of the sample sizes the differences between a correlation of  $r=0.05$  and  $-0.05$  are statistically significant.

#### 4. Discussion

Several hundreds of years ago the velocity of light was considered to be instantaneous primarily because its quantity was beyond that discernable by contemporary instrumentation. A limiting value to the velocity of light was first realized when large spaces, those involved with the distances to Jupiter and its moons, were measured. Even as recent as the late 19<sup>th</sup> century some scientists assumed that the velocity of the action potential along the axon barrel, and hence “thought”, was “instantaneous” or even the velocity of light. Direct measurement, improved

instrumentation and reasoning altered this perspective. A similar manifestation may be required for the latency for the manifestation of the entanglement.

If there is a specific latency for entangled phenomena to occur, or, once it has occurred to be manifested, then the mechanisms and processes that mediate these phenomena might require alternative interpretations. We (Persinger and Koren, 2013; 2014; 2015) have found that the velocity of about  $10^{23} \text{ m}\cdot\text{s}^{-1}$  emerges from two separate approaches when universal values are involved. One was derived from finding the dimensional equivalence between the four dimensional geometry of a closed shape (the circle) and four universal parameters one of which was the Gravitational Constant. The second approach was the solution when the average potential gradient in the universe in  $\text{V}\cdot\text{m}^{-1}$  was divided by the equivalent magnetic field strength during the final epoch when the total energy of the universe was converted into electric and magnetic forms.

If Mach's principle is correct then there should be local manifestations of this velocity. There is evidence for this possibility. The net change in voltage associated with an action potential the axon of a neuron is about  $1.2\cdot 10^{-1} \text{ V}$ . When divided by the length of the Compton wavelength ( $2.42\cdot 10^{-12} \text{ m}$ ) the equivalent is  $0.5\cdot 10^{11} \text{ V}\cdot\text{m}^{-1}$ . When this value is divided by the typical functional magnetic field intensity from the cerebral cortices during cognition and the interface between axons which is about  $0.5 \text{ pT}$  ( $10^{-12} \text{ T}$ ) the velocity term is  $10^{23} \text{ m}\cdot\text{s}^{-1}$ . This order of magnitude of magnetic field fluctuations is also displayed by the Schumann Resonance. It displays a fundamental resonance between 7 and 8 Hz with harmonics emerging every 6 Hz at approximately 13-14 Hz, 19-20 Hz, and 25-26 Hz until discernment by instrumentation becomes difficult around the 7<sup>th</sup> harmonic (Nickolaenko and Hayakawa, 2014).

Living systems are immersed within the Schumann Resonances. Resonance spectra indicate that the amplitude of the second harmonic around 14 Hz between 20 and 22 UT is about  $3 \text{ pT}\cdot\sqrt{\text{Hz}^{-1}}$  or about  $10^{-11} \text{ T}$ . If the typical vertical electric field values for the Schumann Resonance of  $\sim 10^{-3} \text{ V}\cdot\text{m}^{-1}$  were spread across the Compton wavelength of the proton ( $1.32\cdot 10^{-15} \text{ m}$ ), the velocity would be within the range of  $10^{23} \text{ m}\cdot\text{s}^{-1}$ . This suggests that under certain conditions the entire Schumann spherical wave guide around the earth could display the capacity for the mediation of excess correlation or entanglement. More than 20 years ago Minakov et al (1993) showed mathematically that if gravitational fields were to interact with the electromagnetic phenomena, the most powerful amplification region would be the second global ( $f=14 \text{ Hz}$ ) harmonic of the Schumann Resonance.

The observation that substantial time, about 20 s, was required to display the evidence of entanglement may appear contradictory. If the diffusivity is in the order of  $10^{23} \text{ m}\cdot\text{s}^{-1}$  then  $\sim 20 \text{ s}$  would be sufficient for propagation over  $10^{24}$  to  $10^{25} \text{ m}$ . Our assumption that  $\sim 20 \text{ s}$  would be required for the very local property of this diffusivity to complete one Bohr orbit of an electron would reflect the latency to effect matter within a local space rather than the latency to traverse space. At distances where the diffusivity time is  $> 10^{-16} \text{ s}$  the manifestation within matter would be functionally instantaneous with the time required to complete one Bohr orbit. Perhaps this is one of the reasons why non-local and other entanglement effects are difficult to demonstrate when curvilinear distances are less than that of the circumference of the earth which is  $\sim 4\cdot 10^7 \text{ m}$ . At that distance the entanglement velocity would be in the order of  $10^{-16} \text{ s}$ .

The manifestation of this subtle effect within the right temporal region and presumably the right parahippocampal structure of the human brain may have quantum application. Burke and Persinger (2013) calculated convergent solutions that suggest the hippocampus could serve as a “singularity” for access to cosmological consciousness. The human hippocampus is effectively two, interlocking C-shaped structures that are geometrically congruous with a small spherical condenser wrapped and partially interdigitated by a larger spherical condenser. The shape is similar to a toroid with a gap which could allow discrete leakage of magnetic flux. This arrangement in non-brain circuits is strongly affected by polarization or phase vectors that can be matched within an order of magnitude of the geomagnetic scalar potential.

If it occurs in a similar manner within the human hippocampus then the structure could be an interface between shifts in phase of electromagnetic fields and the non-potential toroidal field of the geomagnetic matrix. This non-potential field corresponds to the types of vertical current densities coupled to the earth-ionosphere cavity. According to Schmidt quasi-normalization the magnitude of the dispersions for the internal field coefficients are between 1 and 6 nT (Winch et al, 2005). This is the diminishment produced by the toroids during the excess correlation between subjects in this study. Persinger and St-Pierre (2014) showed quantitatively that the variation in G was inversely correlated with the geomagnetic fluctuations in the order of 5 nT and that the energy available within a cerebral volume would be within the range of  $10^{-14} \text{ J}$  or the mass equivalent of an electron. Availability of universal current sources could be sufficient to affect the substrates that determine coherent brain activity once entanglement is manifested within the time frame that defines the electron orbit.

## References

- Burke, R. C. and Persinger, M. A. (2013). Convergent quantitative solutions indicating the human hippocampus as a singularity and access to cosmological consciousness. *NeuroQuantology*, 11, 1-7.
- DeCoursey, T. E. (2003). Voltage-gated proton channels and other proton transfer pathways. *Physiological Review*, 83, 475-579.
- Hotta, M., Matsumoto, J. and Yusa, G. (2014) Quantum energy teleportation without a limit of distance. *Physical Review*, 89, 012311.
- Hu, H. and Wu, M. (2003). Spin as primordial self-referential process driving quantum mechanics, spacetime dynamics and consciousness. *NeuroQuantology*, 2, 41-49.
- Hu, H. and Wu, M. (2013). On the natures of quantum gravity and graviton. *Journal of Consciousness Exploration & Research*, 4, 1066-1089.
- Koren, S. A., Dotta, B. T. and Persinger, M. A. (2014). Experimental photon doubling as a possible local inference of the Hubble Parameter. *The Open Astronomy Journal*, 7, 1-6.
- Megidish, E., Halevy, A., Schacham, T., Dvir, T., Dohar, L. and Eisenberg, H. S. (2013) Entanglement between photons that never co-existed. *Physical Review Letters*, 110, 210403.

Minakov, A. A., Nikolaenko, A. P. and Rabinovich, L. M. (1992). Gravitational-to-electromagnetic wave conversion in electrostatic field of earth-ionosphere resonator. *Radiofizika*, 35, 488-497.

Nickolaenko, A. and Hayakawa, M. (2014) *Schumann Resonance for Tyros: essential of global geomagnetic resonance in the earth-ionosphere cavity*. Springer: Tokyo.

Persinger, M. A. and Koren, S. A. (2007). A theory of neurophysics and quantum neuroscience: implications for brain function and the limits of consciousness. *International Journal of Neuroscience*, 17, 157-175.

Persinger, M. A. and Koren, S. A. (2013). Dimensional analyses of geometric products and the boundary conditions of the universe: implications for a quantitative value for the latency to entanglement. *The Open Astronomy Journal*, 6, 10-13.

Persinger, M. A. and Koren, S. A. (2014). Evidence for a causal relationship between Mach's Principle and the quantitative latency for universal entanglement. *International Letters of Chemistry, Physics and Astronomy*, 15, 80-86.

Persinger, M. A. and Koren, S. A. (2015). Potential role of the entanglement velocity  $10^{23} \text{ m}\cdot\text{s}^{-1}$  to accommodate recent measurements of large scale structures in the universe. *International Letters of Chemistry, Physics and Astronomy*, 23, 106-112.

Persinger, M. A. and St-Pierre, L. S. (2014). Is there a geomagnetic component involved with the determination of G? *International Journal of Geosciences*, 5, 450-452.

Persinger, M. A. and Saroka, K. S. (2012) Protracted parahippocampal activity associated with Sean Harribance. *International Journal of Yoga*, 5, 140-145.

Persinger, M. A. and Saroka, K. S. (2014). Quantitative support for the convergence of intrinsic energies from applied magnetic fields and "noise" fluctuations of Newton's Gravitational value within the human brain. *International Letters of Chemistry, Physics and Astronomy*, 19, 181-190.

Rouleau, N. and Persinger, M. A. (2015). Local electromagnetic fields exhibit temporally, non-linear, east-west oriented 1 to 5 nT diminishments within a toroid: empirical measurements and quantitative solutions indicating a potential mechanism for excess correlation. *Journal of Electromagnetic Analysis and Applications*, 7, 19-30.

Scott, M. A., Rouleau, N., Lehman, B., Tessaro, L., Juden-Kelly, L., Saroka, K. S. and Persinger, M. A. (2015) Experimental production of excess correlation across the Atlantic Ocean of right hemispheric theta-gamma power between five pairs of subjects sharing circumcerebral magnetic fields. *Journal of Consciousness Exploration & Research*, 6(9), 658-684.

Vaziri, A., Wiehs, G. and Zeilinger, A. (2002) Experimental two-photon, three dimensional entanglement for quantum communication. *Physical Review Letters*, 89, 240401-1.

Winch, D. E., Ivers, D. J., Turner, P. R. and Sterning, R. J. (2005). Geomagnetism and Schmidt quasi-normalization. *Geophysical Journal International*, 160, 487-504.