

Journal of Nonlocality Round Table Series
Colloquium #4

**Conditioning of Space-Time: The Relationship between Experimental
Entanglement, Space-Memory and Consciousness**

[Appendix 1: Matti Pitkanen](#)

[Appendix 2: Stephen Jarosek](#)

Guest Editor: Joseph M. Caswell*

ABSTRACT: In response to the Vieques 2014 FQXi Conference on the Physics of Information (<http://fqxi.org/conference/2014>), this colloquium brings together over a dozen neuroscientists, physicists and medical researchers to provide a body of empirical data both supporting and extending the quantum information hypotheses recently advanced by Koch, Tononi and Tegmark.

Specifically, the evidence presented by the participants describes numerous controlled studies documenting nonlocal correlations between physical parameters of isolated living and non-living targets, as a result of operators' mental intention, often in conjunction with changes in the target's biophoton signatures. However, some of the results also suggest that elemental consciousness might not be a property of matter alone, as these quantum versions of panpsychism claim – but possibly a property of spacetime itself.

Although relevant clues are scarce at this point, the discussion aims to provide a stepping stone toward the better integration of quantum information theory and applicable experimental models, paving the way to a neuroscience freed from the current neuro-dogmas.

KEYWORDS: biophysics, photon emission, entanglement, excess correlation, electromagnetic fields, heliobiology, morphic resonance, consciousness, nonlocal effects, geomagnetic field, spacetime, space memory, intentionality, conditioning, subtle energies

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- **Lucas Tessaro:** research areas focused primarily on the biological interactions of magnetic fields at all levels of discourse from the organism to the molecule; member of TAR
- **Trevor Carniello:** quantitative electrodynamics of living and non-living systems, EM-mediated non-local interactions on biological systems, neuroquantology; member of TAR
- **Dr. Blake T. Dotta:** post-doctoral researcher; primary research interests in neuroscience, electromagnetic fields, consciousness, biophysics, and ultraweak photon emission
- **David Vares:** thought intention and precognitive entropic representation within external quantum processes. Geophysics, space weather, and random quantum fluctuations; member of TAR
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- **Lyndon Juden-Kelly:** PhD student; primarily concerned with space-time dynamics and the relationship between energy and matter. Research involves concepts, ideas, and problems from neuroscience, consciousness research, and quantum physics.
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Dr. James Lake is a Board certified psychiatrist who practices integrative medicine, and a life-long student of consciousness. He previously held adjunct faculty appointments at University of Arizona School of Medicine, Center for Integrative Medicine and at Stanford University Hospital, Department of Psychiatry and Behavioral Sciences. He founded and chaired the American Psychiatric Association's Caucus on Complementary, Alternative and Integrative Mental Health Care and is a founding member and current chair of the International Network of Integrative Mental Health (www.INIMH.org). He has published numerous peer-reviewed articles and chapters on integrative medicine and psychiatry. He serves on the editorial review boards of several journals and has authored or co-authored four textbooks on integrative psychiatry. Special interests include the role of intention in healing, uses of augmented cognition to facilitate Psi, and the evolution of a predisposition for the near-death experience and other transpersonal experiences.

Dr. Wolfgang Baer received his Ph.D. in Physics from the UC Berkeley. He started a computer graphics development company, has run a multi-million dollar simulation laboratory for the US Army at Ft. Ord California, and held a research professor position at the Naval Postgraduate School in Monterey California. His interest in cognitive brain functions has lead to publications exploring the physics of consciousness, real intelligence, and research applications directed toward the extension of cognitive brain capability beyond its normal limits.

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Stephen Jarosek is an independent researcher who now resides in Budapest, Hungary. He obtained his Bachelor of Engineering from the University of NSW in 1985, and his MBA from the Australian Graduate School of Management in 1990. He is interested in cognitive science and the practical implications as they relate to politics and culture. His publications include: *The law of association of habits*, *Semiotica*, 133-1/4 (2001), pages 79-96; *The semiotics of sexuality*, *Journal of Sign Systems Studies*, Vol. 33.1, 2005; *Pragmatism, neural plasticity and mind-body unity*, *Biosemiotics*, 30 March, 2012.

INTRODUCTION

The phenomenon of non-locality is said to occur when two unique spatial loci share an observable event without the involvement of traditional modes of spatial interaction (Stapp, 2009; Persinger & Dotta, 2011). All physical events can be represented as quantum information, and it is the interactions between spaces and their respective quantum information which are involved in the dynamic processes associated with excess correlations or entanglement (Ahn et al., 2000; Aczel, 2002).

Although these correlations can and do occur spontaneously, experimental elicitation of the phenomenon has been produced with the application of specifically-patterned electromagnetic fields (EMFs). Dotta & Persinger (2012) reported a doubling of photon emissions in a remote (non-local) site of abiotic liquid hyperchlorite when injections of hydrogen peroxide were made at the local site, only if the same angularly accelerated magnetic fields were applied to both locations. While this effect has also been reported in the context of pairs of brains apparently entangled over relatively large distances (e.g., Persinger et al., 2010; Dotta et al., 2011), more recent experimental evidence has demonstrated that this effect may be produced over a distance of at least 300 km (Burke et al., 2013) when applying the appropriate configurations of weak-intensity EMFs. It has been suggested that this quantum information requires little else than a

carrier wave for non-local interaction, and that the applied specific EMFs act as the carrier wave (Persinger & Dotta, 2011).

More recently, excess correlations of shifts in the pH of spring water have also been reported at distances up to 10 m when the local site is injected with a weak acid proton source (Dotta et al., 2013a). Furthermore, these shifts are highly susceptible to subtle manipulations of the field parameters, such as the duration of individual points and the sampling rate of the pH meter (Rouleau et al., 2014). Taken together, these studies emphasize the importance of the spatiotemporal components of the applied EMFs. This area of research is still in its incubation stage, as a number of new studies have suggested that these entanglement effects could potentially involve human interaction through conscious intentionality and biophoton emissions (Caswell et al., 2014a). It may also be interesting to note the apparently similar importance of specifically-patterned EMFs applied transcerebrally during a participants' intention to affect the output of a random event generator (REG) device (Caswell et al., 2013), particularly given the possibility for human-REG interactions to represent some form of consciously active entanglement between operator and device (Caswell et al., 2014b). Quantitative and empirical approaches involving consideration of specific geometries and dimensional properties of potential biophysical and environmental factors has recently proven to be a promising approach for an interdisciplinary understanding of quantum biology and nonlocal effects associated with consciousness (Caswell et al., 2013; 2014a; 2014b; 2014c) and entanglement phenomena in general (Persinger & Koren, 2013).

Although the progress associated with our understanding of non-locality has been moving at a greater pace in recent years, new mysteries continue to emerge through the course of experimental research into entanglement. One of the more recently considered and perplexing aspects which may be involved in this process is that of apparent "space-memory". Conceptually, space-memory is the idea that space, or any physical substrate bounded in space, may retain a temporal structure (e.g., a pattern): any space, either subjected to electromagnetic perturbations or containing a large deposit of water, minerals, or any other form of matter (e.g., electrons, protons, neutrons), can be altered in a way that will allow for the storage and potential retrieval of some form of temporal pattern which is essentially information. This apparent property might emerge from the fact that space and time are so intimately intertwined in the fabric of space-time. Recent experimental evidence has demonstrated the potential to "store" patterned information in a local space through the application of EMFs, and that this process can occur for both photon emissions (Persinger & Dotta, 2011) and spring water pH levels (Dotta et al., 2013b). That is, for both photon emission patterns produced through hydrogen peroxide-hypochlorite reactions and incremental shifts in water pH, patterned activity seemed to be "encoded" in the local space using electromagnetic fields, and was then "retrieved" sometime later by applying the same EMFs (Persinger & Dotta, 2011; Dotta et al., 2013b). However, many questions regarding this seemingly anomalous characteristic remain elusive, particularly given the early stage at which this line of research currently finds itself.

Consider, for a moment, memory and how it is encoded. Ultimately, the physical substrate of memory is the conversion of electrical impulses (temporal patterns) within the nervous system to a long-term structural equivalent (e.g., dendritic spines or matter/space). From this perspective, we begin with a simple pattern (time) that is encoded over a number of trials within a given space. However, we must realize that both the original temporal pattern and the space in which it is stored share a common source of variance: they both exist in space-time. As with the general phenomenon of experimental excess correlation or entanglement, parallels between the previously observed space-memory for a relatively simple physical system have also been observed to some degree in the context of apparent human-REG interaction, wherein anomalous statistical deviations in an external random system (e.g., a REG device) appear to demonstrate some form of latency following an event in the immediate environment (Caswell et al., 2014d; Gaona et al., 2014), which has recently been suspected to represent an additional form of space-memory that could be influenced by proximal biological activity involving repetitive group behaviours in a specific space. The phenomenon of encoding information in space may also begin to help us better understand other concepts on the periphery of non-locality including morphic resonance (Dotta & Rouleau, 2014). Furthermore, space-memory and other subtle environmental factors may also be related to previously observed effects on human consciousness and other apparent anomalies associated with specific geographical locations or “sacred sites” (Devereux et al., 2007; Caswell et al., 2014e). While much of this research has been largely exploratory in nature, a common observation in previous controlled experimental settings (e.g., Radin et al., 2004) has been the demonstration of a “lagged” effect for the interaction between human consciousness and an external system. However, the ability to incorporate quantifiable biophysical correlates in the theoretical pursuit of conditioned space-memory remains quite rudimentary.

While small-scale laboratory effects certainly represent an important avenue of focus, the potential role of larger-scale environmental factors, however distant, should be investigated given the suspected role of the human brain and consciousness in “anomalous” and non-local effects, including remote viewing (Scott & Persinger, 2013) and consciousness-correlated collapse or “psychokinesis” (Caswell et al., 2014c). In particular, the role of geomagnetic activity and associated Schumann resonance in human brain activity has been noted in a host of previous studies (Mulligan et al., 2010; Mulligan & Persinger, 2012; Persinger, 2014a; Saroka et al., 2014), including the apparent ability of specific cognitive states to induce alterations in the proximal geomagnetic field (Saroka et al., 2013; Persinger et al., 2013). This specific environmental factor appears to satisfy a number of important conditions necessary to consider the geomagnetic field as a probable candidate in mediating apparently non-local information transfer, such as providing a shared magnetic field in which all human brains are immersed (Persinger, 2013; Dotta & Rouleau, 2014) and the potential to store information (Persinger, 2008). While some researchers may dismiss these findings for human-environment interaction, Persinger (2014b) has recently provided a comprehensive quantitative investigation into the myriad effects of small-scale environmental factors outside of human awareness on biological

function, which again may relate to the occurrence of seemingly anomalous phenomena and subjective experiences associated with “sacred” geographical sites and subtle environmental energies (Cook et al., 2008; Hill & Saroka, 2010).

With these considerations and apparent overlaps in mind, we have sought to discuss and elucidate potential biophysical factors, limitations, applications, future directions, and other relationships for the related phenomena of EMF-mediated entanglement between non-local systems, the recently investigated concept of “space-memory”, the potential role of consciousness in these processes, and the suspected environmental factors which may be involved.

I. SPACE

1.1. Questions related to information and entanglement

QUESTION 1: What is the relationship between information as a fundamental unit and the observed universe? What possible role could fundamental physical processes (e.g., electromagnetism) play in the conditioning of information?

Brian Millar: Which is more fundamental – “things” or information - a question of “ontology”. Wheeler (1991) in “It from Bit” famously argued that the root of reality is information: this is an important part of his world view (the participatory universe). There are an impressive number of thinkers who agree. But it can equally be argued that things come first (e.g. Barbour, 2011) - “the chicken or the egg ?”

I consider only one of meanings of “information” in common use – the mathematical information of Shannon (Shannon & Weaver, 1963) . In this sense information is no more than a convenient (logarithmic) representation of probability. What then, is the ontological status of probability?

In classical physics probability is simply a convenience tool for when we are too busy (or lazy) to work out the deterministic result for each individual particle. Quantum mechanics (QM), however, introduces a radically new kind of (true) probability. As long as the wave-function (or density matrix) of a quantum system is left on its own it evolves in a strictly deterministic way. But when it interacts with something macroscopic, such as a measuring instrument, the quantum state “decoheres” to an event. Which of the possible outcomes represented actually

“materializes” is a matter of *pure* chance: according to conventional QM there is no mysterious underlying mechanism – no “hidden variables”. In QM probabilities are (at least) as “real” as events. The novel (true) probabilities of QM lend a little support to the primacy of information.

I eschew deep metaphysical waters and merely state that most matters can most easily be analysed by consideration of the IT, while others are best approached via the BIT. Of particular interest here is the “psi” of parapsychology. The observational theories (OTs) (Millar, 2015) consider that all of the (apparently disparate) lab-psi phenomena are mere variations on a single basic theme – “retro-PK” (or precognition): the future casts its shadows before (see also Q 15). This non-local in time (NLT) coupling requires a (Shannon) information channel as the essential connecting medium. According to Aristotle there is nothing in the mind which was not earlier in the senses. The OTs posit there is nothing precognised which is not *later* in the senses. The practical application of this scheme requires that there exists a “quantum-lab” embodied in the wet-ware of the brain.

Lian Sidorov: One way to paraphrase this would be "is the evolution of the physical universe driven by the fundamental forces of the standard model, by another, as yet unknown physical force, or by the dynamics of an embedded informational architecture that we may be glimpsing only partially?" So far the working assumption has been that information is a passive descriptor of physical systems, an outcome of their material organization, which itself occurs under the influence of physical forces. The question is whether that assumption is entirely correct: do we have any evidence to suggest that information alone, in the absence of any energy transfer, can alter the organization and behavior of physical systems? If the answer is "yes" (and the hundreds of REG PK /DMILS studies previously discussed in this panel series seem to support that conclusion) then "information" might not necessarily be bound to states of matter. Could it be bound to spacetime? Again, the evidence for retrocausality and spacetime-specific event targeting in remote viewing data suggests that spacetime coordinates can be meaningfully encoded by conscious intent and modulate the outcome of the mind-matter interaction, whatever the nature of that interaction turns out to be. But whether information can act directly on spacetime, or self-organize in sufficiently complex patterns to be self-directed *in the absence of matter*, and whether the physical evolution of a complex system can be controlled by its self-directed informational architecture, these are questions best left to the future.

Alternatively, if some form of rudimentary, elemental consciousness turns out to be intrinsic to all forms of matter (see, for example, recent panpsychist proposals from Koch, Tegmark and Tononi: Koch 2009, 2013; Tegmark 2014; Vieques Panel 2014) then it might be related to the spacetime metric as an additional, compact dimension, as per Kaluza-Klein and related unification models, (Pagels 1985, pp 301-315), and thus have the ability to somewhat distort the unfolding of events in 4-D spacetime, or perhaps create the equivalent of remote viewing "topological wormholes". The very brief, fragmentary nature of remote viewing data, with its characteristic sensory/symbolic scrambling (the opposite of the unified awake experience), its participant network correlations, error correcting features and propensity for multi-participant

cognitive attractors (Sidorov 2003, Sidorov et al 2013; Targ and Katra 1998; Warcollier 1927, 1958, 2001) suggests that psi might be based on both quantum computational dynamics and some form of topological instability, which operators learn to partially manipulate as they advance in training.

I think that the essential aspect to consider, when addressing the question of consciousness, is probably its scale, or "natural unit": one could argue for emergence (bottom-up intelligence), however that model may run into some difficulty when confronted with the extensive evidence for nonlocal mental interactions (Jahn and Dunne 2005, 2009, 2011; Nelson and Bancel 2006; Radin 1997, 2006; Carter 2007). The basis for such entanglement-like phenomena is difficult to explain without reference to a larger quantum framework (or embedded, potential geometry). I believe that the structure and dynamics of this framework should form the real focus of consciousness research, which ought to be grounded in a broader experimental basis than the current body of neuroscience data.

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Joey Caswell: Many lines of research, particularly within the general area of bioelectromagnetics, have supported the contention that the *pattern* of a physical process is far more essential than its *intensity* in order to produce a particular effect. This is especially the case for a number of the experiments discussed in the preceding introduction, wherein specific patterns of electromagnetic activity employed in a particular order are required to elicit the observed effects. Subsequent studies might determine “what” may be reflecting the patterned (“information”) electromagnetic activity, whether it is the actual space itself or some other unknown local disturbance such as minute gravitational effects.

Lyndon Juden-Kelly: If Information may be considered as the accumulation of meaningful digital sequences in the form of 0/1 computation, then the possibility exists that it may not only

pervade the universe with regard to manifestation as matter within space, but it may also be that information adapts or conforms to subtle energies over time. In biological systems information in this context can be metaphorically likened to the ultimate expression of protein composition. Because of the apparent ability of information to be transmitted between traditionally non-local spaces, it may be thought of as a process not necessarily mechanistically defined by but rather facilitated through electromagnetic resonances.

Lucas Tessaro: At the most basic interpretation, information can be represented as a 0 or a 1. This interpretation is often considered with respect to the ‘presence or absence’ of a carrier for this information. The ‘all or none’ firing of neurons is an oft cited example. However, the “0 or 1” descriptor for information could also describe different states of matter. More specifically, the binary representation of information could reflect the fundamental unit of the Universe, the photon. Being both electric and magnetic, the photon could represent information with patterns of photon activity oscillating between these two states. The presence of electromagnetic fields similarly reflect this dualistic conceptualization of the photon. The presence or absence of photons, the state of those photons, and the associated correlates of those photons (frequency, intensity, density, etc.) likewise could play a role in the conditioning of space with information.

James Lake: In the broadest sense problems of consciousness can be addressed by examining properties of space-time on a cosmological scale in which complex living systems can have existence. Along these lines it is important to take into account constraints imposed by matter, energy, fields (including quantum fields and gauge fields) on living systems in order to establish a cosmological framework or system in which it is meaningful to investigate consciousness. Relevant models in this inquiry include but are not limited to dissipative structure theory, complexity theory, classical quantum mechanics (QM), quantum field theory (QFT), and the gauge field theory. To develop a general model of consciousness that is consistent with cosmology all formal descriptions of energy or informational fields associated with consciousness should be made using the formalisms of vector fields in electromagnetic theory, spinor fields, or other gauge field theories.

Processes underlying information and information flow in complex living systems are expressions of the properties of electrons and photons. Electrons are associated with spinor fields whereas photons are associated with vector fields. According to contemporary neuroscience, interactions between electrons are at the heart of biochemical reactions required for the creation and propagation of signals in neurons and complex circuits of neurons that embody biological information or the possibility of information. In other words electrons mediate elemental properties of neurons which, in the classical neuroscience paradigm, characterize neurophysiological processes presumed to be essential for consciousness to be possible in complex living systems. In contrast vector fields govern the properties of photons including the special case of coherent biophotons postulated in quantum mechanics and quantum field dynamics and may be associated with neuronal function at the level of coherent macroscopic quantum processes. The conceptual ‘gap’ between classical models of

consciousness in contemporary neuroscience grounded in the physics of electromagnetism, and more recent models of consciousness grounded in mathematical formalisms of quantum mechanics or QFT may be an expression of different kinds of systems that are conceivable when the formalisms of spinor fields and vector fields are applied to complex living systems. In other words the ‘gap’ between the classical neuroscience model and quantum-like models may reflect different viewpoints about the roles of spinor fields and vector fields with respect to fundamental processes underlying complex living systems in which consciousness is present or potentially present. An important task in developing a complete model of consciousness involves solving the problem of clarifying relationships, if any, between spinor fields and vector fields, how these play out in complex living systems in general, and their implications for complex living systems in which consciousness is observed to take place. Assuming that electrons and photons both play non-trivial roles in complex living systems, and by extension in the human central nervous system, it is important to examine the respective “rules” of statistical behavior that characterize these systems at large scales. From this we can infer potential orders of complexity in terms of energy-information processes possible in complex living systems. This invites discussion of factors that define and constrain ‘boundary conditions’ that determine the order of complexity that can be attained in complex living systems in general, including the special case of systems in which consciousness is possible.

In the context of the above discussion, a complete model of consciousness is one that regards the human brain as a special kind of complex system in which the particular properties or quale of consciousness take place as a unique expression of relationships between well described neurophysiological mechanisms on one hand, and spinor and/or vector fields on the other. In this model all living system are characterized by specialized possibly unique relationships between spinor and vector fields reflecting interactions between sub-atomic and molecular systems coupled with multiple hierarchically arrayed physical or neurophysiological processes. A related problem is how to characterize the significance of information and information flow in systems that have the capacity for consciousness, starting from field-like dynamics in complex living systems, progressing to large-scale molecular-energy dynamics, functional CNS circuits, and eventually quale or ‘subjective’ experiences associated with consciousness. In this context it is important to consider whether particular capacities or states including so-called ‘anomalous’ states like NDEs, OBEs, confirmed claims of telepathy, clairvoyance, or ‘healing,’ correspond to particular “shifts” in brain dynamics at the level of relationships between large-scale effects of spinor fields in or near the CNS (presumably mediated by biomagnetic fields and ultimately, therefore, electron flow) and/or large-scale effects of vector fields in or near the CNS (presumably mediated by biophoton emissions including the special case of coherent biophoton emissions). This invites discussion of the possibility of non-local effects or ‘entanglement’ within the CNS or between the CNS and the environment with respect to large-scale dynamics associated with spinor fields, vector fields or other kinds of fields.

This general conceptual framework may provide a useful starting place for developing testable formalisms describing fundamental energetic or informational relationships between fields, contemporary neuroscience models of brain function, emerging quantum-like models, and the range of conscious experiences.

Wolfgang Baer: I have problems with entanglement and tend to favor the backward propagation of influence as a branch of cyclic event structure rather than action at a distance explanation. The fundamental unit of information is the quanta. The pattern of quanta (photon hits in the optic modality) flowing through our selves is all the raw data we have to develop a theory.

QUESTION 2: What, if any, could be the most likely physical candidates of information transfer between systems? Is consciousness itself information, or an emergent property of universal information?

Patrizio Tressoldi: I see biophotons as the most likely candidates (see question 12). Preliminary results from our research group (Tressoldi et al. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2506135) support this hypothesis. However, even if we consider biophotons = energy= information, much still remains to clarify with respect to how this energy/ information can be directed to distant targets, e.g. REGs, biological material, at will to whichever part of the world and bypassing every electromagnetic shield.

Lucas Tessaro: The Bókkon Biophoton Hypothesis (BBH) posits that the visual cortex of the brain can mediate higher-order cognitive functions, primarily by serving as an outlet for internal mental imagery (Bókkon, 2009; Bókkon and Angiulli, 2009). Furthermore, it is suggested that all stimuli presented to the visual cortex can be represented by congruently patterned biophoton activity. Although the BBH deals specifically with visual information, it can be stated with some assurance that all qualia can be represented within the brain as QEEG activity, which we know to be correlated with biophoton activity (Bókkon, 2009; Bókkon and Angiulli, 2009; Dotta, Saroka and Persinger, 2012). All subjective qualia, regardless of modality, are now quantifiable in terms of photon emissions. Thus, the photon is the most likely physical candidate for information transfer.

Rajendra Bajpai: I consider quantum field of biophotons to be most likely candidate for information transfer and information sharing. Information transfer implies time ordering of donor, carrying and recipient of information. This type of time ordering may not be permissible in quantum systems. That is the reason for calling it information sharing. Some aspects of

consciousness are the results of describing a quantum phenomenon in the semi- classical framework. The capability in a living system to detect its own entangled field may explain a few other aspects of consciousness. This capability may arise from reflection or feedback from the environment. The capability confers self-awareness and course correction.

Brian Millar: The second question seems to harbour an all too common misconception about the nature of non-locality. Non-local coupling involves only a *correlation* and NOT a *signal*: it is impossible to send a *message* by means of non-locality. There is no *transfer* of information. There is only *formal* information in the correlation. *You can't have non-local cake and eat signals too!*

According to the OTs, any (direct) attempt to USE psi, as if it were a signal, couples the underlying quantum system to the noisy environment and causes decoherence which, in turn destroys the effect. The moral is - don't try to make money by dreaming winning horses or, if you do, don't tell anybody, bet sparingly and, whatever you do, don't buy flashy cars or houses with any winnings: the trick can only work (consistently) if the world remains unchanged by it (which rather defeats the object of the exercise)!

On these theories consciousness, in the sense of introspectability, is not a causative factor at all but, on the contrary, consciousness plays a limiting role. The most extraordinary psychological aspect of psi is just its near-total inaccessibility to introspection: it is deeply UNconscious. If the entire occipital cortex is knocked out the patient is quite blind; but he can often still guess the nature of an object presented before his eyes considerably better than chance (blind sight). Ask a successful ESP subject to make confidence calls, though, and he is typically unable to succeed to any appreciable extent. Consciousness bears a striking *negative* relation to psi – either you can do psi or introspect but not both at the same time.

The OTs suggest that this is a *physical* necessity rather than something psychological. If a quantum computer produces an answer to a problem it is impossible *in principle* successfully to ask it “How did you do that?” Quantum processing must be strictly isolated from the environment: if not, the quantum processes decohere and any answer which may be produced is garbaged. The quantum computer is the very embodiment of “Don't ask - Can't tell you”. While there is little or no empirical evidence that the human brain contains a quantum computer, the same kind of “hands off” rule applies to any quantum processing. On this basis it is clear why intermediate interrogation of any quantum processing in the brain is a big “no-no”. The psi process itself must remain strictly inviolable to introspection.

As noted above, the quantum process the OTs require is particularly vulnerable to decoherence since part of the works (the [external] feedback channel) is exposed rather than safely tucked away in some secure “hydrophobic pocket” inside the subject's head.

Joey Caswell: It may be that producing a “shared space” through the application of identical electromagnetic patterns could require similarly identical conditions with regard to other

fundamental forces. While a difficult undertaking, an experiment of the kind observed in the research by Persinger, Dotta, and colleagues could be replicated with the local site in a standard environment, while the non-local site receiving an identical electromagnetic field treatment could be situated within a slightly altered gravitational environment. We have previously suggested a potential link between minute gravitational variations and both geophysical processes and terrestrial biology (Dotta et al., 2014x), with an earlier experiment from which calculations were derived to propose an intrinsic relationship for electromagnetic and gravitational interactions with regard to apparent non-local information transfer in the context of human consciousness (Caswell et al., 2013). While consciousness may represent information, this is dependent upon the definition of information. Consciousness can certainly be thought of as a self-reflective pattern of personality and behaviour shaped through a history of sensory perception and social/environmental interaction. It remains possible that consciousness could be a primordial universal property which requires a proper “antenna” (e.g., the human brain) to adequately harness conscious information, and which adaptively imprints a history of experience through organic changes within the antenna itself (e.g., dendritic growth) in order to precisely modulate the universal information of consciousness for the individual carrier unit.

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Lian Sidorov: In a 2010 *Nature* article Vlatko Vedral posed a key question: “Could it be that life does not just keep its entropy low, but rather, also aims to keep its quantum entanglement high?” There is accumulating evidence to support this hypothesis, as quantum biological effects are proving to be not only possible and ubiquitous, but also far more robust than non-living counterparts, with decoherence times that far exceed those of isolated subatomic particle systems (Vedral 2011, Sidorov 2013).

At the same time, the Koch/Tononi/Tegmark hypothesis proposes that intelligence/ self-awareness emerge from the self-organization of *any* sufficiently complex and self-referential material system (not only biological structures), as a consequence of matter being fundamentally endowed with a quality of consciousness (see Vieques Panel, 2014).

The convergence of these two perspectives leads to an obvious question: is there a critical connection between self-awareness/free will and the genetic material, seen as the common denominator of all life on Earth? Does the genetic material represent that critical threshold of self-referential complexity necessary for the emergence of "higher" intelligence - and with it, self-direction? And does that ability to perceive a self, to exert one's will, begin to change the *local* dynamics of quantum information flow across the global system, perhaps in proportion to the density of the self-contained local information?

Could the geometric and functional organization of atoms in DNA/RNA molecules lead to a criticality threshold in terms of emergence of basic intelligence? Or could the reverse be true - that the most elementary molecular organization representative of life is the *result* of a consciousness-driven selection for increasing macroscopic quantum coherent assemblies? Perhaps the mystery of self-replication is tied precisely to such self-directed behavior, once a minimal complexity threshold is reached. Likewise, the unfolding of dynamic geometrical processes such as morphogenesis and crystallization may turn out to be at least in part under the control of consciousness, as Emoto and Radin have shown (Radin et al., 2008). Perhaps such preliminary studies will be extended in the future, to see if the intention of one or multiple operators can catalyze self-assembly reactions and make life molecules from the primordial soup.

I think that to speak about consciousness in a meaningful way one must constantly be reminded to stay grounded in empirical data: there are questions forever relegated to the domain of philosophy, and then there are questions that we could attempt to tackle experimentally. The generalized frustration with classic neuroscience models is that they do not come anywhere close to the fundamental nature of consciousness - a problem which the Koch/Tononi/Tegmark hypothesis commendably tries to rectify. However, the challenge is now to find the appropriate experimental models to prove it - and that might require an act of unusual political courage.

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Vieques 2014 - **FQXi Conference on Physics of Information - Panel on Consciousness at the FQXi conference 2014 in Vieques** (2014) <https://www.youtube.com/watch?v=MtUZw3PkKYg>

Lyndon Juden-Kelly: The physical candidates, if you will, which allow for information transfer between locus may just be shared proximal spatial and temporal occupation within the same dimension of reality.

Wolfgang Baer: In my concept cognitive systems are modeled as action cycles conceived as a flow of action around a loop. Information is transferred through inter-action between cycles. An isolated non-interacting cycle is in a state of time. It absorbs an action pattern by internal adjustments that show up as changes in objects in the observable phase of the cycle. Such changes from one state of time to another provide a time interval and hence progress as we normally see it. If no change happens the cycle holds a repeating existence which may be described as a deterministic lifetime.

These questions are very good and will certainly provide a guide to a valuable effort. However it is also clear that they are grounded in a objective world view that must be replaced with an event oriented world view in which one must understand oneself not as the body one experiences and wakes up to, but rather as the larger system which generates within itself that perceptive body experience.

1.2. Excess correlations as entanglement?

QUESTION 3: Do experimentally observed excess correlations between physically isolated systems correspond to an entanglement between the physical objects in space-time, or between the very space-time they occupy? How could an experiment be designed to investigate this distinction? Does data currently exist to support one side or the other?

Joey Caswell: This is probably one of the most important and potentially difficult to ascertain factors involved in the interpretation of current experiments in this area of research. However, the demonstration of conditioned “space-memory”, in which patterns of photon emission were “retrieved” several days after an initial emission was induced, seems to suggest that it is the actual space that is affected by experimental entanglement, at least in the context of these studies. Perhaps an interesting way to begin exploring this further would be to replicate the EEG

entanglement studies after which the same space, undisturbed, could be examined for similar subtle electrical patterns days later.

Trevor Carniello: Consider the effective nature of space-time as being a background field upon which all other fields (gravity, electromagnetism, matter, etc.) operate or interact. Since these components are always in a sort of mutual dynamism there is the potential for an exchange of information to occur between them. This interaction would be analogous to the interaction between photons and electrons or positrons. Here the carrier particle, the photon, operates as the information exchange system between adjacent or interacting particles. Much like the aforementioned example, the background space-time manifold (field) can interact with any and all other operating components. The nature of the carrier particle would most likely be the exchange of energy which would most likely distort the space-time manifold. The direct alteration to any added energy or matter interacting with a space-time manifold can be calculated in relativistic ways. The resultant change in the organization of the background space-time field might favour a particular directionality between a sender or receiver pair.

Brendan Lehman: Both, however a distinction is made in that experiments require the periodic sampling of a small cluster of the amount of matter within the experimental system. This small cluster provides the only information into this system that can be consciously perceived by the human brain. Future technology in this area will allow the sampling and measurement of a greater variability of the matter interactions occurring within a particular space, as such allowing that increased amount of information available for conscious processing, and therefore involved in the excess correlations. With such limitations, true data does not currently exist in this area as the distinction is difficult to make. Future directions of this research could involve the live computation of electromagnetic field patterns, based on particular fundamentals, and applied at appropriate point durations could potentially involve more of the spatial components of the system.

Lyndon Juden-Kelly: Excess correlation demonstrated between physical systems separated by considerable distances may be entangled within the very space-time that they occupy. Recent experimental research has facilitated the coupling of non-local electron tunneling procedures within the operation of microelectronic devices such as Random Event Generators through the facilitation of simultaneously generated appropriately patterned electromagnetic field stimulation at both sites, suggesting that while electromagnetic energy may not necessarily be the means by which information results in stimulus-response order effects, it may be considered the process facilitator by which entanglement processes could be observed by changing the probabilities within a given non-local but ‘shared spaces’.

Brian Millar: According to the OTs what “causes” non-local correlation of otherwise unrelated (random) systems is later (motivated) sensory observation of their output by a psi-source, which is (usually) located in the brain of a human observer. Anything, such as EM disturbances, which have an effect on the brain may conceivably affect the quantum circuitry. However, since no

physiological details of this hypothetical “motor” exist this answer is unavoidably “handwaving”.

Empirically, Puharich (1973) (who was also much interested in the Schumann resonance) reported substantial psi enhancement with a double mesh Faraday cage, though only with special subjects. But his subsequent (literally) fantastic adventures with Uri Geller (1975) shredded his scientific reputation and no-one, so far as I know, has attempted the experiment since.

The OT account of psi correlation production by an organism containing a psi source would be falsified if psi were to be found to be unrelated to feedback: a single experiment, using remote viewers (May et al, 1996), does indeed claim this. The fly in the ointment is that it is usually unclear who is actually producing the psi: in many cases the experimenter seems more likely than the nominal “participants”. Consequently it would be necessary to determine the effect of feedback on the experimenter too and this has not (yet) been done.

Recently, the long-running Global Conscious Project (GCP) of Nelson (Bancel & Nelson, 2008) has been explicitly suspected of being a psi experimenter effect (May et al, 2014/2011), though definitive proof one way or the other is lacking. Nelson was also one of the PEAR team (together with Dunne) which reported significant PK results repeating nicely over decades (Jahn et al, 1997). Other (largely European) experimenters, however, proved unable to replicate these results in large-scale trials (Jahn et al, 2000).

Unwitting (unconscious) psi experimenter effect generally looms large in the OTs (Palmer & Millar, 2015). While both participants and experimenter have feedback, the experimenter is by far the more motivated of the two (his very livelihood may depend upon it). At any rate, the criterion of objectivity on which experiment logically depends is violated by the mere existence of psi. If any psi is registered it is very likely to follow the expectations/hopes of the experimenter. In fact, I am aware of just a handful of psi experiments in which quite unforeseen convincingly significant results were obtained. Just these exceptions make my ears prick up, for they suggest something objective about psi. In the extreme case parapsychology may turn out to be a monumental exercise in self-fulfilling prophecy, driven by a few psi-gifted experimenters - a “science of self-stimulation”.

If this is so for parapsychology, one may question to what extent this applies elsewhere. The Laurentian group is distinguished by its verve and productivity: their theoretical background, moreover, makes a welcome contrast to the “non-physical mind” still dominant in Rhinean circles. Under the charismatic leadership of Persinger confirmation of his theories is surely welcomed. Such a small enthusiastic in-group is psychologically fertile ground for experimenter effects: are the results idiosyncratic? Under these circumstances it would seem expedient to carry out critical experiments by several different independent experimenters, preferably including a few disbelievers.

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Lian Sidorov: One such rudimentary experimental idea might be to simply target the space inside a vacuum chamber as the "PK target" and see if its parameters (i.e. pressure or optic properties) change relative to controls. Also, if "imprinting" of a space is possible, as some of the

commentaries in this discussion suggest, then perhaps one could compare the evolution of two identical biological samples placed in the "treated" and a control space shortly after the PK session, and see if their development is showing any consistent differences across multiple trials.

QUESTION 4: The Greek philosopher Heraclitus wrote: You could not step twice into the same river. Scientists generally assume that space is homogeneous and of negligible concern during experiments. However, experimental evidence displays strong shared space laboratory results. Do the Earth's orbital velocity (30 km/s) and the Sun's orbital velocity (~220 km/s around the Galaxy) indicate that we are never truly in the same space twice?

Joey Caswell: This is a particularly vexing notion. Although it is a certain fact that our exact location within space is constantly changing due to the intrinsic motion of our planet and galaxy, the "space-memory" studies appear to conflict with this. The experimental entanglement research by the NRG has also supported the suggested importance of a specific *electromagnetic environment*. Additional research discussed in the introduction section has also provided evidence of the geomagnetic field as an important factor with regard to potential acquisition, processing, and emission of information. It could be that, although the "true space" which we occupy is always changing, the planetary space is defined by the sphere of geomagnetism which we all share.

David Vares: It is becoming ever apparent that researchers must consider the environment when conducting experiments. At the University of Waterloo's newly constructed Institute for Quantum Computing (IQC), the sensitivity of the equipment accommodates the vibrational movements of traffic outside the campus. Now, more than ever, scientists have come to realize that the complex manifold of reality must be taken into consideration. The Neuroscience Research Group at Laurentian University takes continuous measurements of such dynamics. Being aware if the Sun is flaring, or the behaviour of the Earth's electromagnetic field might account for variations in (an otherwise) closed system experiment. The realization that even an incubator cannot be kept isolated, forces scientists to expand the sphere of interactive forces for consideration when examining results. With the celestial movement of our Sun, Earth, and even Galaxy, we can never truly be in the 'same space'.

There is both an associated anxiety related to this concept, and a liberating freedom. On one hand, controlling for experimental design is seemingly impossible. The perfect design can never be obtained as only a number of interactions can be recreated. Yet on the other hand, the constant movement of our Earth, and the very movement of space, brings with it a tantalizing addition to scientific research; the concept of 'universality'. Experimenting within a closed system, which is moving throughout the universe, provides the ultimate test-retest reliability of measurement. By simple conceding that some things cannot be controlled for, the scientist can

then claim results across light years! Surely, we can never be in the same space twice, but recognizing this feature of research will enable experimental designs to accommodate and better explain results.

Lyndon Juden-Kelly: Assuming the brain to be a volume occupying an apparent space within the cerebrum, recent research has indicated that scores to absorption related traits associated with high imagery content (Tellegen Absorption Scale) have been localized to specific electromagnetic activations from distinct regions within the cortex, namely the right hemisphere's parahippocampal region, temporal and frontal lobes. Given that Absorption is the highest studied correlate of hypnotisability, I would suggest that our mental capacities are highly susceptible or interactive with our environment.

Trevor Carniello: Space is influenced by time and vice versa, however the two of them together constitute a process. This process is ever-changing and suggests that every piece of space, as it is subjected to alterations in time, will never be considered the same. Space, then, is considered to be heterogeneous in this context. A compliment to this idea is the concept of Mach's principle of Universal imminence which suggests that all bodies affect all other bodies whilst external bodies exert an effect on local bodies. Thus, if the Universe is heterogeneous, subject to modulations, then every measurement that is conducted at a certain time would reflect those instantaneous parameters. The result would be an inherent variability to all measurement even if that measurement was taken in the same laboratory for years.

Lucas Tessaro: At the cosmological scale, space is indeed homogenous. However, the Earth rotates, orbits the Sun, the solar system orbits within the galaxy which itself is moving through space (assuming the theory of Universal expansion). At the cosmological level, although the distances may be comparatively small, the precise Minkowski metric for a space will change. If the coordinates for a space change as a result of the motion of the Universe, then no, we are never truly in the same space.

1.3. EM fields and information

QUESTION 5: Could the natural electromagnetic environment in which the entire planet is constantly immersed (e.g., geomagnetic field/Schumann resonance) provide a consistent system conducive to promoting shared spaces via electromagnetic field applications and excess correlations?

Trevor Carniello: Consistency or repetition, with respect to electromagnetic research of non-locality or excess correlation, does not facilitate the observed effects. In fact the effects are markedly diminished. What is required however is the presentation of time-varying fields subject to complex angular rates of change. The natural electromagnetic background is considered to be quasi-stable. It is due to this stability that the natural electromagnetic background does not lend itself to be a reliable candidate of these phenomena. However, perturbations within the background electromagnetic field, due to its transient differential rates of rate of change, would in fact contribute to the onset of these phenomena. This process may contribute to the formation of resonant cavities with the ability to acquire and store information. Given the right conditions the re-application of the encoding parameters (specific parameters that were initially present at the first onset of the phenomenon) can release said energy. This hypothesis has been applied to the idea of space-memory and haunt phenomenon.

Lucas Tessaro: Most studies suggest that non-local interactions require the application additional magnetic fields in order to create identical space-time conditions pursuant to excess correlation. However, the dynamo system producing the Earth's magnetic field, combined with the Earth's rotation, may under certain circumstances create the proper conditions for 'natural' XCS. If we consider human biophoton emissions, and that photons carry information, individuals under the proper conditions could 'receive' that information. Given that a single neuron could influence the entire cortical manifold, this photon could then activate the 'receiver' in a way that mimics the 'sender', a rudimentary example of spontaneous XCS under proper conditions.

QUESTION 6: What is the evidence for information transfer and retrieval by means of the geomagnetic field? How does this relate to non-local psi information transfer associated with consciousness, such as that observed in remote viewing or psychokinesis?

Blake Dotta: We have previously published data demonstrating that global geomagnetic activity at the time of a conscious experience (dreaming of an anticipated event) was correlated with what the geomagnetic activity would be 2-3 days before that actual event. These results point to the global geomagnetic field as a possible medium of information transfer. This has large implications for behaviours like remote viewing and PSI like events. If every event has an electromagnetic equivalent, then reproducing that same electromagnetic equivalent could possibly allow for information transfer. Imagine point "A" and point "B" separated by a large distance. The information occurring at point "A" has a unique electromagnetic signature, in order for point "B" to acquire this information the same unique electromagnetic signature would be required. We have previously demonstrated information transfer and retrieval effects using specific electromagnetic configurations and biophotons. Like the description above, these space-memory effects were only produced when the proper electromagnetic configurations were applied to a space. The retrieval of information (biophoton pattern) only occurred when the same

unique electromagnetic configuration that was applied during the “storing” phase was applied during retrieval.

Joey Caswell: As discussed in the introduction, Persinger (2008; 2013) has provided quantitative support for the contention of “information storage” through the geomagnetic field. More recently, evidence has been examined which strongly implicates Schumann resonance in human brain activity (Persinger, 2014; Saroka & Persinger, 2014). In addition to these particularly thorough reports on brain activity in general, Scott & Persinger (2013) have similarly demonstrated evidence which may help explain geomagnetic perturbations as a factor in remote viewing phenomena during which storm-level activity introduces “noise” into the non-local interaction and interferes with accuracy. In the alternate context of “psychokinesis” (PK), or consciousness-correlated collapse of random physical systems, we (Caswell et al., 2014x) have recently demonstrated quantitative and empirical support for the role of solar-driven geomagnetic alterations in relation to PK processes. Taken together, these experiments and subsequent supporting calculations derived through traditional dimensional analysis seem to suggest a fundamental modulating role for the planetary electromagnetic environment in a number of non-local contexts.

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Kean Hin Ooi: Geomagnetic field can be the medium for information but not necessary the only medium for information. In qigong perspective, simple information/primeval qi infiltrates everything.

We believe remote viewing/psychokinesis is still possible in zero geomagnetic field condition, implying that geomagnetic field is not the required medium.

1.4. Does space learn and remember?

QUESTION 7: What are your experiences with unique effects in a certain space? Has a specific experimental result been more easily obtained in a unique space? Can a particular space, with its background sounds and subtle fields, induce particular types of imagery? How susceptible is our mentation to the environment around us?

Margaret Moga: In preliminary experiments of magnetic field (MF) activity during energy healing, I tried doing some experiments in my laboratory (with a portable massage table) and some experiments in a medical clinic. It quickly became clear that healers and clients were better able to relax and reach a deep state of healing consciousness in the clinic, but not in the laboratory, regardless of the quiet and solitude in both environments. My MF recordings did not detect any obvious difference between the two environments. Other methods of measuring conditioned space (e.g, pH or REG) may detect a difference between “healing” and “non-healing” space, with the interesting question of how much effort, how many healing sessions are required to condition a healing space.

Kean Hin Ooi: Many qigong practitioners are able to perceive differences between the qi field/information field of places of worship and mortuary. Places of worship normally carry information of kindness, and it is comforting. And the surrounding of a mortuary is always filled with sadness and anger.

The experiments with fieldREG have proven that information within a space would produce certain patterns.

Background sounds and subtle fields are all information and if they carry the right/required information it would induce imagery. However susceptibility depends on the sensitivity of the person within the field (ability to pick up information) and the strength of the information (depends on many factors, including how long [how many times it has been repeated] and how

strong [eg: how many people were yelling at the same time] the information has been instilled into the space.).

QUESTION 8: Does the recurrence of behaviours (human or animal models: verbal, ambulation, etc.) occur more often in highly used research space? Do effects disappear if a space is tampered with? What are the residual effects of emotions on a space? How long do they persist? Do re-experiencing emotions in a particular place (e.g., church or pain clinic) help reinforce and maintain this type of space-conditioning?

Margaret Moga: Emotions may be detectable as low-frequency magnetic field (MF) activity (Moga, 2014). In my experiments, I have observed that the greater the valence or intensity of the emotion, the greater the magnitude of the MF oscillations and the longer it takes (up to 6 hours or more) for the MF activity to subside.

Dave Schumacher: There are four main lines of evidence that will be explored to address the questions posed above: the spontaneous case phenomena of place memories (aka residual haunting), experimental studies showing the random output of REG devices demonstrating statistical deviations were correlated with the emotional state of the study participants, exploratory FieldREG studies in novel parapsychological settings and controlled experimental studies of non-locality showing space memory.

A place memory is one supposed type of haunting that is thought to involve the environment recording highly emotional or repetitive events and under the right conditions, at the right time and with the right person these events are perceived again at a later time. Parapsychologists have long thought that the environment may be able to record and hold a moment of the past that has imprinted itself on the environment (Gurney, 1888-1889; Sidgwick, 1885; Meyers, 1886-1897; Lodge, 1909; Roll, 1964; McCue, 2002; Heath 2004; Heath 2005). These ‘recordings’ and ‘playbacks’ can last for decades or centuries. Place memories may account for up to 90% of all haunting cases (Persinger, 1974; Graves, 1986).

The main components that seem to be important for place memories to occur are: 1) a living person and an event taking place, 2) emotion and 3) a recording medium and mechanism (Heath, 2004; Heath 2005; Johnson, 1983; Roll, 1964; Persinger & Koren, 2001). The role of emotions and recording mediums will be explored further as they are relative to the question being answered above.

Events that have a higher emotional content seem to be more likely to be recorded and retrieved (Heath 2004; Heath 2005; Alvarado, 2000). One study exploring the relationship between hauntings and emotionally negative events showed a correlation between hauntings and the

locations where tragic events took place in the past (Alvarado, 2000). Harry Price (1939) speculated the emotional aspect of the recording may allow it to be perceived easier than other mundane events that have been recorded since the high emotional content of the recording makes it stand out better to those perceiving it. Additionally, it should be noted that emotional events that create a place memory may be both positive and negative in nature (Auerbach, 2006, personal communication).

A recording medium is also required to make a place memory possible. There are two theories that have been proposed in regards to a recording medium. The first is the possibility that geomagnetic fields are involved in recording events like a hologram (Persinger & Koren, 2001). The second is Dr. Roll's psi-field theory in which information is recorded through spatial proximity, frequency and recency (Johnson, 1983; Roll, 1964).

Creation of a place memory could occur similar to the process used to make holograms except magnetic field are used instead of lasers. The presence of humans and/or objects could be recorded in the crystalline structure of rocks during a geomagnetic storm with a locally specific pattern that matches the inductance of the earth's crust. The presence of humans and objects could generate interference patterns by altering the geomagnetic activity as it overlaps the local static field and thereby recording the event in a manner similar to a hologram (Bentov, 1977; Persinger & Koren, 2001). Then at a later time and under the right magnetic conditions the recording could again be experienced.

Dr. Roll's psi-field theory has three main aspects – spatial proximity, frequency and recency. The aspect that is important to the question above is frequency. According to Dr. Roll's theory, the more recent, closer and frequent the human or object is with the recording medium the more likely the human or object will be recorded and later perceived (Johnson, 1983; Roll, 1964). A hypothesis put forward by Heath (2004 & 2005) proposes that place memories created by passive means will occur more frequently with proximity, recency and frequency of repetition, thereby complimenting Dr. Roll's psi-field theory.

One final intriguing piece of information is that those involved in investigating and researching spontaneous cases involving potential place memories have noted that place memories can be erased using something that disrupts static electromagnetic fields (Auerbach, 2006, personal communication).

Besides the anecdotal reports from spontaneous experiences and case investigations and the proposed hypotheses, there is little empirical evidence to support the overall idea of a place memory. However, there are exploratory field studies and experimental studies that show that emotions do affect the environment and that space-memory is possible under certain conditions.

The output of Random Event Generators (REG) devices demonstrating statistical deviations has been shown to be correlated with the emotional state of those influencing the REG (Blasband, 2000; Bierman, 1996; Caswell et al., 2014a; Lumsden-Cook, 2005a; Lumsden-Cook, 2005b). Not only does the emotional state appear to be involved in the effect, it has been shown that positive or negative emotions and emotional events correlate with the positive or negative direction of the random output of REGs in various locations, such as a psychiatrist's office (Blasband, 2000), religious settings, funerals, allegedly haunted locations (Caswell et al., 2014a; Caswell et al., 2014b) and poltergeist settings (Caswell et al., 2014b; Gerding et al., 2002; Maher & Hansen, 1997).

Some of these studies also demonstrated a delayed or lagged effect, which is suspected to be another type of space-memory (Caswell et al., 2014b; Gaona et al., 2014). These delayed or lagged effects seen in exploratory studies have also been seen in controlled experimental studies as will be discussed below. Alternatively, it could be that the people and/or their actions that caused the delayed or lagged effect in the REG output data could have been the result of space tampering or normalization of the location by the people present at the locations influencing the environment (Caswell et al., 2014b).

Radin et al. (2004) explored the effects of healing intention and space-conditioning on the growth of cultured human astrocytes and the output of a REG. *Johrei* practitioners directed healing intention to the study chamber and cell growth and REG output were assessed. Healing intentions on the astrocytes were weak but cumulative. Peak deviations in REG output occurred when no healing intention or space-conditioning was taking place. This again indicated a delayed or lagged response to the treatment. The REG z-scores slowly declined for 40 hours following the last *Johrei* healing intention, which may indicate the change in the 'conditioned' environment took time to return to pretreatment levels. A linger effect of shorter duration (25 to 30 minutes) has been observed in other psychokinesis (PK) experiments and studies involving Direct Mental Interactions with Living Systems (Watkins et al., 1973; Watkins & Watkins, 1974; Wells & Watkins, 1975). The linger effect seen in the studies discussed could imply some level of space memory that fades quickly over time, but there are controlled experimental studies that provide relatively more definitive data in regards to space memory.

Recent experiments using applications of magnetic fields to a defined space have shown that certain types of information can be stored in local space. This has been accomplished using both photon emissions (Persinger & Dotta, 2011) and pH (Dotta et al., 2013). In both experiments, the activity was encoded using specific configurations of magnetic fields and later downloaded by applying the same magnetic fields. The longest period between encoding and downloading was less than 3 to 5 days. Though a short duration, space memory was demonstrated in the context of specific magnetic field configurations.

In summary, there is evidence to suggest that certain intentional and unintentional human conscious actions can affect animate and inanimate objects as well as space itself. The effect of

repetitive behavior seems to be cumulative over time and may imply short term space memory. The duration of the effect varies based on the type of phenomena and lasts from as little as 3 minutes in the controlled experiments utilizing magnetic fields too potentially centuries in the place memory model. However, there is the potential to disrupt these space memories as was reported with the anecdotal information presented for place memories or that speculated in the FieldREG exploratory studies.

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Nicolas Rouleau: One important distinction must be made here. Context-dependent memories consist of stored information whose retrieval is contingent upon the presence of one or more environmental stimuli. In this sense, our brains internally mark or plot the environment such that specific stimuli trigger a type of heuristic process that selectively activates relevant information stored as memory. This is not what is being referred to when discussing space-conditioning. Space-conditioning involves the physical storage of information within the environment itself: space-memories. In many ways, we have conditioned our environments for millennia. The storage of ink as symbols on parchment paper, capturing the thoughts of humans both living and deceased or the grooves pressed upon vinyl which hold their voices are examples of storage of information in space. Retrieving said information involves translating the code (e.g. grooves, series of 0s and 1s, etc.) into a form of energy that can be sequestered by one or more of the human sensory systems (e.g. visible light, somatosensory feedback, etc.)

There are perhaps methods which have not yet been developed which could allow us to classically condition spaces in novel ways. In the case of an organism, a neutral stimulus must be paired with an unconditioned stimulus in order to generate a conditioned stimulus which will elicit conditioned responses. This has been referred to as classical conditioning and represents only one of many possible types of conditioning. Perhaps there are combinations of stimuli which, when paired, allow the space within and between matter to exhibit memory-storage properties. Identifying the appropriate stimuli which would be sufficient to condition the space would involve understanding the fundamental receptivity of space to various applications of energy. Discoveries in particle and quantum physics will inform this understanding.

Under the assumption that information can be encoded and stored within discrete environmental spaces, the possibility of residual emotional information becomes apparent. The brain is the source of emotional information and therefore the origin of the signal which must be received by the environment, encoded, and stored. One potential signal which could carry emotional information from the brain into the environment is the biophoton. Brains emit photons, with a typical power of 10^{-11} W·m⁻² (Dotta, et al., 2012). If some component of the environment is receptive to the emission, can store the energy, and later release a quantum containing the original information, this would constitute a space-memory. If the environmentally-stored information is ‘functional’, and can be translated into useful information by neurons, humans exposed to certain environments might be transiently imparted with the cognitive-behavioural information of a long-deceased encoder. If the encoded information is ‘structural’ and the intensity of the re-emission by the environment is sufficient to stimulate cells of the retina, the space-memory might appear transiently as an apparition. Specific environments, containing specific information, would therefore operate as if cinemas: replaying information

mechanistically. These types of phenomena are, of course, contingent upon the premises outlined above; however, this would provide a physical basis for many phenomena which are currently placed outside the realm of scientific inquiry by individuals who refuse to attempt to measure or quantify the objects of anomalous experiences.

In my ongoing research, it has become apparent that spaces exposed nanoTesla strength electromagnetic fields display a range of interesting residual phenomena. These include sustained field intensity upon termination of current through a toroidal coil and sudden drops in intensity upon movement of a nearby mass that are not characteristic of 'control' spaces which are unexposed to patterned electromagnetic fields. These residual effects are potentially problematic when considering most experimental designs call for repetitive exposures within the same space. Whereas this likely represents a confounding factor in most designs, it generally represents an independent phenomenon worth further investigation: space-memory.

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Jean Burns: I had an experience with a room that many people felt had an unwelcome, depressed feeling about it, in which this feeling was removed.

The story is as follows. I was given the opportunity, at a conventional school, to give a series of classes on psychic phenomena to students who were interested. However, the meeting room they offered me was an unused room in which I felt a dreary depressed feeling. The feeling was so noticeable that I commented about it, and I was told that lots of people felt that way, and that's why it wasn't being used. However, it was the only room they had available, so I took it.

The class had about fifteen people in it, and at the first meeting a number of them commented about the dreary feeling in the room. I suggested that we send "pulses" of happy energy to the walls, where the effect seemed to be emanating. None of the students had done anything like that before, but they agreed. However, several of them commented that when they sent a pulse, they felt that it was simply absorbed by the wall, with no decrease in the depressed feeling. Nobody felt it did any good, but I said, "Let's persist. We'll do this again at the next meeting."

We were meeting once a week, and for several weeks the only result was the feeling that the pulses were absorbed by the walls. But then the unpleasant feeling began to be less noticeable. A few weeks after that it was completely gone, and instead the room felt happy and comfortable.

This feeling lasted for the rest of the class, and I was told later that the room became a favorite classroom after that because it had a good feeling in it.

Kean Hin Ooi Yes. Information would have accumulated within the research space.

Do effects disappear if a space is tampered with?

Yes. Information can be transformed or overwhelmed. That is also the principle behind Feng Shui and also traditional Chinese information.

What are the residual effects of emotions on a space? How long do they persist?

It depends on whether the space is a closed entity or not. If nothing changes within the space, information can retain for quite a long time. One of the ways to change the Fengshui of a house is to hold loud, happy house warming party.

Do re-experiencing emotions in a particular place (e.g., church or pain clinic) help reinforce and maintain this type of space-conditioning?

Yes, it is repetitive programming.

QUESTION 9: Aside from the electromagnetic field-induced space-memory research, many additional studies have indicated forms of apparent space-memory associated with persistent anomalous subjective experience and other physical anomalies. These include various cross-cultural phenomena, particularly those associated with sacred spaces. Could these processes be related by quantifiable physical factors?

Joey Caswell: On one hand, there are a number of subtle but potentially revealing environmental factors shared by many “sacred spaces”. Earlier archaeoacoustic investigations of ancient sites conducted by Jahn et al. (1996) revealed acoustic resonance features around 110 Hz. Similar research by Devereux et al. (2007) also demonstrated a strong 110 Hz resonance at particular sacred sites known for anomalous subjective experiences. Following this line of inquiry, Cook et al. (2008) investigated the role of frequency-dependent acoustic stimuli on brain activity and revealed that the 110 Hz signal produces interesting changes in neuroelectrical activity including changes to left temporal lobe EEG. On a research expedition led by Dr. Jose Miguel Gaona for our Transnational Anomalies Research (TAR) team, a particularly important cave site was investigated using archaeoacoustic methods (Gaona et al., 2014). The El Castillo cave site within Monte Castillo (near Puente Viesgo in Santander, Spain) has shown evidence of prehistoric ritual activity and has also produced the oldest known cave paintings in the world. Curiously, we similarly found a dominant 110 Hz frequency-dependent acoustic resonance for

this intriguing site. In a forthcoming manuscript (Gaona et al., 2014), we have suggested a number of biological implications for the persistent feature of 110 Hz resonance from many perspectives in physics, biology, and psychology. However, whether or not the physical environmental measures associated with anomalous experience within sacred spaces are related to the apparent phenomenon of “space-memory” has yet to be determined. Despite this current lack of evidence, the emerging interdisciplinary approach of paranthropology has begun to unite the typically disparate realms of cross-cultural research and experimental investigations of consciousness (e.g., Caswell et al., 2014y). Much work remains to be conducted in this area, however, integrating the laboratory approaches employed in the space-conditioning studies with those used to investigate ancient ritual sites provides an interesting basis from which to begin.

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Margaret Moga: Apparent space-memory has been reported in the experiments of Persinger and colleagues (Persinger & Dotta, 2011; Dotta et al., 2013b) as a pattern of information retained in local space, and in the experiments of Tiller and Dibble (2012) as “conditioning” of space. It has also been described in parapsychological experiments as a “linger effect” (Heath, 2003). Space-memory generally refers to the modification of ‘empty space’, but it may also be applied to objects, which have been reported to retain memory of emotions and events (Watson,

1992; Schoch and Yonavjak, 2008). Both the conditioning of space and the imprinting of objects may involve exposure to weak intensity EMF.

Trevor Carniello: Yes, sacred spaces generally contain unique physical factors such as water or mineral deposits that may enhance, reduce, or distort the local magnetic field. These alterations to the intensity or frequency domain of the local magnetic field generate unique physical characteristics of that local field. Under the right circumstances energy can be released or absorbed (by an observer) which can lead to the facilitation of the experience.

Lucas Tessaro: The persistent use of sacred spaces throughout human history suggests that these spaces were utilized because of their association with subjective experiences. Naturally formed sacred spaces are likely tied to a number of physical quanta, such as local geomagnetic anomalies. One physical property of space which may be under considered as a source of variance are the acoustic properties of the space. The construction of man-made sacred sites, such as Greek temples and Christian churches, often reflects the property of sound. If the space were designed to resonate, the standing waves of sound produced in that space could evoke particularly spiritoreligious imagery.

QUESTION 10: Are there temporal limits to space-memory? If there is a limit (e.g., three-day window), what are the implications for this increment of time? Is there something fundamental to these potential limits?

Blake Dotta: There may be *multiple* temporal limits to space-memory. Our lab has repeatedly seen an 8 minute window for excess correlation effects, while specific space memory effects have been demonstrated up to 24 hours later. The temporal limits to these effects may be directly related to the amount of energy being “stored” in the space. Smaller units of energy may be restricted to smaller temporal windows, but larger units of energy would have a much larger temporal “window”. In this sense, there is not a strict temporal limit but a relationship between space and the amount of energy being stored within that space.

Trevor Carniello: The process by which information is encoded relates to the temporal limit of space-memory. Consider that all processes occur according to the linear relationship of ΔS and Δt . Conceptually this suggests that any process is related to the increment of space and the increment of time which it occupies. Energy and ΔS (the curvature of space) can be related using Einstein's field equations. Given discrete spatial limitations or discrete energy requirements, there would exist a comparable temporal limit to space-like memory formation. Given the presentation of successive reinforcements of this process there would be facilitation and, consequently, a temporal dilatation to extend the longevity of the effect. This effect is comparable to successive reinforcements of behaviour, or a learned process, in which repeated replications will store the electromagnetic equivalence of that behaviour into the structural equivalent of dendritic spines (physical memory).

Kean Hin Ooi: No, information does not take up space, however, information can be overwhelmed/transformed: just like the thought/idea of a person. Information within time and space is affected by the changes to the time and space – how fast or slow is the change depends on how strong is the impact and how strong was the original information (something which is very difficult to quantify.)

QUESTION 11: How does the concept of space-memory, particularly in light the electromagnetic field results, relate to Sheldrake’s theory of morphic resonance? If these concepts are related, what is it that becomes conditioned in the context of biological memory? Could a form of collective consciousness be involved in morphic resonance and space-memory? How is this information accessed?

Trevor Carniello: I would not suggest that morphogenic resonance is a form of space-memory but I would suggest an alternative; morphogenic resonance is merely a measure of space-memory. For instance, if a particular process is encoded and stored as space-memory, the direct measurement of the strength of that memory would be the differential in the rate of change of its formation. That is, there should be reduction in the necessary energy of the process that was used to encode that memory, given that appropriate parameters present during the encoding phase are also present. The greater the degree of reinforcement of a single component of the encoded memory the greater the reduction in the time (or energy) that is required for that process to occur. Morphogenic resonance, at least in this interpretation, is said to occur transiently. The role that consciousness has with respect to morphogenic resonant processes would be akin to a filtration system. Under the appropriate circumstances, the brain would receive an amount of de novo information and would be allowed to process it accordingly.

Brendan Lehman: In short, the concept of space-memory relates to morphic resonance as electrically-based short term memory in the brain relates to structurally-based long-term memory, and in turn, converge in how these provide the framework for conscious experience. Local space-memory, trained by the fields of locally resonant aggregate structures (i.e. brains, computers, REGs, etc.), build in complexity over time and provide a feedback to the dynamic field of any of these structures passing through. A change in the dynamics of any aggregate structure's resonant patterns, especially if it were strong enough on its own or matched with any endogenous fundamental pattern, would provide a type of ephemeral “memory”. Perhaps if the resonance were strong enough, the “three-day window” would provide the consolidation time necessary to stimulate a larger-scale resonance with the dynamics of the geomagnetic field. Different intra- (tectonics, etc) and extra-planetary (solar, interstellar/galactic) factors would influence resonance thresholds and different increments of time. This “collective consciousness” would constitute the noosphere, as described by de Chardin and others. In keeping with the metaphor, access to this information cache would then require a hippocampus – a tuned

resonance antenna. While the complexity and sheer number of signals are staggering, advancements in excess correlation technologies may provide the means to provide an access terminal.

Joey Caswell: It is possible that “electromagnetic blueprints” exist for specific forms of matter, including genetics and other organics. Following the space-memory research by the NRG, it could be that electromagnetic signatures repeated over many centuries become imprinted upon the local space. Thus, the local environment becomes “conditioned” by the forms taken around it which will tend to appear over time while simultaneously becoming refined by evolutionary processes. Again, the relevance of Persinger’s theory for information storage within geomagnetic space appears to become a useful starting point in order to further consider this question.

1.5. A role for photons?

QUESTION 12: There are experimental results which suggest that bio-photon emissions (BPE) are related to anomalous deviations in random event generator (REG) data output. There are also results indicating that group activities such as meditation produce changes in BPE profiles, while these activities have further been associated with significant deviations in a nearby REG device. Collective religious experience and other group behaviors could produce much greater bio-photon fields than those observed in mundane settings; could this account for the REG deviations observed in proximity to these group events? How might photon emissions affect a specific space? Which aspect of BPE, in either individual or group settings, would be the most important in this context?

Rajendra Bajpai: The possibility of Bio Photon Emission (BPE) playing some role in biological phenomena has been suspected for a long time but any specific role has not been identified so far. The primary reason lies in the widespread use of the semi- classical framework for describing biological phenomena. The semi-classical framework envisages emission of incoherent and localized photons a biophoton signal. Such photons would not have intrinsic time coordination. They would, however, permit ordering of photon events and visualization of processes involving them. The observed time coordination e.g. that exhibited by the shape of signal, has to have an explicit cause. The time series of a spontaneous biophoton signal contains only one signal property. It is signal strength and is measured by the mean of time series. The other properties of time series e.g. variance are linked to measuring system and errors in measurements. They do not possess any extractable information about the signal. We found the time series of biophoton signals to be different; they exhibit time coordination and allow

extraction of eight properties of the signals. The extracted properties suggest that a biophoton signal consists of a core coherent component and a peripheral incoherent component. The coherent component is a quantum in nature and its quantum state is determinable in many signals. Another feature of biophoton emission observed in many human subjects is the emission of different biophoton signals from different anatomical sites of any subject. The time series of signals from different sites have three same and five differing properties. The values of a differing property at various sites constitute its profile. A profile is much more informative than the property at any site in identifying a subject and its some states. The properties and their profiles make BPE mysterious. We suspect its mystery reflects the mystery of "life". The reason for the suspicion is the stability of the quantum state of the quantum component of biophoton signal for macroscopic time. It has to be emitted from a quantum entity whose quantum state remains stable for macroscopic time. In other words, the quantum component of biophoton signal and the quantum entity of living system remain entangled. Entanglement implies isomorphism between properties of biophoton signal and quantum entity. The semi-classical framework does not identify quantum entity as such but only finds time coordination in acts of biomolecules implicated in biophoton emission without any valid reason. We further suspect that quantum entity contains substantial chunk of a living system. The isomorphism would then imply the possibility of determining all properties of a living system by measuring the properties of biophoton signal. The major objective of biophoton research is to verify isomorphic connections between properties of living systems and biophoton signals. The properties of a living system include various aspects of consciousness.

Quantum component of biophoton signal is not localized but extends far and wide. It leads to many non-local effects. The quantum component of a living system can interact with other material constituents of other living systems locate at far distances; some of them would get influenced by it and some could even identify it as well as its emitter. The former is a recipe of remote intervention and the latter of remote sensing. The interaction of quantum component could result into resonance, tuning and entrainment of living systems besides exhibiting Bohm Aharanov effect in certain situations. The quantum component has the potentiality of explaining and measuring influences of various religious practices, meditation, exercises, prolonged stress of different kinds.

I am skeptical about the increase in the biophoton field at a spatial location in collective practices because of two reasons. The observable interference effects with light requires adjustment of the order of light wavelength in locations of emitters and presence of many wavelengths in a biophoton signal. We do expect the profile of properties in each subject to change. The profiles of signal strength, intercept of Fano Factor curve and SSI would be more sensitive.

Joey Caswell: Given that photons are the quanta of electromagnetic radiation, biophoton emissions might act upon (non-)local space in a similar fashion to the patterned electromagnetic

fields employed in the NRG research, by enacting some form of conditioning and subsequent space-memory. We (Caswell et al., 2014z) have previously demonstrated quantitative and empirical support for the theory that cerebral biophoton emissions could be involved in “psychokinesis” (PK) interactions at a distance. From what I understand, JNL member Patrizio Tressoldi and colleagues have been working on their own studies based on these experiments which have begun to reveal some intriguing findings in line with our own. I have previously (Caswell, 2014) suggested a link between biophoton increases during meditation and apparent PK effects shown by meditators and meditation practice itself (e.g., Mason et al., 2007). From the ongoing FieldREG investigations with TAR (Caswell et al., 2014-1; 2014-2; Gaona et al., 2014z), we have found some evidence which may support the extension of the biophoton hypothesis in non-local interaction for human group activities (religious and otherwise) and novel behaviours with a proximal physical system, along with providing some quantitative support for this theory. As with the electromagnetic field-induced conditioning of space shown by the NRG research, it is probable that the pattern of biophoton emission represents the most integral component of this relationship. In this regard, non-linear signal processing techniques will likely continue to prove an effective approach to assessing the relationship between biophotons and non-local interactions.

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Kokubo Hideyuki: I think that anomalous BPE is one of evidences of lon-locality as same as RNGs. However, I am not sure that the detected factors are the same in both bio-sensors and RNGs. There are several mechanisms of generating biophotons from cells. Some mechanisms are related to the detection of anomalous effects but others are not related to them possibly. Also, BPE is one of parameters of reactions of the sensor for psychokinesis and also we can measure other kinds of parameters. For example, I and my collaborators measured “bio-PK field” directly around a human body by measuring 2-hexanol (one of gas components which are generated from bio-sensors) (Kokubo, Takagi and Nemoto, 2011; Kokubo, 2013). In addition, I measured gas and fluorescence emitted from bio-sensor, and reported that bio-sensors show different patterns of reactions according to different healing (bio-PK) ways (Kokubo et al, 2013). The generating mechanisms of biophotons are not the same as ones of gases and fluorescence. Therefore, I think that the concept “biophoton field” should be changed to “bio-PK field”.

The mechanisms of sensing PK are depended on their matters or systems, not only time-space possibly. I think that we should discuss what mechanism detects what unknown factors which are generated by our mind.

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II. TIME

2.1. Questions related to morphic resonance

QUESTION 13: If the concept of morphic resonance relates to a form of space-memory for biological systems, what factors could account for the gradual loss of species without

later re-emergence? Could there be a contamination of the space associated with a given species blueprint? Does this relate to the anomalous occurrence of strange organisms being found occasionally?

See Pitkanen Appendix.

QUESTION 14: History has demonstrated that lost ideas are often rediscovered, and some concepts may be invented by multiple individuals at around the same time (e.g., calculus, theory of evolution). Could the theory of morphic resonance and space memory account for the rediscovery of ideas throughout the history of civilization? How might non-local information transfer associated with conscious experience relate to simultaneous discovery of a similar idea between separated individuals or groups?

See Pitkanen Appendix.

2.2. Does time-like entanglement make sense?

QUESTION 15: Many experiments by the NRG have demonstrated that the fundamental space or fabric of space can be manipulated in order to elicit an excess correlation or macro-entanglement. Since both space and time are intertwined in the fabric of space-time, what effects might this change in space elicit with respect to the time domain? Would it be possible to entangle points in time and thus allow for brief frames by which information from a particular time can be transferred to this point in the time line (time travel, precognitive RV)?

See Pitkanen Appendix.

QUESTION 16: If one concedes the possibility of a time-like excess correlation, how could that change our perception of time? Would there be a limit to the amount (duration) of a time-like entanglement and what would the likely duration of this phenomenon be?

Trevor Carniello: Time, then would not be linear but the superposition of probabilities (either infinite or bounded) of a given process. The limitations associated with the duration of this time-like entanglement would be reflected in the past reinforcement histories associated with the transition from one probability to the next. Intuitively, the energies involved with the transition from one probability to the next (the transition between superpositions) would be discrete and would reflect the temporal and spatial limits of the process that is being transformed. I may even

be so bold as to suggest that the limit of this energy would be reflected by the equation $E = h\nu = h*c/\lambda$, (spatial and temporal convergence). There is a caveat that must be applied to this situation. This caveat is reflected in the nature of a process which , by definition, requires at least two iterations ($2 \Delta t$'s). Thus the phase energy (the transformation energy required to phase one set of probabilities to another) would be twice that of the calculated quanta.

QUESTION 17: While the concept of space-memory has been observed across a range of systems (e.g., photons, spring water pH), there has also been an apparent lag effect revealed in recent field studies using random event generator (REG) devices in proximity to group activities. Is it possible that the concept of space-conditioning could play a role in the significant REG effects which have been found to occur following an event of interest in the immediate environment?

See Pitkanen Appendix.

QUESTION 18: The Global Consciousness Project data for the September 11, 2001 events demonstrated an anticipatory network effect predating the actual events by several hours (Nelson RD, Bancel PA. *Anomalous anticipatory responses in networked random data.* Retrieved from <http://noosphere.princeton.edu/papers/pdf/GCP.AAAS.06.pdf>). Are there other field-REG experiments showing such anticipatory deviations - and if so, what type/magnitude of events do they tend to correlate with? Could a truly massive collective consciousness event like September 11 actually cause a spread-out distortion in space-time instead of a momentary entanglement, analogous to massive gravitational distortions?

Answer: See Pitkanen Appendix.

2.3. Holding times for space-memories

QUESTION 19: Relative to holding times for space-memory, would the increment of space change the increment of time? Can a nm space hold for nanoseconds while a km space holds for kiloseconds?

Brendan Lehman: Not completely. It is likely that this relationship is a positive one, and further research may indicate that there is an optimal range, however the cascading of effects from one level of discourse to another is undeniable. Upcoming studies which indicate the successful application of the excess correlation paradigm with the pairing of brains during

simultaneous engagement in a complex task (video game) provide a new context. Participants with no experience at the task are paired with participants at a high level of experience, and with the conditions that necessitate excess correlation, improve their performance at a higher rate than controls. These results suggest that the classical effects of electromagnetic fields in these contexts which are known to produce effects at levels as small as the picometre (DNA base pair length) have the capacity to be manifested in information at the level of human behaviour (metre). This cascade along the levels of spatial discourse may provide an explanation for the delay seen in observing effects, especially in spaces without training.

QUESTION 20: Consider the idea of a multi-verse of outcomes or, similarly, a divergent theory of probabilities where at any point there are a myriad of possible superpositions in space-time. What energies would be necessary in order to phase a set of probable outcomes into another? How does consciousness relate to the collapse of the system and its observed state? Is there a likely candidate that would allow for spontaneous extra-dimensional or multi-dimensional entanglement?

Trevor Carniello: This process is similar to what has been presented in the answer 16 by this author. Here it is suggested that at any given point in a self-referenced portion of space-time, that all the probable outcomes are superimposed upon each other. Here the multiverse of possibilities are linked together by discrete quanta of energy greater than h . It may be said then, that any source that generates an amount of energy greater than this limit has the capacity to phase between probable outcomes. Alternatively, this energy source has the potential to homogenize all probabilities into to a continuum reflecting a normal distribution of the most probable outcomes. This complete collapse of all possible outcomes to a central tendency would be the observed. I suggest here that the moderator responsible for the phase change or amalgamation of the multiverse of possibilities is consciousness. The consequence of this interaction between the multiverse of probabilities and the operational parameters of the brain (consciousness) would be the spontaneous generation of multiversal or extra-dimensional entanglement.

Kean Hin Ooi: The strength of an intention relies on the ability of the practitioner to remain mindful and focused. We have done experiments with REG where the directive of a practitioner was changed by the intention of another, stronger practitioner.

2.4. ESP, precognition, and sleep

QUESTION 21: There is a great deal of evidence suggesting that extrasensory perceptions (ESP) and precognitive phenomena are more prevalent during sleep, particularly dream states, compared to waking states of consciousness. What aspect of sleeping consciousness allows this state to be more conducive to apparent correlations between information about the future and awareness of this information? Could this be due to intrinsic neurophysiology or the simple fact that we may be too occupied with other thoughts during a waking state? What role does the geomagnetic field and Schumann resonance play in this phenomenon?

Margaret Moga: Paranormal phenomena (e.g., ESP, precognition, “hypnagogic hallucinations”, out-of-body experiences (OBE)) are more prevalent during stage-1 sleep, which occurs at the transitions between waking and sleeping, when we are falling asleep or just waking up, and also, the transitions between REM (dreaming) and NREM sleep (e.g., Kompanje, 2008; Tart, 2009; Kusse et al., 2012). Recent sleep research has shown that sleep is local, not global, in the sense that some areas of the brain may be in a wake state, while other areas are in a sleep state at the same time. For example, the thalamus enters stage-1 sleep minutes before the frontal cortex, and posterior areas of the cortex lag behind frontal areas in sleep onset (Magnin et al., 2010; Ferrara and DeGennaro, 2011; Nobili et al., 2012). The window of time when the cortex is still active (just before sleep onset), but the thalamocortical input (i.e., sensory input) to the cortex is quiescent (in stage-1 sleep), corresponds to the time when hypnagogic hallucinations (including ESP and precognition) are most likely. As a possible neurophysiological mechanism for paranormal phenomena, the ‘deafferentation’ of the cortex during sleep transitions may make the cortex more susceptible to the influence of the geomagnetic field and Schumann resonance, leading to hypnagogic hallucinations and anomalous information transfer (Magnin et al., 2010).

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Patrizio Tressoldi: : The available evidence support this assertion. It is also valid for other types of so-called ESP phenomena, like clairvoyance and telepathy (see Storm et al. 2010; 2013, Baptista et al. (in press). However, if we consider the typical remote viewing protocol, participants are in a waking state of consciousness. What makes the difference with for example the usual forced-choice tasks, is how participants control their mental activity in order to access distant and future information (for a more extensive review of remote vision characteristics, see May and Marhava, 2014). It seems then that the critical variable is a mental status and control very different from that commonly used in our waking everyday activities.

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Lian Sidorov: Brian Millar has suggested (private communication) that we have "a fully operational quantum computer in the brain, in addition to classical deterministic neural nets". The possibility of quantum computation in the brain, for long promoted by theories like Pitkanen's Topological Geometroynamics (Pitkanen 2012ab,c) and Penrose-Hameroff's Orch-OR model, (Hameroff and Penrose 2014) has received recent support from theoretical work by Craddock et al., (2014) and from experimental results by Anirban Bandyopadhyay and his group at the National Institute of Material Sciences in Tsukuba, Japan (Kurzweil News 2014). Further evidence for nonlocal correlations between isolated neural cultures was provided by Pizzi et al (2004), while over a dozen studies demonstrating EEG correlations between distant senders and receivers have been documented to date, including publications in *Nature*, *Science* and *Physics Essays* (Radin 2006).

The question that naturally emerges from comparing spontaneous psi (such as telepathy and precognition, which are primarily reported in conjunction with sleep or sleep-like states) and laboratory psi, in which the subject is awake and deliberately seeking the remote information or a connection with the transmitting subject (i.e. Remote Viewing, Ganzfeld) is whether such quantum effects are part of a different, more archaic mode of cognitive processing that in fact lies behind intra- and inter-species communication (see Backster 2003, Sheldrake experiments in Gilman 1984, 1985, Mahlberg 1987). Specifically, do phenomena like swarm intelligence, animal instincts, telepathy or "the sense of being stared at" (Sheldrake) have their basis in a spontaneous form of quantum entanglement between individuals of the same or different species - and how does that type of supra-personal cognitive processing mesh with intentional, self-oriented conscious neural computation?

Of course one can easily argue that directed thinking during daytime functioning recruits attention to specific tasks and thus interferes with the perception of ongoing psi information inputs. The sense of Self, which is minimal or absent both during dreams and psi-conducive states (such as meditation) typically acts as a tremendous "attractor" that might disrupt the neural landscape and distort quantum processing dynamics in the brain. Therefore one could make an argument that during sleep (whose universal biological function we have yet to understand) our cortex is released from the onslaught of sensory data integration and motor commands, and thus has additional degrees of freedom, additional neuronal capacity to respond to nonlocal information - until a critical perceptual threshold is reached.

However the model can hardly be that simplistic: we know that virtually every methodology for acquiring nonlocal information (psi) requires deliberate and sustained focus on the target person or object; in HRVG remote viewing protocols, for example, the target coordinate is repeatedly invoked in the subject's mind, overlapped with specific sensory queries and degrees of emotional focus. How does that conscious, presumably classic neural processing, facilitate psi data acquisition? Does the activation of attention pathways produce a specific effect on microtubules in the brain, perhaps aligning them in a configuration that is more conducive to quantum coherence? Does the repeated target ID stimulus act somewhat like laser pumping, sending a very specific pulse throughout the larger, supra-individual network? And most importantly - what does this directed (presumed) entanglement with an unknown RV target via the aligned intent of the experimental participants tell us about the natural "unit" of consciousness: are we studying Mind in the right scale when we choose to integrate our cognitive models at the level of individual brains, or are we making the "hard problem of consciousness" that much harder, that much more intractable, by expecting a simple cog to provide us with the design of the entire machine?

The study of subconscious nonlocal responses, as demonstrated by hundreds of DMILS experiments (Radin 1997, 2006) may provide a welcome re-orientation of neuroscience toward subtle physiological aspects (such as, perhaps, brain- and body-wide microtubule configuration response to distant intent) that bring us closer to the level of a practical quantum biology conversation and help us conceptualize the right experimental hypotheses. As we learn more about sleep neurobiology, it is to be hoped that new technologies will offer us a glimpse into the microphysiology of dream and dream-like states, so that we might come closer to understanding the connection between local brains and nonlocal information, which seems destined to invoke some type of quantum dynamics.

Does the drop in nightly atmospheric temperature and the drop in body temperature that accompany sleep have a facilitating effects on the presumed quantum processing responsible for spontaneous dream state psi? Are the synchronicities documented by Jung a form of higher-order, supra-individual, subconscious PK? And are the dream archetypes we share as a species

an indication that perhaps in sleep we shift to a different mode of functioning - in which multiple observers bind as one unit, with different cognitive parameters and different causality dynamics?

It might also be interesting to compare the neurophysiology of dream states, collective prayer, meditation and that induced by the acoustics of sacred places (Gaona et al, 2014): shared mental images, typically below the threshold of rational articulation, as in dream archetypes and group telepathy (ref Ullman and Krippner 1973, Warcollier 1927, 1958, 2001), could well have played a role in the emergence of myths, religions and other major cultural constructs. Again, the question of scale is unavoidable: does the emergence of self-awareness and self-determination culminate with the human brain, or does it continue on a transpersonal level? And if so – where do we go from here?

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Kean Hin Ooi: They help a person to get into mindful state. (This can be examined with simple experiments by measuring the EEG on various fronts. Anyway a good practitioner can lead a newbie into mindful state in an easier manner.)

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