The Emergent It: A Collective Awareness

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Abstract: We explore the inferential implications of the correspondence principle. According to the correspondence principle macroscopic entities, its, are distinguished by their emergent properties. By definition, emergent properties are those properties which exist in the collective, the macroscopic entity, but not in the constitutional parts, the qubits; the whole is more than the sum of its parts. As such, although macroscopic entities would appear to be the result of quantum interactions, it would seem logically inconsistent to reduce said entities to qubits. To do so is to miss the subtleties of emergence; emergence requires more than quantum interactions, it requires a collective awareness – consciousness.

Dedication: to Richard Dawkins for all of his inciteful expositions.

"The butterfly understands the caterpillar but the caterpillar doesn't understand the butterfly."
– a Buddhist observation

Precisely following Ben Goertzel's Pattern Theoretics [GTZL, pgs. 6 – 21], we define emergence as follows:

A pattern is "a representation of something simpler"; it's a regularity within an entity such as a data stream, a bit string, an eco-system, etc. Put rather simply, given an entity x, if there exists an entity y and a process z where z applied to y yields x and it's "simpler" to represent x in terms of z applied to y than it is to designate x outright, then the ordered pair (y, z) is a pattern in x. In a non-destructive bit of circularity "simpler" is defined in terms of pattern.

The "structure" of an entity is the set of all patterns in that entity. The "structural complexity" of an entity is a measure of the non-overlapping structure in an entity. Thus to define "simpler" above: if the structural complexity of y plus the structural complexity of z plus the structural complexity of obtaining x by applying z to y is less than the structural complexity of x then the ordered pair (y, z) is simpler than, hence, a pattern within, the entity x. If this holds then the tuple (x, y, z) defines a pattern space and leads directly to a formal definition of emergence.

In a pattern space P the emergence between a set of entities $(a_1, a_2, \ldots, a_n)$ is equal to the structural complexity of $a_1 \cup a_2 \cup \ldots \cup a_n$ minus the structural complexity of a_1 minus the structural complexity of a_2 minus … minus the structural complexity of a_n. This designates the non-overlapping pattern which exists in the collective $(a_1 \cup a_2 \cup \ldots \cup a_n)$ but not in the constituent components $(a_1, a_2, \ldots, a_n)$.

Theoretically the structural complexity is context dependent and uncomputable in the sense of Algorithmic Information Content (AIC) [GLMN, pgs. 27 – 41] but it would still seem an extremely useful concept when defined in contextually meaningful ways and subjected to coarse-graining. As demonstrated by Kevin Knuth in [KNTH1] and [KNTH2] it is a rather straight-forward endeavor to define contextually meaningful algebras using order theory and then deriving contextually meaningful calculi from those algebras. For present purposes the most general sense will suffice since our emphasis is on the general nature of emergence.

The above is a formal mathematical definition of the general concept ubiquitous to general systems, emergence. As it well demonstrates, macroscopic entities, its, from the perspective of the correspondence principle, are really ecologies of patterns; pattern space consisting of pattern spaces consisting of patterns all resulting from quantum information systems. It is structure or, more precisely, structural complexity which distinguishes an it from arbitrary randomness or void and the relevant structural complexity is an emergent phenomenon on each level of analysis. So although the scientific endeavor strongly supports the conclusion, it from bit, there seems to be more to the story. The questions I find most stimulating: what gives form to emergent phenomena and how is stability of form maintained over time?

According to quantum information theory [ABDF, pgs. 39 – 63], “qubits are the basic building blocks of quantum information systems” and “any well-defined two level quantum system can be thought of as representing a qubit.” The formal context of the two state quantum system is irrelevant but to be meaningful they must have operators on the state space. In other words, they must correlate with real world observables such as polarization states, spin states, energy states, etc.

In a rather insightful paper [LCDO] Richard Lucido explores what he calls the mutual dependency of consciousness and matter. He defines matter (elementary particles) as essesential being, a term he coins to refer to those entities whose being is wholly constrained to their essence. That is to say, their being is completely contained in the finite information necessary for their description. As such, essesential beings are “their own universal, their own Platonic form, free of the idiosyncrasy of the particular case”; being a Platonic form, “they are indistinguishable from others of the same type.” Most importantly, essesential beings have no temporal extension; they have no subjective existence over time. Essesential beings such as elementary particles carry no history; they have no way to store a history. Although elementary particles are capable of changing state they have no way to keep a record of those state changes, hence, they have no existence beyond their temporally independent essence. But yet these essesential beings interact in a myriad of ways giving rise to a diverse array of emergent form, how is this possible?

Mr. Lucido argues that the answer is existential being, being which is extended over time and irreducible to finite information, a wavefunction defined on an uncountably infinite interval [0, 1]. He calls this existential being consciousness but he defines consciousness from the local perspective; consciousness is a non-physical being which depends on a physical substrate for its existence – the brain. This leads directly to the apparently intractable question: if emergent form depends on consciousness and

consciousness depends on brains, themselves an emergent form, how did the Universe evolve prior to the emergence of brains?

Harvard cardiologist, Herbert Benson, documented Tibetan monks, adept at the art of g tum mo heat yoga, sitting out for an entire night on a rocky ledge high in the Himalayan mountains in sub-freezing temperatures wearing only thin cotton garments – without detriment. Being a professional in the health sciences Mr. Benson was intrigued and, with the permission of His Holiness the Dalai Lama, managed to study some of these adepts in a laboratory setting [WMCR]. He monitored a number of the monk's physiological signs while they practiced g tum mo heat yoga in a frigid room. He draped frigid wet sheets over the torsos of each monk and watched steam rise from them; the sheets were dry in a matter of minutes and each monk dried three sheets. At the conclusion of his study Mr. Benson conjectured that the monks were somehow able to access brown fatty deposits similar to hibernating animals.

In [ETJN, pgs. 16 – 26] Edwin Jaynes uses Bayesian techniques to generalize the efficiency of a Carnot heat engine to biology. His goal is to explain how biological muscles work without violating the second law of thermodynamics. He conjectures that "the maximum theoretical efficiency surely corresponds to the maximum concentration of primary energy that seems possible in a muscle; the energy of adenosine triphosphate (ATP) hydrolysis of one molecule is concentrated into a single vibration mode and is captured before it spreads to others." Based on this plausible conjecture he calculates the efficiency of biological muscle at 76.5%, just slightly above empirical measurements. Based on the same theoretical discourse he calculates the effective upper temperature for the muscle at 5060 Kelvin which is comparable to the temperature at the surface of the sun. Could these monks practicing g tum mo heat yoga be somehow consciously, whether sub-liminally, liminally, or super-liminally, controlling the ATP hydrolysis process?

William Tiller and his associate Walter Dibble, both of Stanford University, have, for a number of years, been quietly but effectively building a consciousness inclusive theoretical framework they call Psychoenergetic Science. Psychoenergetic Science, based on peer-replicated double-blind experiments and, in essence, a complementary extension of the Bohm/Hiley interpretation of quantum mechanics, deals a death blow to the principle of causal closure. If I'm not mistaken, Messrs. Tiller and Dibble were the first research team to demonstrate the existence of magnetic monopoles. From [WTWD, emphasis mine] an extended quote:

"The first phase of our intention-host device experiments involved designing four separate target experiments. Each was to be influenced by an appropriate, separate intention-host device that would be plugged into a wall outlet of the experimental space, placed within a few feet of the target experiment apparatus and switched on. Our novel procedure for introducing a specific intention into a host device was to do it mentally and emotionally from a deep meditative state.

For the first target experiment, the intention was to increase the pH of a vessel of water in equilibrium with air at room temperature by +1.0 pH units with no chemical additions. Our measurement accuracy was ±0.02 pH units. Figure 2 shows a sample result for this target experiment. One can readily see that it was robustly successful in producing the intended result (which was 100 times larger than the noise level).

The second target experiment was with water in equilibrium with air at room temperature but the intention was to decrease the pH by ~1.0 pH units, again with no chemical additions. Figure 3 shows a sample result for water more alkaline than the Figure 2 example. Once again, this experiment was successful. Similar successful results have been obtained for a variety of water types.

For the third target experiment, the material medium was an in vitro biological molecule, alkaline phosphatase (ALP), a liver enzyme. ***The intention was to increase the chemical activity of ALP by a significant amount*** *via just exposing the ALP for a period of 30 minutes to its intention-host device "conditioned" space that had been brought to the coupled state. Once again, the experimental results were remarkably successful compared to the built-in controls. About a 25%-30% increase in ALP chemical activity was achieved at p<0.001.*

In the fourth target experiment, the material medium was an in vivo living system, fruit fly larvae. Here, ***the intention was to significantly increase the ratio of the cell's energy storage molecule, ATP, to its chemical precursor, ADP, so as to make the larvae more physically fit*** *and thus have a greatly reduced larval development time, to the adult fly stage. Again, with built-in controls, this living system was exposed to its intention-host device "conditioned" space for the entire period, ~28 days. We found that the ratio [ATP/ADP] increased by ~15%-20% with p<0.001 and decreased by ~20%-25% at p<0.001."*

Based on the results of these robust experiments Messrs. Tiller and Dibble have theorized that reality consists of two quasi-independent but reciprocal domains, an electromagnetic, distance-time dependent domain (the domain of our everyday existence), and a magnetoelectric frequency domain which is neither distance-time dependent nor susceptible to analysis by conventional scientific instruments geared towards the analysis of electromagnetic phenomena. They postulate that these quasi-independent domains can be coupled by what they call a "deltron" moiety. This moiety allows for interactions between domains and experiment suggests it could be the mechanism responsible for quantum entanglement and other information based mysteries such as [MTU]. Messrs. Tiller and Dibble have demonstrated that the human acupuncture meridian system, as described by Eastern medicine, is maintained at a partially coupled state.

In many of the Eastern traditions, as well as the thoroughly suppressed Western esoteric traditions, it is understood that sentient beings are animated by a subtle energy. The point in the body within which this energy resides is often referred to as the divine seed, the golden embryo, the philosopher's stone, etc. [BRPR]. From a Western scientific perspective this point is the prostate gland or Skene's gland in females. The goal of yoga and meditation is to transfer this divine seed from the prostate gland to the pineal gland. This is the phenomenon referred to by the alchemist metaphor "turning lead into gold." It is also what Jesus Christ was referring to when he spoke of being twice-born, once of the flesh and once of the spirit. In fact, every "virgin mother/hero-savior" pair in the history of human religion, from Shiva/Parvati to unnamed/ White Buffalo Calf Woman, have undergone the same process of transformation; this is called, in Tantra, The Left Hand Path of VamaMarga [WWH1].

When the divine seed is constrained to the prostate gland human animals are dominated by three major concerns: physical survival; physical reproduction; physical dominance or will to power. They have "fallen" into the physically dominated existence. When the divine seed is transferred to the pineal gland human animals are dominated by an absence of concern; they have encountered and conformed to

Divine Will. In the sense that they have returned to their mentally dominated, enlightened point of origin, they have "risen again." They experience the infinite duration underlying all of temporal existence – immortality – hence they are freed of all anxiety and concern; they have become intimate with death [WWH2]. This is expressed quite eloquently in the Tibetan masterpiece, Bardo Thodol [WTEW]. How could these monks write a guidebook specifically for the Bardo state if they had never experienced the Bardo state? The spiritual is the mental and, whereas the physical is distance-time dependent hence subject to temporal decay, the mental is not distance-time dependent hence immortal. As Harvard's Sara Lazar has demonstrated, this transfer of the divine seed is accompanied by pronounced structural changes in the electrochemical neuro-system [SLZR].

So what gives form to emergent phenomena and how is stability of form maintained over time? I would suggest that a leading candidate for solving this riddle is the deltron moiety of Messrs. Tiller and Dibble. And this reflects on the question: it from bit or bit from it?

From the perspective of the correspondence principle its are quantum information systems; they emerge due to interactions between qubits – its from bits. But when rigidly defined, emergence demands more from the story. There must be an additional element that makes the Universe fly and it would seem logically imperative that this additional element have primacy.

In his winning FQXi essay [PGBS] Phil Gibbs starts "from the idea that physics emerges from a system of interacting qubits." He then demonstrates mathematically the plausibility that this system defines a Calabi-Yau space and fluxes which in turn define the vacuum – emergent space-time. I was rather impressed with Mr. Gibbs' paper but in a personal correspondence I had to inquire: where does the logic inherent to the qubits come from? Using Kevin Knuth's work [KNTH3] as an analogy, the qubits and the ordering relations between qubits forms an algebra of events. From this algebra is derived a calculus; in a restricted sense the Calabi-Yau manifold and fluxes of Mr. Gibbs. But for the scientific enterprise to be meaningful there must be a formal logic underlying the real world referents scientific theories correlate to; where does this formal logic come from? Why do the real world referents qubits refer to display the logico-deductive characteristics that they do?

Based on personal introspection I put forth the following conjecture to conclude my argument. The formal logic which underlies the evolution of all physical phenomena in our physical Universe emerges from pure potentia. This potentia has free will in the sense of Sartre; it has the freedom to make a choice but is compelled to make said choice lest it forever remain potentia. This potentia could well be described by the Universal Wave Function of James Hartle and Stephen Hawking [GLMN, pg. 138] but, based on my own yoga and meditation practice, it seems to be a well of consciousness. This well of consciousness deploys conscious intent in the approximate form of a deltron moiety and the result is the emergence of a complex adaptive system, an ecology of pattern; a teleological Universe defined by attraction, autopoiesis, and adaptation; a dynamic attractor for sentience – existence in perception.

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About the author:

Wes Hansen is an artist and inventor who also dabbles in mathematics, philosophy, and science (he closed the binary Goldbach Conjecture using strong induction with multiple base cases;). His defining emergent property is a decades old yoga and meditation practice he calls The Journey. The Journey has no destination; this is the wisdom contained in the word “Bodhisattva,” infinite compassion tempered by infinite wisdom.