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Mathematics for Life Science

OPEN ACCESS JOURNAL

DOI: https://dx.doi.org/10.17352/mls

Editorial

On Defining a Living Element as an Increment of Wave Energy to an Existing Particle-wave

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Received: 02 December, 2024
Accepted: 30 December, 2024
Published: 31 December, 2024

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https://www.mathematicsgroup.com/mls

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Abstract

This paper overall treats the timeless mind-body problem. Descartes said: "I think, therefore I am." This suggests the existence of life in a non-material world, specifically, a spacetime that is devoid of particles, which then evokes the equally celebrated theme of the wave-particle duality, which is the foundation of quantum mechanics. Correspondingly in mathematics, there is a dichotomy of the real number 1, and the imaginary number *i* - - which has however presented itself as a mystery for centuries. Here, we maintain that a 1-dimensional manifold is either a line or otherwise with curvatures and any curvature can be locally fitted by a circle, i.e., either a line with unit 1 or a unit circle expressed by exp(*it*), such as in the contrast between a linear calendar time t and a circular clock time *it*, or a linear expansion versus a rotational motion as indicated by the eigenvalues of a linear operator in a dynamical system. As such, the imaginary number *i* is just a periodic motion, or a wave. While Maxwell's electromagnetic wave has energy, the quantum wave is yet a probability; we unify these two treatments of the wave by equating the quantum wave with Maxwell's electromagnetic wave. The wave-particle duality logically leads to a diagonal spacetime manifold containing {(particle, its associated electromagnetic wave)}. In literature, a particle wave has its energy E distributed into (3E/4, E/4) respectively. Experimentally, a 50/50 beam splitter has been found to split half of the E/4 into a particle-less wave, evidencing the existence of a separate but coincidental wave universe; it is here that we define a living element as a set of particle-less electromagnetic waves that adds life to a set of molecules in the particle universe. We will present the mathematical formulation of the above and examine its implications and applications.

1. Introduction

Science can be broadly classified into Natural Science and Social Science, and Natural Science can be further divided into Physical Science and Life Science, but they can all be unified by Mathematics (cf. [1]); to quote Galileo, "Mathematics is the language of God." Physical science is rooted in the subject of Physics, which governs the Universe by the four forces: gravity, electromagnetism, nuclear weak and strong forces. Life and social sciences distinguish themselves by their dynamics being independent of the aforementioned four forces. The object of this paper is to outline a spacetime geometry that will account for all the universal behaviors.

This geometry is that of a diagonal spacetime four manifold, $M^{[1]} \times M^{[2]}$, containing the set of {(particle, and its associated electromagnetic wave)}, particles contained in the spacetime $M^{[1]}$ and waves in a separate but coincidental spacetime $M^{[2]}$ (not "parallel"), much like two identical stamps glued together as one. That this is physically possible is demonstrated by the construct of a beam splitter which splits the wave of a particle but not the particle [2,3], resulting in a particle-less wave in $M^{[2]}$ [4,5]; we claim that dark energies and dark matter are residents of $M^{[2]}$ [6], where out of the four physical forces only gravity rules but we also postulate the existence of an additional force that is responsible for the dynamics unique to the life (as well as the social) science. By embedding our living space in this larger Universe, we may gain more perspectives in advancing the well-being of lives in general.

The organization of the remaining paper is as follows: In Section 2 we will formulate the above diagonal manifold mathematically, thereof to define "a living element." In Section 3, we will present a discussion, and in Section 4, we will conclude with a summary remark.

Citation: Light GL. On Defining a Living Element as an Increment of Wave Energy to an Existing Particle-wave. Math Life Sci. 2024;1(1):001-004.
Available from: https://dx.doi.org/10.17352/mls.000001

2. The model

2.1 The micro aspect - - quantum mechanics

Maxwell equations [6] cast light as a beam of electromagnetic wave (EMW), in

$$\mathbf{E}\oplus\mathbf{B}\oplus\mathbf{S}\in\mathbb{R}^3_{(x,y,z)} := \left(\|\mathbf{E}\|_{\max}\cos(kz-\omega t), \frac{1}{c}\|\mathbf{E}\|_{\max}\cos(kz-\omega t), c\varepsilon_o\|\mathbf{E}\|^2_{\max}\cos^2(kz-\omega t)\right), \tag{1}$$

i.e., a direct sum of an electric field **E**, its associated magnetic field **B** and the resultant Poynting vector S = **E** × **B**. Einstein cast light as a particle, the "photon;" along with Planck's energy formula, $E = h\nu$ = the Planck constant × the frequency of the wave, quantum mechanics was born. This wave-particle duality of light has had a long history [7]; Newton proposed it as a particle and Huygens/Maxwell, as a wave. Then Bohr declared in his principle of complementarity [8] that the particle and the wave aspects of the wave-particle duality are mutually exclusive, such as an electron can manifest itself either as a particle or as a wave, but not both, as demonstrated by Young's double-slit experiment. Moreover, the nature of the quantum wave ψ is to date a subject of debate [9], with the textbook settlement of it being a probability wave following the Copenhagen interpretation. Here, we integrate ψ with the EMW from Eqn. (1) by an identification of the probability density of a particle's position with the energy density of its wave, i.e., $|\psi|^2 = \|\mathbf{E}\|^2$, so that the quantum wave is an electromagnetic wave. This prompts the question of how the energy E of a (*particle, wave*) is distributed; here, one draws a hint from the enigma of the electromagnetic mass, where the mass of an electron in motion is 4/3 to that at rest, suggesting a distribution $\left(\frac{3E}{4}, \frac{E}{4}\right)$ so that moving, necessarily involving both of the two spaces, reveals E, but resting in the particle universe only exhibits $\frac{3E}{4}$. This energy ratio was also deduced in [6], where a spinning electromagnetic wave ball B produces a vortex with its energies gravitating toward the center of B and gives birth to a point particle, the photon, by the Gauss theorem that calculates the divergence of the gravitational field inside B, specifically,

$$\begin{aligned}
&\iiint_B div\left(\frac{\omega M_B}{4\pi R^3/3}\right)\left(\frac{GM_B}{r^2}\right)\cdot\frac{\mathbf{r}}{\|\mathbf{r}\|}dxdydz\\
&=\left(\frac{M_B}{4\pi R^3/3}\right)R^3\int_{1/e}^{1}\left(\iint_{S_r^2}\frac{d}{dr}\left(\frac{G\omega M_B}{r^2}\right)d\sigma\right)dr\\
&=\left(\frac{M_B}{4\pi R^3/3}\right)R^3\int_{1/e}^{1}-\frac{2G\omega M_B}{r^3}\cdot 4\pi r^2 dr\\
&=-\left(\frac{M_B}{4\pi R^3/3}\right)R^3\cdot 8\pi G\omega M_B\int_{1/e}^{1}\frac{1}{r}dr\\
&=-\frac{3}{4}M_B\cdot 8G\omega M_B=-\frac{3}{4}M_B\cdot c\cdot\frac{8G\omega M_B}{c^2},\quad (c=1),\\
&=-\frac{3}{4}M_B\cdot c\cdot R_{Schwarzschild}\Leftrightarrow\omega=\frac{1}{4};
\end{aligned} \tag{2}$$

the above calculation is based on the identification of waves with a periodic motion, as in e^{it}, hence entailing an imaginary spacetime, so that the wave energies must reside inside the Schwarzschild radius by the curvature tensor $g_{11}=1-\frac{2GM_B}{rc^2}=\left(\frac{\Delta t_o}{\Delta t}\right)^2<0$, as from the Einstein field equations.

2.2. The Macro Aspect - - General Relativity [10]

We begin with two independent sets of Einstein field equations for two distinct spacetime 4-manifolds,

$$R^{[i]}_{\mu\nu}-\frac{1}{2}R^{[i]}g^{[i]}_{\mu\nu}=-\frac{8\pi G^{[i]}}{c^2}T^{[i]}_{\mu\nu},\quad i=1,2, \tag{3}$$

where, for either of the two spacetimes, the left side calculates the spacetime curvatures, and the right side is any given energy-momentum distribution. We unify the two manifolds $M^{[1]}$ $M^{[2]}$ into $M^{[3]}$, which is our recognized Universe, by consideration the of

$$\begin{aligned}
&g^{[3]}_{11}=1-\frac{2G^{[3]}m^{[3]}}{rc^2}=w_1g^{[1]}_{11}+(1-w_1)g^{[2]}_{11},\ w_1\in[0,1],\\
&=w_1\left(1-\frac{2G^{[1]}m^{[1]}}{rc^2}\right)+(1-w_1)\left(1-\frac{2G^{[2]}m^{[2]}}{rc^2}\right),\\
&=1-\frac{2\left(G^{[1]}m^{[1]}+G^{[2]}m^{[2]}\right)}{rc^2};\ \text{hence,}\\
&G^{[3]}m^{[3]}=w_1G^{[1]}m^{[1]}+(1-w_1)G^{[2]}m^{[2]},\ \text{where } m^{[3]}=m^{[1]}+m^{[2]}\ \text{and}\\
&G^{[3]}=6.67\times10^{-11}\left(\frac{Nm^2}{kg^2}\right)\ \text{is the recognized universal gravitational constant;}
\end{aligned} \tag{4}$$

i.e.,

$$\begin{aligned}
&G^{[3]}m^{[1]}+G^{[3]}m^{[2]}=w_1G^{[1]}m^{[1]}+(1-w_1)G^{[2]}m^{[2]},\\
&\text{which renders an identity if } G^{[3]}=w_1G^{[1]}=(1-w_1)G^{[2]}=G^{[2]}-w_1G^{[2]},\\
&\text{or } w_1=\frac{G^{[2]}}{G^{[1]}+G^{[2]}},\ \text{with } G^{[3]}=\frac{G^{[1]}G^{[2]}}{G^{[1]}+G^{[2]}}.
\end{aligned} \tag{5}$$

In this way, we have

$$\begin{aligned}
&a^{[3]}=w_1a^{[1]}+(1-w_1)a^{[2]}\ \text{and}\\
&m^{[3]}_Ba^{[3]}_B=\frac{1}{r^2}\cdot\left(\frac{G^{[2]}}{G^{[1]}+G^{[2]}}\cdot G^{[1]}m^{[1]}_Am^{[1]}_B+\frac{G^{[1]}}{G^{[1]}+G^{[2]}}\cdot G^{[2]}m^{[2]}_Am^{[2]}_B\right),\\
&\text{so that}\\
&a^{[3]}_B=\frac{G^{[3]}m^{[3]}_A}{r^2}\cdot\left(\frac{m^{[1]}_A}{m^{[3]}_A}\frac{m^{[1]}_B}{m^{[3]}_B}+\frac{m^{[2]}_A}{m^{[3]}_A}\frac{m^{[2]}_B}{m^{[3]}_B}\right).
\end{aligned} \tag{6}$$

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Now applying the previous result from Eqn. (2), we have

$$\frac{m^{[1]}}{m^{[3]}} = \frac{3}{4} \text{ and } \frac{m^{[2]}}{m^{[3]}} = \frac{1}{4}, \tag{7}$$

so that

$$a_B^{[3]} = \frac{G^{[3]} m_A^{[3]}}{r^2} \cdot \left(\left(\frac{3}{4}\right)^2 + \left(\frac{1}{4}\right)^2 \right) = \frac{G^{[3]} \hat{m}_A^{[3]}}{r^2}, \text{ where}$$

$$\hat{m}_A^{[3]} \equiv \left(\frac{5}{8}\right) m_A^{[3]} \text{ is the laboratory observed mass of A.} \tag{8}$$

In this way, we have unified the particle universe $M^{[1]}$ with the wave universe $M^{[2]}$ into a diagonal 4-manifold $M^{[3]}$.

Based on the above construct of $M^{[3]}$, we now propose the definition of a "living element" L_j to be $L_j := \{(0, EMW)_i\}_{i=1}^{n \in N} \subset M^{[2]}$ that exerts a force independent of the four forces of $M^{[1]}$; $L_j \cup m_A$ makes the mass m_A live. For example, a living tree branch of (3 *kg* of particles, 1 *kg* of EMW + *energy E* of L_j) of a total mass $\left(4 + E\left(L_j\right)\right) kg$ becomes of 4 *kg* when it ceases living.

Discussion

By the above spacetime geometry, we may interpret the alleged out-of-body experiences of patients, who saw their operations outside of their bodies, as a detachment of the $\{L_j\}_{j=1}^{m \in N}$ from their brains to some surrounding air molecules, for instance. Here, the familiar communication from Person A to Person B is initiated by the $\{L_j\}_{j=1}^{m \in N}$ in A's brain, which causes a vibration of A's body electrons, thereby transmitting photons to B's brain electrons, which in turn alter the $\{L_k\}_{k=1}^{n \in N}$ in B's brain. As such, it follows that A may communicate with B directly from $\{L_j\}_{j=1}^{m \in N}$ to $\{L_k\}_{k=1}^{n \in N}$ without going through the particle universe, but by Bohr's principle of complementarity, this is possible only if A and B are devoid of their awareness of their existences in the particle universe since the principle precludes any observation of both the particle aspect and the wave aspect of the wave-particle duality. In physical experiments, particle-less communication, or quantum counterfactual communication [11-13], has been verified, a celebrated example of which is the Elitzur–Vaidman bomb test, testing a bomb without exploding it.

A corollary from the preceding remark is that artificial intelligence [14] does not possess $\{L_j\}_{j=1}^{m \in N}$; be sophisticated as it may, ultimately it originates from the programming by human brains.

Our theory falls into the domain of beyond-the-standard-model in Physics, and it moderates Evolutionism with Creationism in Life Science. Here again, experimentally the Mach–Zehnder mechanism [15-17] has shown that a photon upon incident on a 50/50 beam splitter loses a fraction of energy; by the above derived $\left(\frac{3E}{4}, \frac{E}{4}\right)$ from Eqn. (2), the lost energy is $\frac{E}{4} \cdot \frac{1}{2} = \frac{E}{8}$, which is a photon-less electromagnetic wave existing in the wave universe. As it is patently clear that Life Science and Social Science cannot be fully accounted for by the four forces that govern the particle universe, any initiation of Life must reside in the wave universe (cf. [18-20]).

The limitation of the above construct remains with the definition of the living element L_j; it calls for more precision. Future research appears to hold promise in the development of quantum counterfactual communication for its wide-ranging implications/applications in all scientific pursuits.

Conclusion

To promote the health of a living entity, we consider situating it in an immersive environment that can integrate its $\{L_j\}_{j=1}^{m \in N}$ as a well-defined organization; here, we note that $\{L_j\}_{j=1}^{m \in N}$ must still reckon with the four physical forces of the particle universe as provided by the molecular structure of the body. As such, standard medical bodily treatments, including particularly genetic engineering, remain essential.

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