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Origin of living matter by a new model of consciousness

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ABSTRACT

In this paper we consider the creation of living matter by a new appeared model of consciousness, named B-DS model, connected to the theories of unification of contemporary physics. In particular we deal with energies of subgroups SU(5), SU(6) and U(1) of SU(11) as superset of $SU(5) \times SU(6) \times U(1)$. This is important in view of the potential importance of quantum effects in biology and in consciousness, where not only systems of known particles are considered, but we hypothesize new ones deriving by SU(6) and the significant effect of entanglement. We consider the human brain and its mental aspects as associated with classical brain physiology and also part of a quantum physical universe. We think that quantum mechanics can be relevant for explaining life and consciousness beyond the basic structure and interaction of matter atoms formed by the energy group of SU(5). For explaining biological systems we need to go beyond the present standard model of physics, i.e. starting by the energy group SU(11) instead of SU(5), considering then new unknown particles, tightly binding from the forces created by bosons of the latent energy group SU(6). The paper deals also with interesting information related to chemistry and quantum biology, as well as models related to life and brain working mechanism.

Keywords: Consciousness, Brain, Biology, Living matter, Contemporary physics, Entanglement, B-DS model

1. INTRODUCTION

To try to answer the question about the origin of living matter, we thought to an extended and generalized model related to current unified theories about grand unification, that extends and generalizes it, incorporating also the consciousness.

We assume that the matter universe transferred into another phase with the help of the latent energy group SU(6), considering that the group SU(11) contains the subgroups SU(5), SU(6) and U(1). We consider the subgroup SU(6) as a new type of energy source with respect to SU(5), containing SU(3), SU(2) and U(1), where SU(3) refers to the strong nuclear force group, SU(2) to the weak nuclear force group and U(1) to electrodynamics. We suppose that the original phase transition takes place before the GUT phase transition, i.e. in the stage of SUT (Super Unified Theory) phase transition [1, 2].

We think the universe as a complex spacetime $R + iR_I$, a wider universe than Einstein's universe, this last being inside it. The wider universe can have any starting nor any ending point, but there exists only the initial and final conditions for narrower (classically measurable) universe, which emerged from the wider universe by the process of phase changing. We consider the real "unfolded" spacetime as the Einstein's spacetime and the imaginary "folded" spacetime as a superset of it. Folded and unfolded spacetimes of the universe are related by the Wheeler De-Witt equation [3].

It can be expected that for the symmetry breaking of SU(11) also an amount of latent energy has been created. If the large percentage of the matter-energy sources in the universe is of dark type, as the present observations seem to recommend, then we may think to the presence of other matter-energy sources, keeping in mind that the relevant contribution to the total matter source of the universe is the dark energy.

By in fieri experiments it seems that our DNA can create interference with the vacuum, producing situations equivalent to the "Einstein-Rosen bridges", i.e. links between completely different areas of the universe, through which one can transmit outside of the ordinary space and time [4]. DNA could be able to transmit information packets to consciousness, a process of hypercommunication (channeling); an example of hypercommunication is foundable, for example, in the world of insects. When the queen of an anthill is separated from her colony, the working ants continue their work according to a precise plan. But if the queen is killed, they all stop to work; no ant knows what to do anymore. It seems that the queen transmits her building plans even though it is far away, through a "group consciousness". The important thing is that it is alive [5].

Like the Internet, DNA would be able to enter data into the network, download information and establish contact with other connected people; it also appears to be an organic superconductor, capable of working at a normal body temperature and storing information like superconductors, without the constraints of classical physics [6,7]. The basic idea is to investigate if there are other quantum network architectures that could be operating in the brain of the living body. We think that quantum mechanics can be relevant for explaining life and consciousness, beyond the basic structure and interaction of matter atoms formed by the energy

group of SU(5). For explaining biological system we need to go beyond the standard model of physics, i.e. starting by the energy group SU(11) instead of SU(5), considering new unknown particles, tightly binding by the forces created by bosons of the latent energy group SU(6).

2. TECHNICAL DETAILS

The SU(11) group (and supersets containing it) is very important and strongly studied in theories of unification; it can be expressed mathematically as:

$$\begin{aligned} \text{SU}(11) &\supset \text{SU}(6) \times \text{SU}(5) \times \text{U}(1), \\ \text{SU}(23) &\supset \text{SU}(12) \times \text{SU}(11) \times \text{U}(1), \\ \text{SU}(47) &\supset \text{SU}(24) \times \text{SU}(23) \times \text{U}(1), \text{ etc.} \end{aligned}$$

It is the special unitary group of degree n , denoted by $\text{SU}(n)$, group of $n \times n$ unitary matrices with determinant equal to one. This group is a subgroup of the unitary group $\text{U}(n)$, consisting of all $n \times n$ unitary matrices, being itself a subgroup of the general linear group $\text{GL}(n, \mathbb{C})$. The group $\text{SU}(n)$ found wide application in the Standard Model of Physics [8]. The breakdown of SUT symmetry group SU(11) gives the two fundamental groups SU(6) and SU(5), leading to a phase transition and then to the break of SU(5) into subgroups $\text{SU}(3) \times \text{SU}(2) \times \text{U}(1)$ [3,8-10].

Do date, experiments and measurements are mainly done on the basis of the Standard Model of Physics and General Relativity, considering the 4-dimensional (4-D) universe where the space-time-matter exists, called “real” for the purpose that we have matter bodies like the physical universe, clusters, galaxies, stars, humans, etc., formed during time by the unified energy group SU(5).

We call it the “narrower universe”, i.e. our universe where General Relativity and Quantum Mechanics hold. Violations may happen when we go beyond the Standard Model of Physics of SU(5), i.e. towards SU(11), thus outside the physical universe, in the case of a “wider universe” containing our narrower universe. As a simple but effective example, we can think to the water decomposed into hydrogen and oxygen, but the character of water is far different from the character of hydrogen and oxygen.

We hypothesize that the physical universe expanded from Big-Bang singularity, considering also the consciousness energy groups SU(24), SU(12), SU(6), created after the symmetry breaking of SU(47), SU(23), SU(11); bosons of SU(6) gradually formed quasi-particles having different masses with respect to those of the usual protons, neutrons, etc., and/or with the creation of new unknown particles than hadrons, hyperons, nucleons of SU(5).

We re-consider therefore the Standard Model of Physics for living matter, starting with the symmetry breaking of the super unified energy group SU(11) instead of that of the standard model with the grand unified symmetry breaking of SU(5). The introduction of the series of new energy sources SU(6), SU(12), etc. helps us in this regard.

We assume that SU(6) with all other new energy sources SU(12), SU(24), etc. created consciousness in the universe and this is in the vacuum inside living organic cells. The empty space would be filled with “quasi-particles” of the latent energies of SU(6); it must therefore

be very carefully investigated, because it is the basis of everything, is filled with some new energy sources instead of nothing, hence there would be no absolute vacuum.

Living matter would be created by the energies of the groups of $SU(6)$ together with all other atoms-elements-compound elements formed by the matter energy groups of $SU(5)$, as encountered in condensed matter physics. Cells with DNA/RNA pairs, chromosome pairs and so on, are tightly binding by the bosons of $SU(6)$, constructed with new quasi-particles in phase of accurate definition, formed by the quarks-like binding in the framework of $SU(6) \times U(1)$. These processes are created in the wider 10-D universe.

3. NEW GROUP ENERGIES, ENTANGLEMENT AND LIVING MATTER

For systems like nerve cells, the accuracy of quantum theory becomes relevant in instable situations, characteristic of living beings; the requirement of high accuracy normally implies to consider quantum phenomena.

The created amount of material substance by $SU(5)$ is also correlated/controlled by the energy sources of $SU(6)$, $SU(12)$, etc. These types of quantum physical properties of living systems are considered due to the bindings by the bosons of the new energy source $SU(6)$, connected to higher level quantum properties such the entanglement, and can explain some of the more enigmatic features of life in general and of consciousness in particular [11].

Quantum entanglement provides an answer to the binding problem of consciousness, allowing for a delocalized quantum state involving many neurons. It is worth emphasizing that quantum networks may lead to quantum memories whereby entangled states would store information such as visual inputs. Major progress will bridge the gap between nanoscience and consciousness in the area of nano-neuroscience; neural phenomena at nanoscale are leading to big breakthroughs in science and medicine and aid in consciousness studies [7, 12-14].

Quantum networks can generate communication channels for information transport and process, performing complex operations. Recent experiments involving solid state physics devices based on nuclear spins demonstrated that quantum information storage on the time scale of minutes or even hours seems to be possible [15, 16]. Regarding quantum communication channels, photon emission and absorption is one of the best candidate mechanism for such phenomena; bio-photonics is an emerging field in spite of its long history [17].

4. QUANTUM CHEMISTRY AND BIOLOGY

Since consciousness requires a physical substrate in the form of a living organism, and in particular the human brain, quantum biology appears to provide a natural connection between quantum physics and a quantum theory of consciousness; classical mechanics does not appear to be an appropriate framework within which consciousness could be properly elucidated [18]. A big question concerns the fact that the same set of rules in quantum physics can also guide biology. The field of quantum chemistry has been developed considering the success of extensions of quantum mechanics to chemical compounds and chemical reactions. However, quantum effects are commonly claimed to become not relevant at scales larger than atoms or sub-atomic particles, at high temperatures and in aqueous media which often provide the environment for particle interactions. But chemistry and biochemistry are ultimately based on

quantum interactions, then living systems, like non-living systems, depend on quantum states; the same can be said about biochemical reactions taking place in the brain such as ligament binding to receptors sending signals through neurons.

Some steps in the process of photosynthesis inform that quantum effects might be involved; then, if plants and some bacteria really harness quantum mechanics to survive, what about the bigger, more complex organisms? In recent times, enzyme catalysis, photosynthesis and avian navigation have been demotic applications of quantum biology. Researchers are looking also for the quantum underpinnings of smell, the origin of consciousness and the origin of life itself.

Another big question relates if quantum effects are regular features of these systems or if nature uses them actively to improve how things are done. It is therefore very important the potential importance of quantum effects in biology and about consciousness, where not only systems of many particles are considered, but they function at high temperatures compared to those typically encountered in quantum physics.

We assume that consciousness is not only in animates but also in inanimates ones, considering that the vacuum, filled with SU(6) energy source and similar, is inside living and non-living elements. Within the biological cells, SU(6) is combined with other elements and compound elements. To say that consciousness is a real and fundamental property of the universe, we add something over the physical 4-D universe, i.e. we refer to a 10-D universe related to SU(11).

Quantum biology is emerging gradually as a response to the challenge of explaining such important and still poorly understood phenomena as photosynthesis, bioenergetics, vision, olfaction, bird navigation, etc. The most important challenge is to explain how the brain works and, in particular, how does conscious behavior emerge from the structure and function of the human brain and its cellular and sub-cellular components [19, 20].

5. ON MODELS OF LIFE EVOLUTION

The brain is a place, where permanent feedback processes take place. Applying theories of non-linear dynamic phenomena, we detect the arise of situations commonly denoted as “bifurcation points”. In these situations, meaningful information can act as a steering agent; such situations are constantly encountered in the body.

All life on Earth is composed mostly of carbon-12 and water; carbon-12 bonds and/or resonates with more simple elements than any other element in the universe. It has been proposed that the codon table of the genetic code follows the shape of a 12-faced pentagonal dodecahedron. There are exactly four nucleotides in DNA combining in sequences of three to produce 64 codons. The genetic code would organize itself into the shape of tetrahedrons, which then combine into the shape of a spherical dodecahedron, exactly like clusters of water molecules. This DNA dodecahedron model shows the 20 standard aminoacids organized in space according to water affinity. From that, protein bonds into sequences of aminoacid tetrahedrons, forming into a 12-sided dodecahedral framework, then twisted by hydrogen around a fixed polar backbone to produce the 10-step spatial symmetry of the DNA double helix [21].

This geometry would originated as five stereochemical growth stages over a period of millions of years. Combining the quasi-periodic model [22] with the last previously discussed,

we arrive to a structure common to all forms of biological life, i.e. a 5-fold egg with a 12-fold yolk inside. Then, through the harmonic physics of atomic resonance and damping, Nature would engineered DNA with its own eggshell container to protect the geometric resonance of life over time.

The vector-in-space DNA model shows five geometric stages of evolution; when combined with the G-Ball model, we get the encoding of a quasi-periodic geometry of an egg; this can be understood as a natural interaction between space and time. Water creates a spherical container for carbon-12 resonance, allowing only whole number harmonic structures to form in the yolk. Around that, a pentagonal water crystal forms to protect the yolk and gestation of life; this cage is then shaped into the form of an egg, whereas the yolk region is displaced along a polar axis, causing the egg to assume the quasi-crystalline shell dimensions [23].

It is well-known that the sound produces regular geometric patterns when particles of powder are vibrating on plates or inside liquid containers. As waves resonate into standing waves, different harmonic frequencies combine to form regular patterns by crossing one another at whole numbers proportions; the same can be said to occur in the atomic substratum of DNA as harmonics guide cell mitosis. The only difference with DNA is that the space, together with gravity and atmospheric pressure, acts as the cymatic container. Cymatic resonance pattern in a circular container shows how water molecules resonate together inside a pressurized bubble to form pentagonal supercluster crystals.

When we consider carbon and water resonating together inside a geometrical space lattice, pressurized into spherical bubbles by Earth's gravity and atmosphere, atoms and molecules in living tissue would naturally resonate synchronously into larger and larger cymatic patterns. About the life, the quantum structure of space and the pressure of its gravitational egg can together give the "know how" to arrange big numbers of resonating molecules into life-size crystalline structures; in this way, living cells would dynamically self-organize into stable geometries like powder vibrates inside a spherical water container.

In the container of a human body, the energy of resonating atoms, molecules and cells would have the possibility to come into a reflected harmonic standing wave, from the 24 thoracic vertebrae with less and less energy to the tips of our 10 fingers and 10 toes. Here we find the body described as the 12 : 5 dodecahedral proportioned carbon water crystal resonating under gravitational pressure into the body.

6. BRAIN WORKING MECHANISM AND THE PROBLEM OF COHERENCE

Conventional neuronal-level computational approaches suggest that the conscious experience emerges at a critical level of complexity. It seems that no specific brain area contain the consciousness; neural activity in a given area may be non-conscious at a moment, and corresponds with consciousness at another one. The classical approach suggests that a critical level of complexity results in the transition through the emergence of consciousness, but no threshold, biological correlate nor testable prediction have been put forth.

Free will, subjective time flow and non-locality have not been seriously addressed by conventional approaches. Another shortcoming of conventional approaches is that neurons and synapses are considered as simple switches, whereas real biological cells are far more complex.

A model correlated macroscopic quantum states to brain function, specifically memory, and it has been extended proposing that the brain is a mixed physical system [24, 25].

Alternatives to computational emergence include dualism (consciousness lies outside science), pan-protopsyhism (precursors of conscious experience are fundamental, irreducible components of reality) and quantum information processing and geometrical approaches [26, 27].

Penrose examined the relationship between consciousness and modern physics, introducing mathematics as a bridge from the artificial world of computers to the natural world of physics; he argued, via Godel's incompleteness theorem, that human consciousness is non-algorithmic, and thus that physical theories of brain function are incomplete due to their dependence on computable algorithmic laws. He further hypothesized that quantum effects play a fundamental role in the understanding of human consciousness by enabling the brain to perform non-computable operations [28, 29].

He related the collapse of the wave function to conscious events using the notion of "objective reduction", with microtubules within neurons providing the brain with structures capable of orchestrating the collapse of the wave function through quantum information processing. The basic idea is that microtubules within the brain's neurons work as quantum computers, with microtubule protein subunits (tubulins) existing transiently in quantum superposition of two or more states as quantum bits. This is essentially the same idea of technological quantum information processing, except that in his model the proposed qubits are tubulin protein conformations, and the reduction/collapse occurs due to a specific objective threshold (objective reduction) rather than environmental interaction [30].

The central postulate of the Orch OR theory is that the site of action of consciousness is located within the brain's microtubules, that operate at the interface between classical neurophysiology and quantum physics. Structures such as microtubules and neurons are large, high temperature systems by the quantum mechanical point of view, then it would be not possible for them to remain in states of linear superposition capable of coherently interfering with one another; the decoherence would eliminate any possibility of quantum effects playing a role in brain processes.

It is known that macroscopic quantum phenomena such as superconductivity, superfluidity and laser action exist at relatively high temperatures, although requiring very finely tuned conditions; these phenomena cannot be explained through classical means, but rather require the idea of macroscopic quantum coherence within a condensate. In order for such phenomena to exist in the brain, Nature would need to provide mechanisms to overcome the decoherence.

Tegmark asserted that the degrees of freedom in the human brain should be considered classical rather than quantum ones; he found decoherence time-scales for superposition of solitons moving along a microtubule of order of 10^{-13} - 10^{-20} s, which are much shorter when compared with the relevant time-scale for cognitive processes (10^{-3} - 10^{-1} s). Thus, he concluded that quantum coherence within the brain is not operable [31]. However, it has been pointed out that Tegmark's calculations are based on an incorrect model of the Orch-OR process. Accounting for this discrepancy, as well as for the effects that screen thermal fluctuations, such as layers of ordered water and actin gel states surrounding microtubules, it has been found new decoherence rates of 10^{-5} - 10^{-4} s, in line with relevant dynamical times of biological phenomena [32].

These arguments have then been refuted, considering that, based on decoherence calculations, the Orch OR model based on gravitational collapse is incompatible with the decoherence, but the notion of quantum phenomena in the brain are still feasible if decoherence

is taken as a quantum collapse mechanism rather than a quantum gravity effect. Coherence times can be extended by counterion shielding, actin shielding, intrinsic error correction, among other properties; nonetheless, decoherence remains a problem [33]. Some experiments have then shown quantum effects at room temperature, in photosynthesis and with conjugated polymer chains [34, 35].

Therefore, the incompleteness seems to be to date an unresolved problem referred to the Grand Unified Theory (GUT), but not to the Super Unified Theory (SUT), which we have considered in the present paper. A way to resolve the problem can be to consider the extension of the standard model of physics in the framework of quantum mechanics by starting with the generalized energy group $SU(11)$ instead of $SU(5)$.

7. QUANTUM METABOLISM AND BIOLOGICAL SYSTEMS

A proposed theory of quantum metabolism has explored the methodology of the quantum theory of solids for providing a molecular level explanation of the empirical relations. It is assumed that atoms in the solid execute coupled vibrations about the fixed lattice site leading to the propagation of waves in it and the frequencies of these vibrations span a range of values from zero to a maximum (Debye) frequency [36].

The production of adenosine triphosphate (ATP), the energy currency of living organisms, is mediated by the coupling of two molecular chains:

- a) The redox chain, describing the electrons transfer between redox centers within the electrontransport chain;
- b) The ATP-ase motor, involved in the phosphorylation of adenosine diphosphate (ADP) to ATP. There are two distinct mechanisms by which these two events are coupled: oxidative phosphorylation, involving an electrical process, and substrate phosphorylation, implicating a purely chemical process [37].

The transit time of this cyclic process determines the total metabolic flux, i.e. the number of charges released by the redox reactions. Quantum metabolism rests on the notion that the enzymatic oscillations in cellular organelles and the material oscillators in crystalline solids can be analyzed in terms of the same mathematical formalism used by Debye in the quantum theory of solids. This realization is deduced by a formal correspondence between the thermodynamic variables in physical systems and the metabolic quantities in biological processes. The principal variables in the quantum theory of solids are the specific heat, the Gibbs–Boltzmann entropy and the absolute temperature T . The critical variables in the theory of quantum metabolism are the metabolic rate, the entropy production rate and the mean cycle time.

Biological systems operate far from thermodynamic equilibrium (although close to steady states), hence their bio-energetic quantities involve rates of change of energetic values. A description of the metabolic activity involving mitochondrial proteins involves coupled quantum oscillators of the Debye type [38].

The almost universal energy currency in biological systems is the ATP molecule. ATP synthesis in a mitochondrion or a chloroplast requires approximately 60 kJ/mol of energy delivered through electron transport reactions or absorption of photons, respectively.

We say that this is possible when supplied by exchanging the energy of $SU(6)$ into matter energies of $SU(5)$.

This is of crucial importance since metabolism is a basic condition for sustaining life. If all energy transduction processes in living systems involve quantum mechanisms, then this becomes a fundamental property of living matter. The human brain is no exception.

The related time course of the cerebral electrophysiological activity was described during the initiation and execution of voluntarily behaviour (for example the movement of fingers) by classical experiments. This approach might be regarded as a decision making experiment and the readiness potential can be seen as to reflect the superposition state of the brain. Studies show that decisions are anticipated far before the overt behavior [39-41]. These laboratory experiments are compatible with the idea that the central nervous system (the “subject”) develops a kind of superposition state before making the choice (the “collapse”). For the subject, the significance of artificial problem solving is evidently modest and requires little “mind-space.” More important decisions might require a “larger space” of the personal universe, and more processing time.

8. CONCLUSIONS

The problem of consciousness has defied conventional approaches viewing the brain as a classical computer, with neurons and synapses playing the roles of bit states. The proposed model suggests that our physical universe appeared by a symmetry breaking of the Super Unified Energy Group SU(11) instead of that for non-living matter, clarified by the Standard Model of physics with the GUT symmetry breaking of SU(5). We consider SU(11) with two fundamental subgroups: SU(6) related to consciousness and SU(5), that then breaks into the strong force SU(3), the weak force SU(2) and the electromagnetic force U(1).

The introduction of a series of new energy sources SU(6), SU(12), etc., other than SU(5), is connected with an extension of spacetime, involving the consciousness as a fundamental property of the universe, and the help of entanglement.

The bosons of SU(6) create forces with new unknown particles, whereas all material parts are created by the elements of the unified energy group SU(5); the so called “empty space” would filled with new particles or quasi-particles formed by the latent energies of SU(6). Thus our universe would filled with some new energy sources in different phases. The in-depth study of the vacuum structure, in progress, will provide new elements to think about.

A particular amount of material substances are created by exchange of the bosons of SU(6) into the bosons of SU(5). The process requires a thorough understanding of quantum networks in wider sense, like SUT instead of GUT. Moreover, further progress in the area of nano-neuroscience will lead to important breakthroughs in consciousness studies.

We may consider that the human brain and its mental aspects are associated with the classical brain physiology, but are also part of a quantum physical universe; it can be conceived as an interfacing organ for the consciousness that also receives information. The brain, or some parts of it, can be conceived as an interference hologram of incoming data and already existing data, which are equivalent to the subject’s memory.

Understanding the biological basis for sustained quantum coherent superposition and entanglement not only will help to solve the enigmatic features of consciousness, but also will enable future quantum information technologies and with that the clarification of the evolutionary mechanisms of life.

Biography of the authors

Paolo Di Sia is currently adjunct professor by the University of Padova and the Free University of Bozen-Bolzano (Italy). His scientific interests span transdisciplinary physics, classical and quantum-relativistic nanophysics, nano-neuroscience, theories of everything, foundations of physics, the structure of vacuum, history and philosophy of science. He is author of 287 works to date, is reviewer of some academic books, editor of international academic books, reviewer of many international journals. He obtained many international awards, is member of many scientific societies and of many International Advisory/Editorial Boards, recently awarded with the title of Doctor of Mathematics (D.Math) as legitimate honor by the International American Council for Research and Development, California Public University, USA.

Narayan Kumar Bhadra is a 16-years teacher and 19-years headmaster/principal of a government sponsored higher secondary school in West Bengal (India). His scientific activity spans the complex quantum-state of consciousness and the cosmology of the very early universe (specially quantum cosmology). He published many preprints and papers on international journals.

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