

Article

Introduction

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Abstract

This series of articles are devoted to TGD inspired ideas related to DNA and genetic code. The first article is about many-sheeted DNA and genetic code. In the first part of the article basic facts about genetics are summarized and the notion of many-sheeted DNA is introduced. In the second part of the article a model of genetic program is considered, and some TGD inspired ideas about regulation of morphogenesis are discussed. Second article represents two models for protein folding relying on the notion of magnetic body: both models represent limiting situations and a more realistic model could be a hybrid of them. The third article discusses some rather speculative physical realizations of the genetic code with chemical realization seen only one possible realization among many. Most ideas are highly speculative and can be defended only by the fact that they follow rather naturally from the basic TGD.

This series of articles are devoted to TGD inspired ideas related to DNA and genetic code. TGD inspired vision about quantum biology and consciousness has evolved during last two decades, readers may benefit of having a brief summary about the process and its outcome in this introduction.

1. The original inspiration came from the notion of many-sheeted space-time and the failure of strict non-determinism for the basic variational principle dictating the dynamics of space-time-surfaces. The study of the preferred extremals of Kähler action demonstrated that the notion of classical field differs from that of electrodynamics. Topological field quantization meaning that field decomposes to magnetic flux quanta, electric flux quanta, and topological light rays analogous to laser beams takes place and means that space-time surface itself is quantized. This has profound implications: for instance topological light rays parallel to magnetic flux tubes make possible precisely target communications with maximal signal velocity and without dispersion. Each physical system is accompanied by a field body and magnetic body becomes especially interesting in the case of living systems and allows to understand various strange findings about the effects of ELF em fields on living matter - one of the first biological applications that emerged already around 2000 in its preliminary form [8].

One of the first applications of the many-sheeted space-time was to the description of DNA as many-sheeted structure [5]. The modular structure of genome could be understood if genes are accompanied by magnetic flux tubes carrying also helical electric fields and electronic supra currents: this implies a direct connection with the TGD based explanation of DC currents of Becker [14].

2. The conjecture that dark matter in TGD Universe corresponds to a hierarchy of phases of ordinary matter characterized by an effective value of Planck constant \hbar_{eff} coming as an integer multiple of ordinary Planck constant emerged around 2005. It inspired the vision that macroscopically quantum coherent dark matter in macroscopic quantum coherence with large Planck constant can be seen as an intentional agent using biological body as a motor instrument and sensory receptor. This explains EEG and its various scaled up variants as communication and control tools of the system formed by magnetic body and biological body [2].

This conjecture is especially interesting if one wants to understand DNA and the basic processes such as transcription, translation, and replication. The phase transitions changing Planck constant imply scaling of quantum lengths and in the case of magnetic body should correspond to processes

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in which flux tubes change their length correspondingly. This provides a mechanism of biocatalysis based if biomolecules and also other biological structures are connected by magnetic flux tubes to form a kind of Indra's net. The reconnections of magnetic flux tubes provide second control mechanism and the reconnection process for the flux tubes of disjoint magnetic bodies could be seen as space-time correlate for directed attention involving generation of quantum coherence in the scale of the resulting system.

One of the implications is the identification of biophotons as ordinary photons resulting when dark photons transform to ordinary photons with the same energy [12, 11]. Dark photons - rather than biophotons - would be the basic signalling and control tool in living matter and biophotons would represent kind of leakage. The hierarchy of Planck constants suggests that great leaps in evolution mean emergence of new levels to the hierarchy of Planck constants. Also the notion of collective gene expression is highly suggestive, and suggests that cultural/social evolution corresponds to the evolution of magnetic body. DNA as topological quantum computer is one of the applications.

Cyclotron Bose-Einstein condensates at the magnetic flux tubes and dark photons with low cyclotron frequencies (even in EEG range and below) but energies above thermal threshold are expected to be important in living matter. Also Josephson junctions - at least the junction formed by the lipid layers of cell membrane - are assumed to play key role. This picture leads also to a quantum models of nerve pulse and EEG [9, 2]. The frequencies of Josephson photons are inversely proportional to \hbar_{eff} so that even the radiation in EEG frequency range can be interpreted as dark Josephson radiation generated by cell membrane.

3. Also p-adic physics has served as a source of inspiration. One of the big ideas was that p-adic space-time sheets could serve as geometric correlates of intentions and cognitions representing the "mind stuff" of Descartes. Mersenne primes and their Gaussian counterparts are of special interest physically and the biologically especially interesting length scale range 10 nm-2.5 μ m contains as many as four Gaussian Mersennes. Furthermore, the Mersenne prime $M_{127} = 2^{127} - 1$ characterizing electron corresponds to secondary p-adic time scale of .1 as and thus to 10 Hz fundamental biorhythm.

These observations suggest that p-adic length scale hierarchy defines a hierarchy of control levels in living matter. One particular application was motivated by the so called Combinatorial Hierarchy emerging naturally from p-adic considerations and leading to the conjecture that besides genetic code also memetic code assignable with the Mersenne primes $M_{127} = 2^{127} - 1$ with code words consisting of 126 bits representable as sequences of 21 DNA codons might be associated with living matter [3].

The notion of negentropic entanglement is one of the basic notions inspired by p-adic physics. Number theoretic entropy defined by Shannon's formula by replacing the logarithms of probabilities with their p-adic norms is well-defined if the probabilities belong to algebraic extension of rationals. The resulting entropy can be negative and has interpretation as a measure for the negentropy associated with the entanglement carrying information as a rule telling which state pairs are correlated (thermodynamical entanglement entropy characterizes the lack of information about the state of either entangled particle). Life as something residing in the intersection of real and p-adic worlds is the emerging vision.

4. Zero energy ontology (ZEO) is also a notion that emerged around 2005. ZEO was inspired by the failure of the strict determinism of Kähler action and also by the need to fuse real and p-adic physics to a larger structure [10]. Causal diamond (CD) becomes the geometric correlate for the spotlight of consciousness in ZEO. ZEO has led to a rather detailed view about quantum jump identified as moment of consciousness in TGD inspired theory of consciousness [13]. The basic challenge has been the understanding of the relationship between subjective time define by the sequence of quantum jumps and geometric time, and ZEO has led to a radical modification of the basic

beliefs about time [1]. Quite recently it became clear that the sequence of state function reductions to opposite boundaries of CD is very much analogous a sequence of pairs consisting of sensory perception followed by motor action, and that this structure appears in all scales. Furthermore, sensory perception and motor action can be seen as time reversals of each other and one must generalize the second law of thermodynamics to a form in which thermodynamic arrow of time corresponds to that for subjective time whereas the imbedding space arrow of time is opposite for the zero energy states which result in the state function reduction to the opposite boundaries of CD. Even the second law itself must be challenged.

5. In the earlier approach self was identified as quantum jump in conflict with the fact that self represents something which remains invariant in quantum jumps. Negentropic entanglement together with Negentropy Maximization Principle (NMP) allows to have representations which are approximate invariants under quantum jump sequence. This suggests that self should be replaced with self representation -"Akashic records". The conscious reading of the representations is possible by interaction free measurements in arbitrarily good approximation and gives rise to declarative memories, internal speech, and imagination. The necessary quantum jumps giving rise to the reflective level of consciousness (internal speech and imagination) takes place for the "detectors" absorbing the dark photons (or dark phonons) scattered from the representation realized at the magnetic body. The braiding of flux tubes provides a geometric correlate for the negentropic entanglement and the "long" parts of closed flux tubes and large flux sheets carry the cyclotron Bose-Einstein condensates defining the "detectors" [13].

What happens if the representations are not read? Is there still a conscious experience? There could be a conscious experience also in this case, and the reports of mystics about higher states of consciousness suggest that it corresponds to an experience of understanding without ability to express what it is that one understands: also the presence of invariant parts of under quantum jumps could be experienced consciously but the contents of the experience would not be communicable.

The temptation to apply this conceptual framework to biology is irresistible. This issue contains three articles devoted mainly to DNA and genetic code. The articles have been prepared from the chapters of [4]: the first versions of the chapter [5] behind the first article have emerged during the period 2000-2006 and the chapters [6, 7] behind the second and third article after 2006. There might be some mammoth bones present despite my best efforts to update the material and provide references to the recent TGD inspired vision about quantum biology.

The first article of this issue is about many-sheeted DNA and genetic code. In the first part of the article basic facts about genetics are summarized and the notion of many-sheeted DNA is introduced. In the second part of the article a model of genetic program is considered, and some TGD inspired ideas about regulation of morphogenesis are discussed. Second article represents two models for protein folding relying on the notion of magnetic body: both models represent limiting situations and a more realistic model could be a hybrid of them. The third article discusses some rather speculative physical realizations of the genetic code with chemical realization seen only one possible realization among many. Most ideas are highly speculative and can be defended only by the fact that they follow rather naturally from the basic TGD.

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