In this work I try to clarify the relation of the basic notions of TGD and of TGD inspired biology
to the ordinary bio-chemistry. I also try to improve my understanding about work of Fr\"ohlich,
Del Giudice, and Pollack using the notions of TGD. The key idea is the notion of coherence induced
by weak em fields with preferred frequencies, which in ordinary quantum theory correspond to
energies much below the thermal energy in quantum theory - this creates what is called kT paradox.

In TGD framework one can do without coherence regions (one could perhaps identify them as special
cases of Pollacks EZs), which can be much larger. The basic observation is that for a pair of
hydrogen bonded water molecules the reaction 2H$_2$O$\rightarrow$ H$_3$O$_2^{-}$ + dark proton
require UV photon with energy of O-H bond of about 5.15 eV. Water clathrates are good
candidates for the precursors of EZs since they have size scale in the same range as EZs and contain
hydrogen bonded water. Quantum criticality suggests that this process should occur spontaneously as a chain reaction. This is achieved in the same manner as in
nuclear fusion if the dark protons at the flux tube fused to nuclear strings giving rise to dark
nuclei.

If dark nuclear binding energy transforms as Coulomb energy, the nuclear energy scale of MeV
scales down to 1-10 eV - depending on the value of h_{eff}. An attractive guess is that the
energy range of bio-photons corresponds to that for dark nuclear binding and excitation energies.
Their spontaneous transformation back to ordinary nuclei would liberate energy could at least
partially explain the evidence for bio-transmutations. Also the relation to cold fusion is
interesting.

Dark nuclear binding energy is liberated as dark photons decaying into bunches of ordinary photons
inducing further reactions {\it hydrogen bonded 2H$_2$O$ \rightarrow$ H$_3$O$_2^{-}$ + dark proton}
also other kind of dark ionizations. If the size of EZs varies from about 1 micron to 100 microns
and if the the size scale of EZ corresponds to the wavelength of dark gamma photon h_{eff}/h
varies in the range 10^6-10^8. This would be the total number of dark photons resulting in the
decay to ordinary photons. Water clathrates have same size scale range as EZs and consist of
hydrogen bonded water molecules and could serve as precursors of

EZs: EZ would have different
lattice structure than clathrates.

In this process ordinary protons transform dark protons at magnetic flux tubes outside EZ. Dark ionization differs from ordinary ionization only in that the proton is dark. The difference between dark and ordinary ionization would define the borderline between ordinary and bio-chemistry (or dark chemistry). Chemical quantum criticality is possible also for other cations and also anions and all biologically important ions can appear as dark ions.

The Urey-Miller experiment was very successful: it produced a large variety of amino-acids crucial for life from simple basic constituents. The variant of this experiment has even produced adenosine, DNA nucleotide fundamental for ATP. There is however a severe problem. The prebiotic atmosphere was not reducing as in the Urey-Miller experiment simulating it.

Clays are good candidates for the key structures in prebiotic evolution since they can replicate. One can even speculate with an analog of genetic code. Phyllosilicates containing -O-H groups are especially interesting: they can adsorb basic biomolecules and induce their polymerization to oligomers. They also induce a formation of vesicles formed from lipid bilayer and serving as a candidate for a predecessor of cell. DNA is the problem and has led to a scenario known as RNA world. Phyllosilicates are also known to generate radiation with positive health effects. The natural and testable hypothesis is that the presence of EZs allows to circumvent the difficulties of the standard RNA world scenario and also generate DNA and biologically active phosphates containing the mysterious phosphate bond as ionized dark proton. The dark magnetic flux tubes and UV photon energy needed to generate EZs could be provided by gel in Pollacks's experiments and by electric discharges in Urey-Miller experiment. Also dark photons from the formation of dark nuclei decaying to bunches of bio-photons can be considered. Water chlathrates can contain atoms and even micrometer sized phyllosilicate crystals, which could catalyze the formation of biomolecules at their surfaces as dark nuclear fusion chain reaction. Chlathrate could also develop phospholipid bilayer around it - kind of primitive cell membrane.

TGD inspired proposal for prebiotic evolution was inspired by the

TGD based realization of Expanding
Earth hypothesis and assumes that life evolved in underground oceans and burst on the surface of
Earth in Cambrian explosion. This view leads to a more precise view about prebiotic evolution.

Possible technological implications of this picture – if true – are quite impressive. Cold
biofusion could make possible artificial generation of
technologically important elements and the
mechanism generating EZs could make possible creation of artificial intelligent life forms involving
silicates and water.