

During last years kind of brain storming period has occurred in the TGD inspired models of bio-harmony and genetic code. A lot of ideas, some of them doomed to be short lived, have emerged, and it seems that now it its time for a thorough cleanup and integration with the general ideas of TGD inspired quantum biology.

TGD leads to 3 basic realizations of the genetic code. One can also consider 3 realization also for bio-harmony. The question is which of them is the realistic one or whether several options can be considered. In this article these ideas are discussed critically and open problems are summarized.

The three genetic codes correspond to a fundamental realization in terms of dark proton sequences (dark nuclei) with 3-proton representing codon. Second realization is the chemical realization and the third realization is in terms of dark photon 3-chords mediating the interaction between various realizations. Frequency resonance is very natural interaction between dark levels and energy resonance between dark level and chemical level. The possibility to modify the value of  $h_{\text{eff}}$  for flux tube makes possible to have for given codon single resonance energy.

The homonymy of the genetic codes at various levels is discussed. At the dark level the fact that icosahedral harmonies can have common 3-chords implies the first homonymy. The basic difficulty of Pythagorean scale realized in terms of quint cycle realized already by Pythagoras becomes the solution of this problem. The well-known homonymies in RNA-tRNA correspondence and even in RNA-AA correspondence can be understood in the model in which dark photon 3-chords mediate the interactions.

Also questions related to the relationship of bio-harmony with ordinary genetic code are considered. Why 3 copies of icosahedral harmony and only one copy of tetrahedral harmony? A special triangle assignable to the 3 copies of icosahedron and tetrahedron is analogous to a singular point of covering: do these 4 triangles correspond to exceptional codons breaking symmetries? How do the dissonant 3-chords present in some icosahedral harmonies relate to stop codons? How do the codons of bio-harmony and ordinary codons relate and is this relation consistent with what is known about transcription and translation?