

## Biophotons

### 1. Background:

- (a) Gurwitsch discovered biophotons almost century ago as "mitogenic radiation". Skeptics still refuse to accept the notion.
- (b) The name of Popp is usually associated with biophotons.
- (c) Biophotons are emitted by living tissues and appear at visible and UV frequencies with intensity in range 1.1 attowatts to 100 attowatts (1-1000 photons per  $\text{cm}^2$  per second).
- (d) The chemi-excitation via oxidative stress by reactive oxygen species and/or catalysis by enzymes is proposed to be associated with the emission of biophotons.
- (e) Biophoton emission correlates with EEG.
- (f) There is evidence that bio-photons are involved with intercellular communications

### 2. TGD view about bio-photons:

- (a) Relies on the hierarchy of Planck constants  $h_{eff} = n \times h$  labelling the levels of dark matter hierarchy.
- (b) Biophotons are identified as decay products of dark photons transforming to ordinary photons in energy conserving matter. Dark photons have wavelength scaled up by  $n = h_{eff}/h$  and give rise to quantum coherence in long length scales.
- (c) EEG photons correspond to dark photons with energies of visible photons so that the value of  $n$  is rather large about  $10^{13}$  as ratio of corresponding frequencies ( $E = h_{eff} \times f$ ). This means coherence in scale of Earth. The interpretation is that dark EEG photons mediate communications to and control by magnetic body.

### 3. The connection with quantum gravity.

- (a) The gigantic gravimagnetic thomson field claimed by Tajmaer et al can be understood if gravitational Planck constant  $h_{gr} = GMm/v_0$  equals to  $h_{eff}$  at least in elementary particle and atomic length scales the predicted values are same as guaranteeing that EEG dark photons have energies in visible and UV range.
- (b) This spectrum is universal and in the range of molecular excitation energies, which suggests obvious interaction mechanism between magnetic body and biochemistry.
- (c) ATP synthase is good candidate for a system generating dark phase and parameter  $v_0$  corresponds now to rotation velocity of ATP synthase motor yielding ATP from ADP. One can generalize  $h_{gr}$  to  $h_{em}$  the estimate for  $h_{em}$  is consistent with the value of  $h_{gr}$ .
- (d) Quite generally, charge separation in living systems is expected to generate large value of  $h_{em}$ . Pollack's exclusion zones would be an example of this.

### 4. Biophotons and magnetic body.

- (a) Biophotons would be kind of dissipative leakage becoming high when the emission of dark photons is intensive or some part of organism suffers damage.
- (b) TGD suggests fractal hierarchy of analogs of EEGs due to the fractal onionlike structure of magnetic body.
- (c) Analog of biophoton emission IR energy range corresponding to membrane potential is suggestive.
- (d) Dark photons could be involved with the mechanism of attention and sense of presence at molecular level realized in terms of cyclotron radiation and touching of magnetic body parts with same magnetic field strength and thus same cyclotron frequency for given ion.
- (e) Cyclotron frequencies associated with the magnetic body part would define kind of password and bio-signature. The model of EEG relies on this assumption.

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5. One can imagine several mechanisms of dark photon emission.
- (a) Microtubuli could act as quantum antennas with varying length emitting frequency modulated dark photons.
  - (b) Cell membrane could emit Josephson radiation with large  $h_{eff}$  ( $E = ZeV/h_{eff}$ ) with photon energy just above the thermal energy in physiological temperature range.
  - (c) Cyclotron Bose-Einstein condensates could emit cyclotron radiation.
  - (d) The phase transition reducing  $h_{eff}$  by power of  $2^k$  and increasing p-adic prime by about  $2^k$  would leave the scale of system unchanged but reduce magnetic field strength and induce emission of radiation at frequencies near to cyclotron frequencies of biologically important ions. Emitted radiation is coherent without further assumptions.
  - (e) The effects of irradiation on vertebrate brain at harmonics of cyclotron frequencies in  $B_{end}=2$  Gauss could be understood as being due to either mechanism.