

TGD BASED VIEW ABOUT QUANTUM BIOLOGY

Quantum model for hierarchy of EEGs

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Effects of ELF em fields on vertebrates

To the beginning

- **ELF em fields have effects on vertebrate brain** at harmonics of cyclotron frequencies of biologically important ions, in particular Ca^{++} ion in a magnetic field of **$B = .2$ Gauss**: the nominal value of Earth's B is **.5 Gauss**.
- **Odd harmonics favored**. Suggests that quantal transitions are in question.
- Thermal noise should mask all effects which appear in very weak fields. Effects appear in amplitude windows at **10^{-7} V/m** and in the range **1-10 V/m**. The latter window corresponds to amplitudes of EEG.
- Classical models not satisfactory. Vacuum dielectric constant appears in cyclotron frequency rather than that of water. Cyclotron radii of order 1 meter and should be perturbed badly by Brownian motion.
- **References.**

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Explanation in terms of large h photons

To the beginning

- Effects seem to be quantal but this is “impossible” since ELF photon energies ridiculously small. For **$k=4$ level** of hierarchy (**$h=2^{k11}h_0$**) EEG photons would have energy above thermal energy.
- **$B_E = .5$ Gauss** should be accompanied by a **dark magnetic field $B_d = .2$ Gauss** (carrying dark energy!).
- **Cyclotron frequencies.** If dark cyclotron condensates at magnetic bodies generate cyclotron radiation involved with bio-control and coordination then radiation at harmonics of cyclotron frequencies might interfere with quantum control by magnetic body.
- **Amplitude windows.** Suppose perturbing field defines a perturbing voltage for Josephson junction. If perturbing voltage **V_1** is constant in relevant time scale and comparable to the constant voltage **V_0** over Josephson junction then Josephson current is of form **$J=J_0\sin(ft)$** , **$f=Ze(V_0 - V_1)/h$** . If **f** corresponds to a biologically important frequency, say frequency defining biorhythm, a strong biological effect can result in the amplitude window. Explanation requires **hierarchy of Josephson junctions.**

To the beginning

- **Why only vertebrates?** Evolutionary level \leftrightarrow highest value of h present in organism! Only for vertebrates $k=4$ level would be present at **level of single organism** and makes possible EEG. Evolution as increase of largest h !
- At **collective level** even bacteria (behaving socially!) could possess $k=4$ level. Time scale of DNA expression is .05 seconds and indeed suggests collective EEG. EEG of ant nest and beehive?
- Also **higher levels** ($h=2^{k-1}h_0$) at least up to $k=7$ corresponding to the time scale of order lifetime present. Prediction for time scales of hierarchy of memories. Hierarchy of biorhythms.

Model for a hierarchy of EEG:s

To the beginning

- **Why EEG? Control and communication** . Communication from cell membrane to magnetic body. Control by magnetic body through genome by activating various gene expressions. Flux sheets through DNA strands make possible the control.
- Model for high T_c superconductivity suggests that **cell is quantum critical high T_c super-conductor**. At least cell membrane must be superconducting in quantum critical sense. Both quantum control of cell interior by magnetic body and genome and communication from cell membrane to magnetic body must be simultaneously possible. Electron pairs transformed to large \hbar phase at cell membrane which is quantum critical system. This might be possible only in a narrow range of temperatures about **37 C**.
- **Cell membrane and its scaled up variants as Josephson junctions** with universal voltage same for all scaled versions. Josephson energy ZeV does not depend on \hbar whereas Josephson frequency f_j scales as $1/\hbar$. **Josephson energy for cell membrane just above thermal threshold**. Electronic Cooper pairs. Quantum critical super-conductivity.
- Cyclotron frequencies $f_c = ZeB/2\pi m$ do not depend on \hbar . Cyclotron energies scale like \hbar so that for high enough level of hierarchy obtains energy above thermal threshold. **Return**

General structure of EEG

To the beginning

- Frequencies combinations of harmonics of **cyclotron frequencies f_c** and **Josephson frequency f_j** .
- **Josephson current** determines the spectrum of Josephson radiation.

$J = J_0 * \sin(ZeV_0t + Ze \int V dt)$ contains frequencies of form

$$f_n = nf_c + /- f_j ,$$

$f_j = eV/hbar$ if $V(t)$ contains only cyclotron frequencies. Noise also present. **Alpha band and its harmonics as cyclotron radiation.** **Satellites of these bands as Josephson radiation.**

- **Alpha band corresponds to cyclotron transitions for biologically important bosonic ions.** Beta and theta bands as satellites $f_c + /- f_j$. Perturbations of membrane voltage by cyclotron frequencies in Josephson current creates theta and beta bands.

- **The narrow resonances in theta and beta bands (3,5,7) Hz and 13,15,17 Hz (Nunez) correspond to biologically important bosonic ions with cyclotron frequencies alpha band [(8,10,13) Hz]**

To the beginning

- **Strong perturbations** (by control signals or noise) lead to a **chaotic looking behavior**: beta band good example.
- **EEG during sleep**. Scaled down version $B_d/2$ of B_d needed. Scaled down alpha around 5 Hz, etc.. **Left (right)** brain hemisphere corresponds to **Bd (Bd/2)?**
- **Scaled variants of EEG** predicted. Scaled variants of alpha band in particular. Preferred scalings by powers of 2^{11} . Prediction of a **fractal hierarchy biorhythms by just scaling EEG peaks**. More general scalings correspond to Fermat integers. p-Adically scaled variants of magnetic fields are also possible. EEG patterns should appear in several time scales.
- EEG hierarchy considerable user of metabolic energy. Ionic pumps and channels not so.
- **Fractally scaled up variants of cell as magnetic flux quanta?** Ionospheric cavity and layer below it as analog of cell at the level of dark space-time sheets. **Return**

The notions of super- and hyper genome

To the beginning

- **Magnetic body controls biological body via genome. Magnetic flux sheets traverse through DNA strands through DNA.** Makes possible for magnetic body to control genetic expression.
- **Magnetic flux sheet can traverse through several genomes.** Flux quantization with increasing flux unit requires increase of flux sheet width: more genomes at flux sheet. Genomes along the same flux quantum like lines of text. Flux quantum contains rows of genomes like book page contains the text lines. Fusion of genomes to super-genome: organs become coherent wholes.
- **Fusion of super-genomes to hyper-genomes** so that groups of organisms form higher level conscious and genetically controlled entities. Cultural evolution evolution of hypergenome.
- **Coherent gene expression in organs and groups of organisms** as a clear cut test. Could introns correspond to hypergenome^{-2 T-} electromagnetic expression of genes possible? **Return**

Quantum leaps in evolution

To the beginning

- Leaps in evolution quantum leaps but in new sense!
- **Highest value of h present in organism characterizes its evolutionary level.** The higher this value of h the longer the geometric time span of mental, the time scale of long term memory, and the time scale of planned behavior. The lower the frequency scale of highest scaled variant of EEG present, the larger than magnetic body of the organism. Evolution at higher levels growth of magnetic bodies.
- The most important levels correspond to $h = 2^{k11} * h_0$, $k=0,1,2,\dots k=7$ seems to be highest level which still correspond to a time scale not longer than human life span. Quantal variant of chakra hierarchy!

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