

DC currents of Becker

Becker postulated that living systems could be regarded as a semiconductor with DC currents running only in single direction. First class of observations of Becker relate to neural system.

1. Potential differences occur in various bodily scales. Potential differences are in mV range. CNS and perineural tissue form a dipole structure (CNS +), there is electric field along axon (dendrites -) and along microtubules. Also frontal brain is in negative potential with respect to occipital lobes (frontal brain-). The strength of the electric field correlates with the level of consciousness.
2. This structure looks fractal: consider only cell and negative charges of biomolecules such as DNA.
3. Brain injury generates positive polarization so that neurons cease to function in the area of injury. Sensory stimuli induced negative shifts and sleep positive ones in the potential. Very small voltages and currents can modulate the firing of neuron without effect on membrane potential. The sign of generating potentials correlates with the sensory input. The hypothesis is that these electric fields are accompanied by DC currents and biosystem is semiconductor.

Second class of experiments used artificial electric currents to regenerate body parts. Nowadays the currents are used to induce healing or retard tumor growth. For humans spontaneous regeneration occurs only in the fractures of long bones.

1. It was found that the applied current was able to change the direction of head-tail axis correlating with the sign of electric field along this direction. Tissue regeneration occurs only if some minimum amount of tissues present suggesting that CNS plays some role even neural activity is absent. Repeated needling of the stump had positive effect on regeneration and DC current was found to be proportional to innervation.
2. Regeneration involves de-differentiation of cells to form blastema from which the regenerated tissue is formed. Becker concluded that this process is rather simple process whereas the regeneration proper is a complex self-organization process involving control signals from CNS, involving also potential waves.
3. Regeneration is possible in salamanders but not in frogs. Comparing potentials in an amputated leg of frog and salamander Becker found that potential goes from negative potential of -1 mV to a positive value and then back to its original value in case of frog but to -10 mV in the case of salamander and returns after that to -1 mV. Artificial electron current induced regeneration also in the case of frog, even in denervated situation. The flow of electrons to the stump seems to be necessary for the formation of blastema.
4. So called neuroepidermal junction was necessary for regeneration even in presence of denervation. Electronic current was assigned to the interface between CNS and tissue. Regeneration seems to be a local process.

TGD based model for the findings of Becker relies on the following observations.

1. The crucial question concerns the role of electrons. It seems that in all situation electron flow to the damaged tissue induces healing. Why electrons generating negative potential should help in healing?
2. Pollack's findings about fourth phase of water formed when external energy feed induces formation of negatively charged exclusion zones of water obeying stoichiometry $H_{1.5}O$ with 1/4:th of protons going to the complement of exclusion zone. Something similar might happen also now.
3. In TGD framework this process is explained as a formation dark phase of protons at the magnetic flux tubes associated with the exclusion zone with dark protons realizing genetic code so that one obtains what might be regarded as primitive primordial life form.

4. There is evidence for a huge anomalous gravimagnetic Thomson field in rotating super conductors. Thomson field is proportional to square of Planck constant h_{eff} and TGD explanation is that large h_{gr} phase is formed at gravitational flux tubes. The assumption $h_{gr} = h_{eff}$ in elementary particle and atomic scales is possible and is consistent with the hypothesis that biophotons in visible and UV energy range correspond to decay products of dark EEG photons.
5. h_{gr} can be generalized to $h_{em} = -Z_1 Z_2 e^2 / v_0$: v_0 would be typical rotational velocity in a system with opposite charges Z_1 and Z_2 . Exclusion zone would be good example. For ATP v_0 would be rotational velocity of ATP. For exclusion zone v_0 could be rotational velocity of Cooper pairs in magnetic field associated with flux tubes or walls. $Z_2 = -Z_1$ is natural assumption by charge neutrality.

Why DC currents are needed?

1. The damage of the tissue means that the $h_{eff} = h_{em} = Z^2 e^2 / v_0$ is reduced for a pair formed by damaged system and its complement. The parameter Z^2 is reduced and must be increased to its original value and perhaps even to a higher value since the larger the value of h_{eff} is, the richer the negentropic resources of system are.
2. The transfer of electrons to the system analogous to exclusion zone induces transfer of dark protons to the magnetic flux quanta of the magnetic body of the system.

I have considered also other models for the situation.

1. The voltages in mV range correspond to Josephson energies much below thermal energy so that the idea about the pairs of systems with voltage between them does not look attractive.
2. meV energies do not suggest interpretation in terms of metabolism.
3. Metabolic machinery uses electron transport chain to generate ATP to which metabolic energy from nutrients is loaded. The naive guess was that DC currents provide more electrons to make metabolism more effective.

Are DC currents ohmic currents or could they be supercurrents.

1. Temperature dependence of the conductivity supports electronic ohmic current hypothesis.
2. If supercurrents are in question the resistance should not depend on length of the current carrying flux tube since resistance would come only from the ends. For microtubular conduction pathways this is true. If the DC currents flow along microtubular pathways they could be supercurrents.
3. Meridians would be a good guess for the conduction pathways and maybe identifiable in terms of microtubular pathways. Acupuncture points would be nodes carrying negative charges and the effects of acupuncture might be due to the increase of the negative charge in turn increasing h_{em} for the acupuncture point.