ABSTRACT

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Formation of dissipative structures in liquid water

Self-organisation is the dominant feature of the dynamics of living organisms. According to the findings of the thermodynamics of irreversible processes (Prigogine) the possibility of self-organisation is connected with the formation of dissipative structures , namely open subsystems able to decrease their own entropy as a consequence of their dynamics.
In this presentation it is shown that such features appear in liquid water at interfaces with hydrophilic surfaces , provided that molecular impurities (for instance, atmospheric gases and bicarbonates) are present. This result emerges from Quantum ElectroDynamics (QED) . QED prescribes that water molecules in the liquid state may oscillate in unison within extended Coherent Domains (CD) between two configurations: the first configuration is one where all electrons are tightly bound to their molecule , in the second configuration one electron per molecule is almost free. In this way a CD includes a reservoir of quasi-free electrons that can be further excited giving rise to vortices. Since the vortex motion is coherent, is also frictionless , so that the life time of the vortices could be extremely long (weeks, months). Consequently CDs become machines able to store a large amount of energy , transforming it from high entropy to low entropy energy. This stored energy can be released to non aqueous molecules when the frequency of oscillation of these ones matches the frequency of oscillation of the CD. In this way selected molecules get activated and an intelligent biochemistry could emerge. Furthermore , since the output energy of the chemical reaction is taken by the CD , changing its frequency of oscillation and hence the nature of the resonating species, the possibility of an evolutive biochemistry emerges.