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Slovenia

Ultraweak Bioluminescence
(Biophoton Research)

The findings of this research field are not very well known, although they have been known and studied for over half a century. Research began with the famous Gurwich mitogenetic radiation. Today ultraweak bioluminescence is studied worldwide and includes many important findings. The light emitted from organisms was found to be coherent, laser like, and typically radiating with intensities of a few tens up to few hundreds of photons/(cm^2*s). So the measurements are taken with a photomultiplier in the photon counting mode. The light has been discovered in all groups of organisms and in various biological materials (tissues, whole organisms, eggs, seeds, etc.)

The ultraweak bioluminescence is produced by decaying of highly excited molecular states. These states are the side products of some encimatic oxsidative processes in animal cells. In plant cells the main production of excited states takes place in chloroplasts in tilakoid membrane. The energy of these states is transported to the emitter structures, which differ in plant (chloroplasts) and animal (nucleus) cells. The process of ultraweak bioluminescence is very sensitive on cell physiological state. Usually the stress causes the increase of bioluminescence intensity. The ultraweak bioluminescence shows the constant production of excited species. The steady state population of these states can be very high, which can be shown as increase of luminescence after the addition of new fluorescent molecules. The excited molecules can also play a role in bio-chemical reactions, which are thermally forbidden.

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