

Electrodynamic Explanation of Ball Lightning

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The author of this article demonstrates that ball lightning is self-closed longitudinal electromagnetic waves. Ball lightning is considered as self-closed alternating displacement current, which produces air luminescence (electroluminescence).

"These facts bring out clearly that ball lightning can generate electric currents. ... Ball lightning explosion makes the impression of electric discharge upon many people, especially upon competent observers. ... Physiological action of ball lightning as usual lies in electric trauma." [1].

Thus, all facts prove that ball lightning as well as streak lightning is electric current, i.e. ball lightning is self-closed alternating displacement current (according to electrodynamics, current is always self-closed).

"For some seconds it was quiet then from the receiver there was heard some growing rustle gradually turning into boom. The receiver had to be turned off, but hissing and acute crackle was already heard from the direction of the river. Looked out the tent Dmitriev saw a ball lightning which was slowly moving above the river in the direction of the tent." [1].

Appearance of radio-interference is the real confirmation that ball lightning is electric current because chemical reactions cannot produce such interference.

The properties of both streak lightning and ball lightning are well-known, therefore basing on electrodynamics it is possible to imagine electromagnetic processes proceeding inside them.

In Nature self-closed alternating displacement currents (**self-closed longitudinal electromagnetic waves**) can be observed as luminescent spherical formations at thunderstorm. Great alternating (high-frequency) displacement current gradually heats up ambient air, generating luminescence of the ambient air. This can lead to such electric breakdown as an explosion (flap). These self-closed displacement currents can put electrical appliances out of operating; in addition, contacting with these appliances a human can be rushed with electric current. At thunderstorm prebreakdown displacement current flows before streak lightning. It is polarization current which is invisible before the moment of breakdown. This displacement current value is comparable with the value of current inside lightning. If the lightning changes its direction, for example, branches out, then "gaped" displacement currents close themselves, as

currents are always self-closed, and can produce air luminescence (prebreakdown processes).

"Current strength value in the basic discharge of lightning reaches tens and hundreds thousand of Amperes." [2].

"...energy content enclosed in the ball lightning of an average size, probably, comes to 20-50 kJ." [1].

For example, if the radius of self-closed cyclic displacement current is 10 cm, and the current strength is 50 kA, then the magnetic energy of current is about 30 kJ.

"...some canals were crossed in the point of branching. After the discharge was stopped a luminescent sphere remained in this place, ..." [1].

"...a sphere, which glows as excited nitrogen atoms do." [1].

"Seemingly, rain drops which fell onto the lightning, evaporated, because a steam was going up from it. It was heard hissing which resembled sounds of electric welding. Then the sound became higher; the lightning was exploded with loud flap and disappeared. At that it fell to cascade of small sparks." [1].

After the ball lightning stopped, air was gradually heated due to polarization current, and the electric breakdown occurred. Self-closed alternating displacement current changed into conduction current. This phenomenon can be observed at contact with conducting objects. Ball lightning representing displacement current can come through the solid dielectrics of small thickness, for example, through thin glass. If lightning is not exploded, i.e. the electric breakdown does not occur, then displacement current gradually becomes decaying. At the same time the excitation and ionization of air atoms decrease, effect of waveguide for self-closed longitudinal electromagnetic wave disappears, and displacement current is dispersed in the space.

"The sphere changed its colour from scarlet to garnet, then a dark stain appeared in its centre and, at last, it disappeared." [1].

"If non-linear dielectric or plasma are irradiated with powerful electromagnetic waves then self-sustaining dielectric waveguides can be generated inside these mediums, ..." [4]

Displacement currents have magnetic energy, i.e. self-closed alternating displacement current has alternating magnetic field, and therefore attraction can appear. It follows from observations that this character of attraction can be produced only by electromagnetic interaction.

"Maxwell attributed to displacement current just the ability to produce magnetic field in ambient space." [3].

"Then the ball lightning was attracted to a central heating radiator and disappeared with acute hissing having fused cross the 3-4-milimeter thickness metall of the radiator." [1].

"Suddenly the sphere was abruptly attracted to an oak which was in several meters from observers. A metal hook fixed on a long wooden handle was leaned against the oak. Having raised the sphere struck the hook. A blinding flash appeared, and something like the canal of average lightning was generated between the hook and ground. The extensive cascade of sparks fell, and the sphere disappeared. ... the hook was much fused, some streaks of as-fused metal appeared on it, the edge was fused at all and turned into a shapeless cone." [1].

"These fusions take place only in the case of direct contact with ball lightning, and are the evidence that at this contact the great amount of energy can be generated. They do not prove that lightning matter has high temperature value. The proof of this is the fact that in many cases when metallic parts of an object were much fused, non-metallic parts were remained untouched." [1]

Thus only if displacement currents are changed into conduction currents that can occur in a conducting object then the object is fused, since displacement current, in contrast to conduction current, is not accompanied with heat generation but only produces magnetic field.

Displacement electric current as well as conduction current can be direct or alternating. For example, if bound charges of a dielectric displace to one side and then to another side then it is alternating displacement current. If displacing like-sign bound charges are in circular motion then it is direct cycle displacement electric current. Electric currents are always self-closed, i.e. if conduction current is broken then it is closed with displacement current, and vice versa, if displacement current is broken it is closed with conduction current. Conduction current is always accompanied with certain displacement current; therefore net current is equal to the sum of conduction current and displacement current. Displacement current, in its part, can exist without conduction current, for example, as vortex electric field.

"Net current, which is equal to the sum of displacement current and conduction current, is always self-closed." [5].

Thus net current is self-closed even if there is only displacement current (without conduction current), for example, as vortex electric field. Displacement current was observed in free state (without conduction current) in many experiments. All known experimental results prove that in free state displacement current is always self-closed, i.e. run in closed cycle. For example, if self-closed displacement electric current runs in transverse electric wave then its effective radius is $r = \lambda / 2\pi$ if λ is the value of electromagnetic wave length, i.e. the orbit is equal to wavelength.

It is useful to remember that displacement current (invisible before the moment of breakdown) as well as conduction current participates in the generation of any lightning. This displacement current may become apparent as ball lightning. All properties of ball lightning are explained by the properties of prebreakdown self-closed alternating displacement current. Streak lightning is conduction current, ball lightning is displacement current. In streak lightning current runs straightly, in ball lightning it circles. Ball lightning is the visible proof of the fact that displacement currents exist in nature along with conduction currents. According to the laws of electrodynamics, these displacement currents in free state are always self-closed. In other words, natural electric phenomena (celestial electricity) could be explained by electrodynamics and there are no causes to consider them, because from the point of view of electrodynamics it is an average electric phenomenon as well as streak lightning. The uncommonness of the phenomenon lies in the great strength of displacement current that generates air luminescence (electroluminescence). Thus, it is possible to defend against ball lightning action by means of metal screens. Contacting with a conductor, displacement current changes into conduction current, and ball lightning disappears. Ball lightning has energy and is a rather stable field form of matter. As all energy (mass) of ball lightning is field one then it practically does not have weight value.

"It emits light as a heated body, but at the same time it practically does not radiate heat. Its movement almost is not connected with gravity, which usually determines the movement of bodies which surround us." [1].

Longitudinal electromagnetic waves (as alternating displacement currents) are applied only for energy transfer in waveguides as yet. The mechanism of producing and keeping of longitudinal electromagnetic waves is known. Therefore, the familiarization with self-closed longitudinal electromagnetic waves can lead to, for example, to production of "vacuum storage (accumulator) of energy" designed for energy accumulating in the form of the excited state of vacuum (field). In this case even the great amount of accumulated energy will have very minute weight, according to the expression of $W = mc^2$. Vacuum is an "ideal conductor" for displacement current. If the whole

lengths of waves are confined to orbits (in-phase wave movement is Bohr's orbits) then emanation does not occur. For example, if it is possible to accumulate and emanate "bunches" of electric energy as impulses then it will be possible to fuse or weld conducting objects from great distance. Displacement electric current does not radiate heat before changing into conduction current.

"Displacement current, in contrast to conduction current, is not accompanied with heat generation." [2]

The properties of longitudinal electromagnetic waves are viewed at the author's website <http://alemanov.da.ru>

References

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NEW BOOKS!

The Foundations of Physchemistry of Microworld

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The new axiomatic of natural sciences is given in the book; on its basis, quantum physics and quantum chemistry have been returned to the classical way of development. The first steps are made on this way, which have led to discovery of the structure of the photon, the electron, and the principle of the formation of the atomic nuclei, the atoms and the molecules.

The Planck's Law of radiation of perfect blackbody is given on the basis of classical concepts, and the connection of quantum phenomena with the laws of classical physics is proved. The application of the new theoretical results to the solution of practical energy tasks on the basis of plasma electrolysis of water is shown. Due to this electrolysis, additional heat energy generated as well as hydrogen and oxygen are the energy containing gases. Cold Nuclear Transmutation of the atomic nuclei of alkaline metals and the atomic nuclei of the cathode material takes place during plasma electrolysis of water.

The book is intended for physicists, chemists and other specialists who are seeking the new directions for understanding the foundations of the microworld and the new energy sources.

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Mysteries of Electromagnetism and Free energy

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In the new book written in an easily understood, popular manner, there is the review of the serious crisis of modern fundamental physics. This very crisis of fundamental physics, and especially of our knowledge about electromagnetism laws of the environment, has caused the situation when the most of electromagnetism phenomena of our reality seem to be strange.

The limited nature of our knowledge about the reality becomes obvious when we face with so-called anomalous phenomena. Moreover, some representatives of the official science declared this field of knowledge about anomalous phenomena to be a pseudo-science. To make this actual problem clear, the second part of the book is devoted to such things as free energy generators, perpetual motion machines, antigravitation, and the official academic science attitude to the problem.

The author makes an attempt to give the theoretic explanation of the phenomena and prove the baselessness of the conclusion made by modern science about the impossibility of the already existent free energy generators, antigravitation systems, perpetual motion machines and other similar things. All these and similar to them energy systems and generators, as well as anomalous phenomena and UFO, have all rights to exist both from the philosophy and science points of view.

To show the possibility to realize these still fantastic for the mankind projects, the author offers vivid descriptions of just the small part of all existent devices (*in the review there are devices and designs of nearly 70 authors and inventors from all over the world!*). Actually the number of the devices is much more. Authors and inventors of different ages and professions continue to make new experiments contrary to the official academic science prohibition in order to penetrate into the unexplored mysteries of the environment.