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# Physical phenomenon of Lightning. Electric current. Interpretation at the metaphysical reality level.

**1. Introduction. The possibilities to discus at the level of metaphysical** reality (MR) physical phenomena and, in a broader sense, natural phenomena, including the sporadic ones, were demonstrated in [2-7]. The content of these works may be generally characterized as a metaphysical doctrine of Inorganic nature [1]. Here we will not present in detail the concept of metaphysical reality and we will restrict ourselves to giving only summary information about it. It is realized in the scientific cognition of the outside world that only certain parts of it (levels) are accessible to us. Speculation about the unobservable parts (levels) of the world is traditionally called metaphysics. Under the metaphysics of the Inorganic world (N-world) we mean comprehension of its unobservable but presumably really existing components which may be denoted as metaphysical realities. Accordingly, physics and metaphysics of the N-world can be considered as two different levels of its cognition.

Thus, the objective reality consists of physical and metaphysical realities. Physical reality is studied by physics and other natural sciences. The situation with the study of the metaphysical reality is more complicated. We have chosen the following approach to its exploration. It relies upon the modern physical picture of the world, which is “the concept of the world and its processes drawn up by physics on the basis of empirical investigation and theoretical understanding”. In a simplified form, the physical picture of the world consists of the description of its structure and physical laws, principles, beginning from the microcosm to the scale of the whole Universe. However, in most cases, there is no description of Means and Methods, necessary and sufficient for the implementation of physical laws and functioning of the world. The analysis shows that these Means and Methods belong to the sphere of metaphysical reality which is conventionally located "beyond physics", "over physics" and "after physics."

All physical laws can be analyzed at the MR level; the examples of such an analysis are presented in [2-7]. It should be emphasized that the potential of cognition of the world at the MR level contains the possibilities for analysis of sporadic phenomena in nature as well. We demonstrated this in [7] on the instance of the analysis of the nature of unidentified flying objects (UFOs). It was concluded that UFOs are likely to present nonmaterial objects, namely the ethereal images of material objects, whose nature and purpose can be satisfactorily explained, in our opinion, only in the framework of theological world view. The experience of such explanation of UFOs motivated us to the analysis of the other well-known natural phenomenon "Lightning". This is a complicated phenomenon. Seemingly, it could not be explained to the full extent within physics, as the

statements of a number of researchers of the problem evidence. The purpose of the present paper is to analyze and to interpret the natural phenomenon of “Lightning” at the MR level and in the framework of theological world view. The theme of "Lightning" is very extensive; here we will confine ourselves to the consideration of cloud-to-ground lightning, without addressing the issues of thundercloud formation. Also, we will not discuss existing physical theories of “Lightning”. As the source data we will use the available general descriptions of the beginning, development and ending of cloud-to-ground lightning, as well as its fixed generalized physical parameters.

**2. In this section we will first give a description of "Lightning", and then** specify the object of the present article. We have taken the description of "Lightning" from the Encyclopedic dictionary (2009), it is adduced also in the Internet. «Lightning is a giant electrostatic spark discharge in the atmosphere usually followed by a bright light flash and thunder. Linear lightning discharges between thunderclouds (intra-cloud lightning) or between a cloud and the ground (cloud-to-ground lightning) are observed most commonly. The process of the cloud to ground lightning development consists of several stages. At the first stage, impact ionization begins in the region where the electric field reaches the critical value. It is caused by free electrons, a small amount of which is always present in air. The electrons are accelerated by the electric field to essential velocities directed to the ground and collide with air atoms ionizing them. Electron avalanches arise in this way, which transform into filamentary electrical discharges called streamers. Streamers present well conducting channels the interflow of which initiates a bright thermally ionized channel with high conductivity called the stepped leader of lightning. The leader proceeds to the ground in steps having a few tens of meters in length and with the velocity about $5 \cdot 10^7$ m/s. After that its motion pauses for a few microseconds, and its glow severely weakens. At the next stage the leader goes again a few tens of meters. A bright glow covers all the passed steps, followed again by the stop and weakening of glow. These processes are repeated by the propagation of the leader towards the earth surface with the average velocity of $2 \cdot 10^5$ m/s. As the leader travels to the ground, the field strength at the leading tip increases and under its influence elevated grounded objects form a reciprocal streamer which joins the leader. This feature of lightning is used for creation of lightning conductors. At the final stage, the return stroke of lightning follows the channel ionized by the leader. The return stroke is characterized by the electrical current of tens to hundreds of thousands amperes, by the brightness, noticeably exceeding the brightness of the leader and by high velocity of propagation, which amounts to $10^8$ m/s in the beginning and decreases to $10^7$ m/s in the end. The temperature of the channel of the return stroke can exceed 25 000 $^{o}$C. The length of cloud to ground lightning is 1-10 km, its diameter is several centimeters. After the electric current pulse passed, the ionization of the channel and its glow weaken. At the final stage the lightning current can last tenth or even hundredth of a second, amounting to hundreds and thousands of amperes. This is prolonged lightning, it the most often cause of fires.

Lighting is accompanied by the change of the electric and magnetic fields and by radio frequency emission. The probability of a grounded object to be struck by lightning increases with its height and with the increase of the soil conductivity on the earth surface or at some depth.

A special kind of lightning is ball lightning. It is a luminous spheroid with high specific energy, which is quite often formed subsequent to the strike of linear lightning».

The description of lightning is also given in Wikipedia. Below we present a number of statements from this description that complement the above description of lightning taken from the Encyclopedic dictionary. «A lightning discharge is an electrical explosion and is similar to detonation in some aspects. It causes a shock wave to appear, which is dangerous in close vicinity to the lightning discharge. At distances of up to several meters the shock wave from a sufficiently powerful storm discharge can deal damage, break trees, injure and bruise humans even without a direct electric shock. For example, by the current increase rate up to 30 thousand amperes per 0.1 millisecond and by the diameter of the channel 10 cm the following values of the shock wave pressure can be observed:

– at the distance of 5 cm from the centre (the boundary of the glowing channel of lightning) – 0,3 MPa,

– at the distance of 0,5 m – 0,025 MPa (destruction of flimsy building units and human injury),

– at the distance of 5 m – 0,002 MPa (breaking glasses and temporary stunning humans).

At large distances the shock wave degenerates into a sound wave.

Interesting is the fact that "near the Ostankino tower downward lightning strikes as often as before its construction".

By the analysis and interpretation of the phenomenon of "Lightning" at the MR level it is appropriate to consider separately its following aspects:

1) concentration of electron excess in a thundercloud in a small amount, which implies the further development of lightning;

2) creation of the trajectory for the upcoming motion of the electron excess from the cloud to the ground in the form of a glowing broken line that precedes the electrical discharge of lightning;

3) electrical discharge of lightning;

4) light emission and thunder, accompanying the electrical discharge of lightning;

5) ball lightning.

The electrical discharge of lightning from a thundercloud to the ground can be considered as electric current flowing through the lightning channel with a diameter of 1-10 cm. As the analysis shows, this raises the question about the interpretation from one frame of mind of such current and the current in a metal conductor considered at the MR level in [6]. In this paper we will discuss this question at the MR level.

**3. In this section we consider at the MR level the concentration of the** electron excess in a thundercloud, in its local area, from which glowing lightning begins. The volume of the thundercloud may amount to several cubic kilometers. Of course, this circumstance presents difficulties for a satisfactory explanation within physics. Below we give the interpretation of this first stage of the formation of lightning at the MR level.

The Active Ether (AE) controls all the Micro-objects (electrons, protons, atomic nuclei, atoms, including isotopes and simple molecules), from which the Earth consists. The AE of the Earth can govern all these Micro-objects in correspondence with its Algorithms. Further, for the sake of brevity, we will omit the word Earth in the expression the AE of the Earth. We will not consider the process of the emergence of electron excess in clouds and, accordingly, the role of the AE in this process. We will consider the role of the AE in the phenomenon of "Lightning" starting from the moment when a certain critical value of electron excess in a cloud is reached. This critical value is determined by the AE in accordance with its Algorithms. In physics, this critical value corresponds to the value of the electric field between a thundercloud and the ground of about 400 kV/m. Electrical breakdown of air occurs by the electric field of about 2500 kV/m. Of course, this circumstance presents difficulties for a satisfactory explanation within physics.

Here it is necessary to note the following. In [2] it was shown at the MR level that there are no electric and magnetic fields in nature as special forms of matter. The electric and magnetic interactions are ensured by the AE. The concepts of the electric and magnetic fields used in physics are just design parameters for the AE in the implementation of these interactions.

Therefore, the main criterion for the AE in making decisions about the beginning of the first stage of the phenomenon of "Lightning" is the critical value of the excess number of electrons in a cloud rather than the design value of the imaginary strength of the electric field between the cloud and the ground. Next, the problem raises for the AE to reestablish charge equilibrium between the thundercloud and the ground. It solves this problem in accordance with its Algorithms.

These Algorithms of the AE are, first of all, the Algorithms of governing electrons, as well as other Micro-objects. Two kinds of governing Algorithms are possible. In the first case, electrons and other Micro-objects retain their possibility to interact with each other. When meeting, they "get round" each other, as Micro-objects in the active state can not coexist at the same space coordinate. In the second case, if commanded by AE, electrons and other Micro-objects become passive, they stop outside review and, accordingly, stop interacting with each other. A passive Micro-object can be at the same space coordinate both with other passive Micro-objects and with other active Micro-objects. As a consequence, the trajectory of motion of passive electrons and other passive Micro-objects does not depend on the presence in their way both of other passive electrons and other

Micro-objects. Their trajectory of motion is predetermined only by the corresponding AE command.

Let us note here once again, that the AE does not move Micro-objects, but it only commands them to move. Micro-objects move in space in a step-wise manner in accordance with their Algorithms both in the active and the passive state.

The AE provides the concentration of electron excess in a thundercloud, in its local area, where glowing lightning starts, in the following way. Let us denote this local area of the thundercloud the Coordinate of the beginning of the glowing lightning (base point). The AE first brings the electron excess in the thundercloud into the passive state. Then it commands them to move in the direction of the base point. It monitors and controls the displacement of each excess electron in the thundercloud, beginning from their initial position to the base point. Each of these passive electrons is most likely to spend different amount of time at the base point of glowing lightning till channeling to the ground starts.

**4. In the previous section we discussed the first stage of the phenomenon** of "Lightning" at the MR level. In this section, we will give at this level the treatment of light emission from lightning preceding electrical discharge. As the analysis shows, there is no casual connection between the first stage of lightning and the light emission, preceding electrical discharge. Each of the two lightning components is implemented by the AE individually in accordance with its Algorithms. Naturally, other kinds of connections can take place between them, primarily, the spatial and temporal connection. The absence of causal connection between the mentioned components of lightning allows us to consider each of them separately. The first of them was already discussed in the previous section.

Next, we will talk about light emission of lightning preceding the electrical discharge between a thundercloud and the ground. Note that there is also no casual connection between the light emission and the electrical discharge of lightning itself. The considered light emission of lightning is formed by the AE in accordance with its Algorithms. It begins to form it at the base point of glowing lightning after it fixed the base point on the base of a thundercloud. For the description of the second phase of cloud to ground lightning it is necessary to picture first the imaginary path of lightning. The considered light emission of lightning occurs along this path. The trajectory of lightning is planned by the AE preliminarily. As it follows from observations, its shape is a curved line, often with multiple branches.

Here a need arises to comprehend the intricate form of the lightning trajectory from a thundercloud to the ground. At the MR level, we exclude conditioning the geometric shape of lightning by the strength of the imaginary electric field between a thundercloud and the ground. We also consider conditioning the geometric shape of lightning by the state of the surrounding atmosphere to be unlikely. As the analysis at the MR level shows, the shape of the lightning trajectory is defined by the AE of the Earth according to its Algorithms. This is the case when the question becomes incorrect, what criteria it takes into account in order to outline the

trajectory of lightning. The procedure used by the AE to implement this trajectory will be presented below.

First, let us make the following hypothetical considerations. In principle, the AE could reestablish the charge equilibrium between a thundercloud and the ground in the following way: localizing electron excess in the thundercloud at the Base point of glowing lightning, planning the trajectory of displacement of these passive electrons to the ground and implementing their displacement. However, the phenomenon of "Lightning" involves light emission, which precedes electrical discharges and is not causally connected to its other stages. This, of course, raises the question of the role and purpose of this light emission. In our opinion, its role is reduced to making the lightning channel visible and, accordingly, explicit.

The AE outlines the lightning channel in stages, each stage accompanied by light emission. This raises the question about the cause of the periodic nature of the process. At the MR level this is interpreted as follows. The average length of an individual branch of the lightning channel is estimated to be 50 meters, while its formation time is of the order of one microsecond, the duration of one segment is of the order of a few tens of microseconds. The sufficiently strong light emission, formed by the AE in the lightning channel with a diameter 1-10 cm, produces photoionization of molecules in the atmosphere. It is natural to assume that the AE plans an acceptable degree of ionization of molecules of the atmosphere in the lightning channel, and is most likely to restrict itself to the plan of the excitation of the electronic levels of the molecules. It achieves this by limiting the duration of light emission which is approximately one microsecond. The next light pulse is formed by the AE after de-exiting the molecules of the atmosphere, their afterglow lasting a few tens of microseconds. Therefore, the intensity of the afterglow is much weaker than the intensity of the initial light pulse, what is actually observed.

**5. In this section we will give the interpretation of the electrical discharge** of lightning at the MR level. It begins after the AE outlined the lightning channel going from a thundercloud to the ground. Its diameter is estimated to be several centimeters. In Section 3 we noted that at the first stage of lightning development the AE focuses electron excess in a thundercloud at the Base point of glowing lightning. Here we agree on conditions, that we do not exclude the possibility of continuing this process while the AE determines the future trajectory of the electrical discharge of lightning from a thundercloud to the ground. The AE continues to hold these electrons in the passive state. Next, it moves these passive electrons to the ground along the intended lightning channel. We shall not discuss here the value of physical parameters of the electrical discharge of lightning. We note only that they vary widely.

At the MR level the dynamics of displacement rate of passive electrons from a thundercloud to the ground is of interest. There are two possibilities. In the first case the AE moves the electrons in accordance with the strength value of the imaginary electric field in the channel of lightning. We believe this possibility to be less likely, as this requires the AE to carry out sufficiently complex calculations of the strength value. Most likely, the AE realizes the dynamics of the

displacement rate of passive electrons according to its Algorithms, with account of the distance between a thundercloud and the ground and the amount of passive electrons subject to displacement, as well as the intended intricate trajectory of lightning. It should be noted here, that during the channeling to the ground, the excess electrons do not interact with molecules of the atmosphere, since they are in the passive state.

After the electron flow of lightning reaches the surface of the Earth and other material objects, the AE firstly, cancels its command to be in the passive state for each of them, and, secondly, stops governing them. Respectively, the electrons transit into the active state after that and begin to interact both with each other and with other Micro-objects. Eventually, they find their permanent place in material medium. However, this raises the question of possible damage, arising after the contact of the electron flow of lightning with the ground and other material objects. Such damages are caused, firstly, by large kinetic energy of the electron flow of lightning. Secondly, they are caused by the harp decay of passive electron bunches after the AE stops governing them. It is possible to suppose hypothetically, that the AE, in principle, could bring the passive electrons to the ground with velocities that would avoid destruction. However, the destruction caused by lightning takes place, what is undoubtedly made provision for in Divine Providence. It may be added that various negative effects of the destructive power of lightning are not so large compared with the creative effort and other activities of nature.

The electrical discharge of lightning is also accompanied by light emission, which is formed by the AE. It will be discussed in the next section.

The electrical discharge of lightning is also accompanied by radio waves. At the MR level this type of radiation is interpreted a flux of radio-frequency quanta. There is a casual connection between the electrical discharge of lightning and the emission of radio-frequency quanta. The substance of this connection is as follows. Naturally, the AE knows the parameters of the electrical current of lightning, which it generates. Using these parameters, it determines the Fourier components of the lightning current pulse. Next, it generates radio-frequency quantum fluxes, whose frequencies correspond to these Fourier components. These radio-frequency quanta are formed by the AE of the Earth near the lightning channel, their direction of propagation being also specified by the AE, of course. Moreover, it also provides the propagation of radio-frequency quanta by means of displacing them in space in the way similar to displacing I-photons. Note that the interpretation of the radio-frequency emission at the MR level was given in [6].

To conclude this section, we note that there is a question, which is formulated as follows in terms of physics. Does the passive electron flow create a magnetic field around it? At the MR level this question is formulated as follows – do the AE Algorithms make provision for the magnetic interaction around the passive electron flow, equal to that around the active electron flow? We believe that the AE has such an Algorithm, and, respectively, the magnetic characteristics of the active and passive electron fluxes are similar.

**6. In this section we give the interpretation of light emission and thunder,** accompanying the electrical discharge of lightning at the MR level. First, we note the following. Lightning can be considered as one of the aspects of circulation of nature. We have not been concerned with the first stage of this circulation, which is the formation of thunderclouds, but focused on the interpretation at the MR level of its second stage, which is the reestablishment of the charge equilibrium between a thundercloud and the ground.

Light emission and thunder, accompanying the electrical discharge of lightning, do not have any causal relationship with it. Both of these phenomena are realized by the AE in accordance with its Algorithms. It has been established through observations that there is a noticeable exceed of the intensity of this light emission in comparison with the intensity of the light emission preceding the electrical discharge of lightning. Therefore, the maximum distance, at which the observation of lightning is still possible, depends on the intensity of this light emission. This raises the question of its interaction with the molecules of the atmosphere in the lightning channel and in its neighborhood. That is why we restrict ourselves to the statement that such an interaction is reduced mainly to the excitation of electronic levels of the molecules. But we do not exclude the possibility of partial excitation of other levels of the molecules.

Next, let us proceed to the interpretation at the MR level of thunder that accompanies lightning. First, we present the traditional description of thunder taken from Wikipedia. "Thunder is a sonic phenomenon in the atmosphere that accompanies lightning discharge. Thunder is a vibration of air under the influence of sharply rising pressure on the path of lightning, due to heating to about 30 000 $^{o}$C. Thunderpeals arise from the fact that lightning has a considerable length, and the sound from different parts of lightning reaches the listener not simultaneously. The reflection of sound from clouds, as well as the refraction of sonic waves propagating in different paths also contributes to the emergence of thunderpeals. Besides, the discharge itself occurs not instantaneously but lasts some time". "As a rule, thunder is heard at a distance of 15-20 kilometers, so if the observer sees lightning, but can not hear thunder, the distance to the thunderstorm is more than 20 kilometers ".

At the MR level thunder from lightning is interpreted as follows. It is conceived in the lightning channel and in its neighborhood. Its conceiving is initiated by the AE by causing the molecules of the atmosphere to move in an appropriate way. Here it should be borne in mind that the AE controls all the Micro-objects that make up the Earth, and can govern them in accordance with its Algorithms. Note, that in addition to thunder generated by the AE, the electron flow of lightning strikes the ground and other material objects, what is accompanied by a short sharp sound.

By the interpretation of lightning at the MR level there is a problem of comprehension of destination of light emission and thunder accompanying its electrical discharge. Firstly, such light emission, along with the light emission preceding electric discharge, makes lightning visible, and hence explicit. Secondly,

it intensity determines the maximum distance at which lightning can still be observed.

The question of the destination of thunder from lightning is more complicated. Undoubtedly, thunder from lightning is the Divine Providence. The Divine Providence is contained in the AE Algorithms, which it implements when channeling electron excess from a thundercloud to the ground. It should be borne in mind, that such channeling could be implemented without the phenomena of thunder. Thunder affects humans, animality and the vegetable world. Here we will not discuss the consequences and the character of different consequences of thunder. We just note that people perceive thunder in accordance with their comprehension of the outside world.

**7. This section will discuss the phenomenon of ball lightning at the MR** level. We first present the summary of ball lightning, taken from Wikipedia. "Ball lightning is a luminous ball soaring in the air. It is a uniquely rare natural phenomenon, a unified physical theory of the emergence and development of which has not been presented up to now. There are about 400 theories explaining the phenomenon, but none of them has won an absolute recognition in the academic environment…

It is widely believed that ball lightning is a phenomenon of electrical origin, which is natural, i.e. presents a special kind of lightning, existing for a long time and having the shape of a ball that can move along an unpredictable trajectory, sometimes amazing to the eyewitnesses.

Ball lightning usually appears in stormy weather, often, but not necessarily, together with an ordinary lightning. But there is a plenty of evidences of its observation in sunny weather as well. Most often, it seems to “emerge” from a conductor or to be generated by an ordinary lightning, sometimes it goes down from clouds, in rare cases it suddenly appears in the air or, as reported by the eyewitnesses, may emerge from any object (a tree, a post)".

At the MR level the phenomenon of ball lightning is interpreted as follows. It is always generated by the AE. It governs it either by itself, in accordance with its Algorithms, or on the initiative of Angels. In our opinion, ball lightning can be of two types. In the first version, it consists of passive electrons. Let us call this type material ball lightning. The AE separates such ball lightning from an ordinary lightning, more precisely, from the flow of passive electrons during the electrical discharge of lightning. In the second version, ball lightning presents an immaterial ethereal object. We will call it ethereal ball lightning. Most likely, the AE forms this type of ball lightning on the initiative of Angels. We also do not exclude the possibility of its formation together with an ordinary lightning. In our opinion, in all other cases of the ball lightning appearance, listed in the previous paragraph, it presents an ethereal object. Let us repeat here once again, that the AE forms and governs ethereal ball lightning primarily on the initiative of Angels, although we do not exclude the possibility that in some cases the AE forms it on its own initiative and in accordance with its Algorithms.

First, let us give a brief interpretation at the MR level of some observable manifestations of the material ball lightning formed by the AE on its own initiative. It concentrates passive electrons in the form of a relatively small ball or, more rarely, in the form of an ellipsoid. Its light radiation is generated by the AE, making it visible and explicit for the observer. The trajectory of its displacement is determined by the AE. Here it is necessary to draw attention to the fact that the relevant AE Algorithms are the ultimate cause of the trajectory it chooses for material ball lightning. The AE releases it from its care before its contact with material objects. Accordingly, at the same time the electrons renew their activity, they begin to interact with each other and with the Micro-objects of the material object they contact with. Released from the care of the AE, the electron flow can possess a significant kinetic energy. Accordingly, the appearing electronic strike can cause damage to the material object.

The AE can also stop governing the material ball lightning in the air at its own discretion. This will be followed by an arbitrary or a harp decay of the electron bunch.

The situation is somewhat different in the case, when the AE creates and governs the material ball lightning on the initiative of Angels. Then its displacement trajectory, velocity, glow obey a particular purpose. The realization of this purpose can be of negative nature from the point of view of people and even be dangerous for them. In our view, it does not exclude the possibility of any additional effect on material objects, including humans and the AE itself. Note that the potential effect on humans happens accidentally, but it may be intentional as well.

And now let us briefly characterize ethereal ball lightning at the MR level. As the analysis shows, unlike Micro-objects, it is not an autonomous entity but presents a short-term dynamic phenomenon produced by the AE on the initiative of Angels. All its manifestations (trajectory of displacement, glow, shape changes, effect on Micro-objects (material objects), potential effect on humans, fading and ceasing to exist) are the result of the AE activity in accordance with the Angels program. The AE provides the formation of glow so, that it is perceived as the glow of a material object of a definite form. The observed displacement of ethereal ball lightning as of a seeming object is the result of a smooth displacement of the "object's" contour planned by the AE of the Earth within which it continues the formation of glow. To this we can add that the ability of the AE of the Earth to create ethereal images of material objects was described in paper [7], in which unidentified flying objects (UFOs) were considered at the MR level. In [7] we have concluded that UFOs are such ethereal objects.

The phenomenon of ethereal ball lightning originates from Divine Providence. As for the existing cases of its hazardous effect on humans, here we will once again restrict ourselves to the statement that it happens not accidentally, but on the initiative of Angels. This completes our brief discussion of the phenomenon of ethereal ball lightning at the MR level.

**8. When treating at the MR level the mechanism of electron excess** concentrating in a thundercloud, in its local area, namely, at the Base point of lightning, we concluded that the AE can govern electrons in accordance with two Algorithms. In the first case, an electron preserves the capability for the interaction with other Micro-objects. In the second case, the electron becomes passive on the command of the AE, it stops outside review and, therefore, ceases to interact with other Micro-objects. However, the passive electron preserves the capability for the step-wise displacement in space in accordance with its Algorithms. Let us repeat here once again that the passive electron can be superimposed on other Micro-objects, its displacement trajectory does not depend on the presence of other Micro-objects, it is determined only by the respective command of the AE.

As the analysis at the MR level shows, the possibility of electrons to transit into the passive state on the command of the AE necessitates the recomprehension of the nature of electric current in metallic conductors. Earlier, its treatment at the MR level was given in [6]: "Electric current, radio-frequency emission and natural radio-frequency decay" (2013). Let us give essential excerpts from this work. "The AE sets in additional motion a certain number of free electrons in a conductor on the background of their thermal motion. It is not necessary for it to set in additional motion all the free electrons. It can vary their amount in a wide range. The velocities of the thermal motion of free electrons in metals amount to significant values of the order of $10^7$ cm/s. Each of the free electrons forming electric current acquires from the AE the same value of the additional velocity on the background of their thermal motion, its magnitude being able to vary in a wide range. The above well explains the practically observed range of current magnitudes in electrical circuits, which amounts to ten orders of magnitude - from a few microamperes to five thousand amperes.

Let us denote the thermal velocities of free electrons in the direction of the electric current vector by $V_0$. Naturally, these velocities will vary due to the chaotic nature of the thermal motion of electrons. Further, let us denote by $\Delta V$ the additional velocities of free electrons, imparted them by the AE. These free electrons form electric current. We will assume that the value of $\Delta V$ is the same for all electrons. Their total velocity will be

$$V = V_0 + \Delta V . \qquad (1)$$

It should be borne in mind that the AE controls all Micro-objects in the Universe and can govern them all. In physics, the maximum distance traveled by a free electron without collisions with ions is called the mean free path $L_0$. The AE sets in additional motion in the forward direction those free electrons for which the possibility of motion without collisions with ions for a distance of about $L_0$ is observed. After the distance $L_0$ is covered the considered electrons will appear in a situation of an unavoidable collision with ions. The AE eliminates their additional velocities $\Delta V$ before collision with ions, but does not prevent their collisions. The times of the beginning of motion of free electrons with velocities (1) are different,

these times cannot be correlated due to the chaotic character of their thermal motion.

In order to achieve a constant magnitude of current in an electrical circuit, the AE, firstly, imparts an additional velocity to *n* electrons in each running centimeter of a conductor. Secondly, after it eliminates the additional velocity of each of these electrons, it imparts the same additional velocity to other electrons. Here we can talk about the additional velocity $\Delta V$ conventionally as about a baton, passing from one electron to another. This is how the AE provides constant current throughout an electrical circuit. Note that this model of electric current involves no through motion of electrons in a conductor".

The concept of passive electrons allows us to treat electric current in metallic conductors as follows. The AE transfers a certain amount of free electrons in the passive state, and commands them to move through a conductor. In generalized terms, the electric current in a conductor is described by the formula

$$I = nev, \qquad (2)$$

where n $cm^{-1}$ is running density of passive electrons, e is the electron charge, v is the velocity of their motion.

In such interpretation of electric current the issue of the electron mean free path disappears as a problem. However, the question how the AE ensures the constancy of current in an electrical circuit still remains. If it represents a closed loop of a metallic conductor, the AE is most likely to implement a through motion of passive electrons forming electric current. If this condition is not satisfied, for example, if an electrical circuit contains a concentrated capacitance, then the AE is most likely to govern each passive electron forming electric current according to the following scheme. It transfers a free electron to the passive state and moves it for the length L, then releases it from its care. Further, it transfers another free electron at the same coordinate to the passive state and moves it for the subsequent length L, then it releases it from its care. The AE implements these procedures throughout the electrical circuit, the total result of which being described by formula (2). It chooses the length L in accordance with its Algorithms. Note that current in electrical circuits has just a symbolic character and is not involved in the transfer of energy from the primary source to the consumer. We have already mentioned above that the flow of both active and passive electrons creates the same magnetic effect.

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