A new model of ether reproducing electromagnetic phenomena, including gravity

Ioan Has[1,2], Simona Miclaus[1]

[1]Land Forces Academy, st. Revolutiei. 3-5, 550170 Sibiu, Romania, email: simo.miclaus@gmail.com

[2] st. Rapsodiei 6B, bl. Sof 1, sc. B, ap. 9, 240240 Rm. Valcea, Romania, email: ioan.has@gmail.com

Summary. This paper is based on the results obtained in our previous articles where an error has been found in Michelson's analysis of his interferometer experiment, even though Einstein relied on it, while developing the Special Relativity Theory, in which he eliminated ether from physics. Our own results imply that ether can exist. We have also validated the hypothesis that Coulomb's law would better describe the complex reality, including ether, by adding other terms to the actual term in r^{-2}. As such, the force that exists between two distant dipoles, when computed with a modified version Coulomb's law, depends on r^{-2}, as in Newton's law. Numerically, the two forces were practically equal given that the gravitation consists of electromagnetic interactions.

For ether's composition, we proposed the HM16 model, in which the constituents etherons α and β are placed in the nodes of a crystalline network with a cell of approximately 10^{-27}m, then subject to manifesting forces of mutual attraction/rejection. Ether behaves as an ideal mechanism in the form of a *perpetuum mobile*.

The microparticles MPs consisted of local zones of ether where an energy intake induced a state of vibrating or vortex motion. The vibrant MPs, having electrical charges, will transmit fundamental vibrations FV in ether around the MPs, which have a finite velocity c_F. Stationary FV vibrations do not transmit energy in the continuous infinite ether, but they do create interaction forces between MPs of an electric (modified Coulomb forces) and magnetic nature.

A MP passing through two energetic levels will expel (or absorb) a special MP, namely, the F photon, which moves through the ether at the speed of light c, which is a property granted by the ether, and forms electromagnetic EM waves that transmit energy in ether. The F photon can be constituted similar to an MP, which creates its own FV vibrations in ether.

It is likely that the two velocities c_F and c will not be equal. As we consider that $c_F > c$, velocity c_F corresponds to the "gravitational" waves resulting from the interaction between the electric dipoles produced by the completed Coulomb's law.

The HM16 model of ether can explain the nature of an electric field in terms of volumetric ε strains of ether, while the nature of the magnetic field can be explained by distortional γ strains of ether. The HM16 model can also explain the various interactions between EM waves and MPs, as well as collisions between MPs.

PACS numbers: 03.50 De, 03.50 Kk, 04.30.Db, 04.30 Nk, 04.30 Tv, 14.80 -j

1. Initial considerations and our previous results concerning ether

Although the conception and development of a model for ether, which constitutes the basis for the existence and functioning of the universe, including the human mind, seem to be a risky, even illusory endeavour, we ought to consider that, while the human mind is capable of progressively deciphering this mystery, our current attempt is merely a small step on this path.

The present HM16 ether model of ether, which has been obtained here as an initial and perfectible form, emanates from our previously admitted hypothesis regarding the possibility of the existence of ether in reality.

The admission of this hypothesis is based on our theoretical results from two series of articles [1, 2,…7], and [8, 9] with their last forms in [7] and [9].

Historically speaking, the idea of the presence of ether, which fills the cosmic space between planets, was initially proposed by Descartes, who justified it through the rejection of any actions at a distance ("*that the force cannot be communicated except by actual pressure or impact"*) [10]. In our paper, such a judgement is considered correct and relevant.

In our work [7] and its predecessor, we reanalysed the theoretical part of Michelson's interferometric experiment and finally proved analytically the existence of an error made by Michelson in his theoretical calculus of time t_2, in which the light ray traverses the transversal arm of the interferometer. The correct calculus of time t_2 in [7] showed that this time equals time t_1, which corresponds to the longitudinal arm of the interferometer. From this result, we derived the important consequence that the displacement $\Delta\lambda>0$ of light's interference fringes, as assumed by Michelson, should not have occurred at the rotation of the interferometer, given that its correct value is $\Delta\lambda=0$ (since $t_1 - t_2=0$).

A first consequence of this analysis is that Michelson's experiment, and implicitly all similar ones, can no longer stand as a reason for the elimination of ether from physics. Indeed, Einstein accepted Michelson's results tacitly and, by doing so, justified his hypotheses grounding the Special Relativity Theory (SRT).

Thus, ether may or may not exist on the basis of the correctly interpreted result of Michelson's experiment and all other similar experiments; hence its elimination from physics is not mandatory, such that other forms of evidence must be found to prove its existence or non-existence. This we take as an indisputable conclusion.

In our current [9] and previous work, we started from the observation that the current simple form of Coulomb's law, on the interaction between electrical charges, cannot express the force of the electric interaction Fc through a formula, which involves one single term in r^{-2} as a function of the distance *r* between the charges.

$$F_C = \frac{q_1 q_2}{4\pi\varepsilon_0 r^2} = \frac{k q_1 q_2}{\varepsilon_0 r^2}; \text{ with } k=1/4\pi; \qquad (1)$$

This form cannot stand if we wish to consider this law as a general law of nature; such a law needs to be applicable to any distances in micro- and macrocosms, as well as at any moment in time.

Our first hypothesis in [9] was that a form of Coulomb's law, which would better correspond to the complex physical reality regarding micro- and macrocosms, including ether, may be obtained by adding the other terms of the respective power series to the left and right sides of the term in r^{-2}, from which the last from the left should be the term in $-\ln r$. In turn, we arrived at the expression of the force of the electric interaction Fcc, which was referred to as either the completed or modified Coulomb's law [9].

$$F_{CC} = -\frac{k_0 q_\alpha q_\beta}{\varepsilon_{00}}.\ln r + \frac{k_1 q_\alpha q_\beta}{\varepsilon_{01}}.\frac{1}{r} + \frac{k_2 q_\alpha q_\beta}{\varepsilon_{02}}\frac{1}{r^2} + \frac{k_3 q_\alpha q_\beta}{\varepsilon_{03}}\frac{1}{r^3} + \frac{k_4 q_\alpha q_\beta}{\varepsilon_{04}}\frac{1}{r^4}... \qquad (2)$$

Concerning the verification of Eq. (2), we distinguish two situations:

i) For small distances, which are direct measurements of Fc, for *r* under 0.10m, and by extending those results to the molecular, atomic and nuclear scale, we observe that the experiments made in these domains showed important discrepancies in relation to Eq. (1), including laboratory-scale experiments made by Coulomb and others.

This difficulty was bypassed by introducing some new laws, such as those for the van der Waals forces, the Johnson potential and the Yukawa potential. But these new laws referred to the

same phenomenon of interaction between the electric charges as Coulomb's law. Consequently, these new laws and other similar laws must be considered as extensions of Coulomb's law, while their corresponding forces expressions may be added to the right-hand member of Eq. (2).

Moreover, these discrepancies at very short distances also indicate the possibility of the existence of similar deviations from Eq. (1), as well as at very long distances.

ii) For great distances for *r* above 1.0m, and by extending the results to chambers, buildings, atmospherics, and planetary, astronomic and cosmic domains, we observe a lack of experiments made in these domains for the direct measurement of Fc. Although the experiments reported over the last 50 years refer to improvements in the precision of the exponent of *r* as (2+ε), everything was conducted at the table scale. Moreover, these experiments were conducted in order to measure the electromagnetic (EM) potential, rather than the electric potential (E) [11], such that they result in indirect measurements, which are not suitable for verification of Eq. (1), given the different nature of these two phenomena, as presented in Sec. 3.

That said, an indirect argument for the necessity of introducing Eq. (2) is the actual situation in terms of the atmospheric electricity domain. In this context, a generally accepted theory is not currently available, which explains the existence of global electric potential in the atmosphere by analytical electrostatic calculus, as well as the development of electric lightning in the atmosphere. This dispute appears, in our opinion, because all proposed theories are based on actual Coulomb's law, or on its consequences, not to mention Gauss's law and Poisson's equation in their actual form. It is important to consider a remark made by Feynman about lighting, in which he said, "Again, we don't understand exactly how it works''; meanwhile, we observe the total lack of analytical electrostatic calculus in chapter 9 of his book, which is entitled "Electricity in the Atmosphere" [12].

We are confident that future direct measurements of the electric potential E, made for great distances, including atmospheric electricity, will confirm the validity of Eq. (2).

As for a first verification of Eq. (2), however, we should consider the coincidence of the F_{DC} and F_N forces obtained in [9] and presented briefly in Sec.4.

Regarding a second verification of Eq. (2), we ought to consider the quasi- coincidence of the 50.0m steps observed in the lighting stepped leader [12] and the distance r_0 =65.0m, calculated in [9] for the nullification of F_{CC}.

As for a third verification of Eq. (2), we ought to consider the consequences of Earnshaw's theorem which stipulates the instability of any configuration of electrical charges, obeying only actual Coulomb's law [13]. As result, at great distances, whether cosmic, planetary or even at atmospheric range, the observed stable equilibrium of electrical bodies cannot be explained. But in condition of validity of completed Coulomb law, the force F_{cc} presents a point of nullification at r_0 distance, thereby assuring a stable equilibrium.

A second hypothesis of our work [9] was that bodies existing in nature, even though they are actually shown as electrically neutral on the laboratory scale (while being analysed at a scale of 10^{-9}m, which is specific to the microparticles (MPs) (atoms, ions, molecules)), remain as consisting of MPs with distinct electrical charges (+q or –q), which are always mutually separated in space at an appropriate scale.

The bodies only appear as neutral on a large scale because the charges +q and –q are actually equal in number in every micro or macro body, while the simple (or multiple) pairs (+q and -q) of electrical charges group themselves (without superposing) in the form of electric dipoles *p,* which are neutral as well being on a large scale. In fact, the electrical charges (+q and –q) of dipoles *p* act like charges +q or –q in any moment and at any distance.

The electric dipoles *p* composed of opposed charges (+q and –q) characterize many bodies, even atoms, which are in turn electrically neutral on an extra-atomic scale, while the dipoles can correspond to the neutrons on a nuclear scale.

An important result has been obtained in our work [9] by applying a special differential calculus, adapted to the case of two electric dipoles *p1* and *p2*, on the assumption that each includes the separated charges +q and –q. By using the force Fcc from Eq. (2), we obtained the equation of the force of interaction between two dipoles $F_{DC,}$ corrected as [9]:

In Eq. (3), we see that the first term (in r^{-2}) is the main term for long distances, as in Newton's law of the gravitational force F_N.

$$F_{DCx} = -\left[\frac{k_0 p^2}{\varepsilon_{00}} \frac{1}{r^2} + \frac{2k_1 p^2}{\varepsilon_{01}} \frac{1}{r^3} + \frac{6k_2 p^2}{\varepsilon_{02}} \frac{1}{r^4} + \frac{12k_3 p^2}{\varepsilon_{03}} \frac{1}{r^5} + \ldots \right] \qquad (3)$$

Assuming the case of two dipoles, which are placed at long distance *r* (planetary, at 10^9m), and applying the F_{DC} force expression from Eq. (3), we obtained the surprise result that the force F_{DC} is numerically equal to the gravitational force F_N, which is given by Newton's law, between the masses of the particles, of which those dipoles consist (their interim ratio is approximately R=2.6).

It follows from this that the gravitational force may be considered as being determined by the electric interaction between the electric dipoles forming every neutral body.

We have to mention that the force of electric interaction F_D between two dipoles, computed through the current Coulomb's law, depends mainly on a term in r^{-4}, which obviously is a negligible quantity with respect to F_N, if the dipoles are assumed as being placed at astronomical distances. This result is currently accepted as correct in physics, such that the possibility of explaining gravity by means of electric forces is lost.

2. General description of the HM16 model of ether

This initial or preliminary model of ether, briefly denoted by HM16, was developed by ourselves as corresponding to the reality of nature and based on the results presented in Sec. 1. We admit that ether is present in nature as a special, real body, which constitutes the physical (i.e., material) support of all existent forms of matter and all phenomena, which occurs and has ever occurred in nature – that is, in both the micro and macro universe.

The constitution or internal structure of ether can be currently thought of, as it is proposed here, in at least two main variants.

The constitution of type A of ether takes the form of a rigid crystalline-type body, that is, with distinct constituent elements, which we call *etherons* and are placed in fixed positions and at precise distances in the ether that stands in a free state, rather than being the subject of any external action, except from itself.

The constitution of type B of ether takes the form of a liquid-type body, that is, with distinct constituent elements (the etherons), which| are placed in mobile, albeit compact, positions at precise distances in the free-state ether.

Following the general aspects of the behaviour of the matter at a macro level within classical physics, as well as at a micro level within quantum mechanics, and in respect of the currently established framework for electromagnetic and gravitational phenomena, we shall choose the constitution of type A of ether for the current analysis, which we shall call the HM16 model of ether.

However, despite adopting the constitution of type B of ether, this will surely lead to similar or even identical results with those relating to the constitution of type A, given that the differences in the behaviour of the two models ought to be negligible.

We claim that ether should have a finer grained structure than the smallest particles that are known at a subnuclear level. We shall call the MPs from the nuclear level, submicroparticles (SMPs), namely, protons, neutrons, electrons, neutrinos, muons, pions etc. We shall call the MPs from the subnuclear level elementary SMPs (ESMPs), namely, quarks, antiquraks, bosons, gluons, rishons, etc. Recall that, in Sec. 1, we denoted the particles from an atomic level as MPs, namely, atoms, ions, molecules etc.

Here we assume that the particles with long-life stability are MPs and SMPs, while ESMPs have a short-life stability and will not be considered in the long-term analysis of ether.

3. Description of the structure and functioning of the HM16 model of ether as the support of matter from nature

We assume that ether can be represented through the HM16 model, which is a compact rigid body of a crystalline type, consisting, at a subnuclear level (level 1 ether), of its own elements of two types, namely, etherons of type α and etherons of type β. These etherons, which are organized in the ether, fill the whole space that is considered as infinite.

Etherons α and β are displaced in the Euclidian space in the nodes of a regular crystalline grid on the three Cartesian axes (Fig. 1). We can assume that the crystalline grid is compact,

similar to the one that is specific to real material crystals, possesses a cubic format with centred surfaces (CSC) and has the highest packing degree (the fraction of the volume occupied by etherons, as rigid spheres in contact, from the total volume), namely, g_i =0.74.

The crystalline cell of the level 1 ether should have a size b_e of the order 10^{-6} of the size of the nuclear ESMPs (the same scale order occurs between two successive levels of structures of matter), which should in turn be of the order of 10^{-6} of the size of nuclear SMPs, which is approximately 10^{-15}m [14]. It follows that the size of the elementary etheric crystalline cell is estimated to be:

$$b_e \approx 10^{-(6+6+15)}\text{m}=10^{-27}\text{m} \quad (4)$$

Etherons α and β should have, as a basic property, in terms of the presence of some contact and interaction forces F_E between them, of the attraction-type force between an α etheron and a β one. But it is probable that there is also a rejection-type force, which includes contact forces between two α etherons or two β ones, similar to the electric interactions.

The mathematical expression of interaction forces F_E with etherons of type α and β are not currently known, but they should still be of the expression type of completed Coulomb's law Fcc, in terms of a power series, as in Eq. (2). However, the result of these forces is predictable, namely, in terms of acquiring a state of equilibrium in the real positions of the α and β etherons within the crystalline grid of ether (Fig. 1), such that equilibrium probably leads to the perpetual stability of the free ether.

These interactions or contact forces F_E (of attraction or rejection) between α and β etherons should manifest as elastic forces, which quickly increase (as a power series, as in Eq. (2)), with the distance of displacement of the α and β etherons from their position of equilibrium under external forces produced by MPs (Fig.

The relative displacement of α and β etherons could be manifest either by linear volumetric deformation ε of the ether grid or angular distortion γ of the initial orthogonal grid of the ether (Fig. 1), in which ε and γ strains have distinct physical effects.

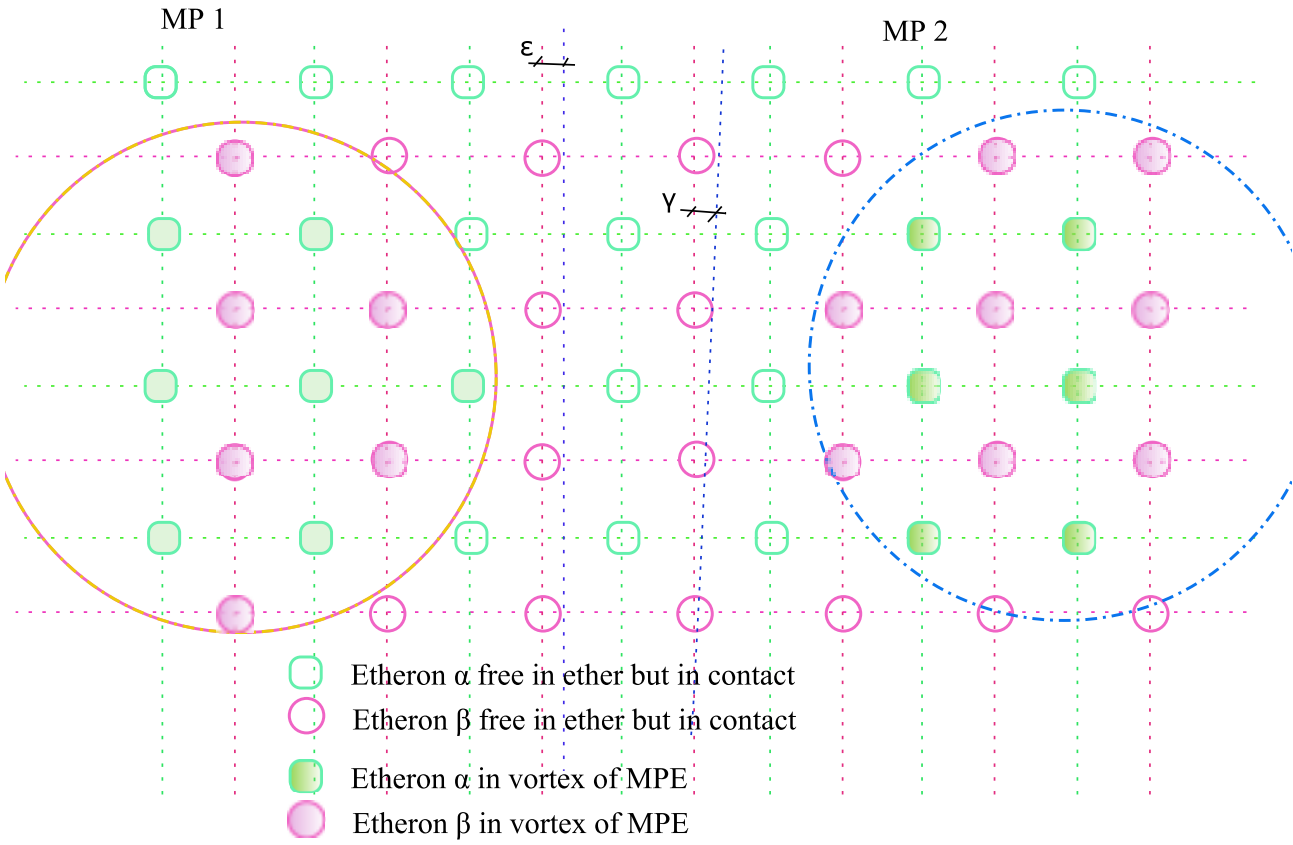

Fig. 1. Constitution of the HM16 model of ether from a grid of etherons in contact and involving a structure of MPs from groups of vibrating etherons.

But the displacement of the relative positions of α and β etherons will be quantified as the result of the possible constitution of the α and β etherons (first-order) from some second-order subetherons on the subetheric level.

The α and β etherons are naturally placed in their positions in the grid, which corresponds to their minimal potential energy (Fig. 1), while the ether behaves as an ideal frictionless mechanism, having no energy loss and functioning as a *perpetuum mobile*.

It is difficult to directly detect the presence of the ether's constituents α and β, not only due to the very small size of the etherons (approximately 10^{-27}m), but also due to their special property of having an ideal frictionless behaviour with no loss of energy. This difficulty is also due to the fact that, at the scale of the human environment and the laboratory, the physical support of nature and the universe is made up of directly observable ensembles of material particles' MAP (solid, liquid and gaseous bodies), consisting of a large number of MPs (atoms, molecules), which

are the only components with which we come into contact, including the experiments on the lowest scale in physics, other research fields or common human activities.

But this ether is in fact the physical support of the MPs and SMPs (or eventually stable ESMPs), which we assume to be constituted from local zones of ether, consisting of a certain number of etherons (Fig. 1), in which, at a certain previous moment, an energy intake W_0 occurred. This energy induces a state of motion in that group of etherons, in the form of vibration or a rotational vortex of the α and β etherons, oscillating from their positions of equilibrium or periodically moving in an orbit with certain frequencies υ. Hence the ether, through contained MPs, SMPs and ESMPs, consists of the vibrating α and β etherons (Fig. 1), as well as accumulates and saves the acquired energy, which will be preserved with no loss over an unlimited time, provided that no change in the state of MPs, SMPs and ESMPs occurs.

At this stage, we must introduce a hypothesis regarding the SMP constitution.

Through a first hypothesis Ip1, regarding the constitution of SMPs, we admit that the group of etherons, which SMPs consist of, does not moves through the ether with moving SMPs, but by means of the transfer of vibration and energy from the old to the new etherons meted on the trajectory.

Alternatively, through a second hypothesis Ip2, we admit that the group of etherons, which SMPs consist of, moves themselves through the ether, as constituent etherons. They will move themselves with the velocity *v* of the SMP, splitting the etheron grid when passing, followed by the immediate recovery of the network after passing.

Both hypotheses Ip1 and Ip2 look plausible, but giving the same result in the present analysis, choosing one of them, can explore the matter further.

SMPs will be considered in the HM16 model, as particles that are at the lowest level regarding their size; in other words, known stable particles of the nuclear component type: protons, neutrons, electrons, neutrinos, muons etc.

But SMPs, as a stable group of vibrating etherons, will also transmit an action of direct vibration to the nearby free etherons, due to ether's continuity, which we name fundamental vibration (FV), such that this action of FVs is still of a vibrating nature, but wihout the

transmission of energy over time in a steady state of vibration.

These SMPs must be of at least two main types, namely, the manifesting positive electrical charge SMPP and the manifesting negative electrical charge SMPN. On this scale, there might also exist the electrically neutral SMPNE, which on a lower scale will prove to be of the SMPP and SMPN type.

The nature of the electrical charge at the SMP level could be given either by the mode of vibration/rotation of the etherons in an SMP or the constitution of an SMP in relation to α and β etherons. There might exist other models for the electrical charge of SMPs; however, in the current analysis, this detail is not essential.

These two types of SMPP and SMPN, as energy accumulators differentiated through the sign of the electrical charge, should produce differentiated effects on the rest of the ether structure made of α and β etherons.

As we showed above, the main effect of the SMP on the ether is the transmission of FV vibrations to the α and β etherons, which are close by, since these etherons cannot be isolated from the vibrating SMP. Moreover, the FVs will continue to be transmitted to the next etheron's neighbours and so on (Fig. 2).

In this way, the FV vibrations of any SMP will permanently propagate in time and continue towards infinity in the space filled with ether (Fig. 2).

Here we have to ascertain that the FVs, which are induced to the ether, must have been present ever since the creation or occurrence of an MP or SMP in the ether. As for the creation or occurrence of SMPs, there is no reason that prevents us from assuming that SMPs, as accumulators of energy that cannot be created or destroyed, only transformed (according to Lavoisier's principle), are of the same "age" as the ether. In other words, they are ageless; thus, MPs and SMPs have existed forever and will always exist to this extent.

We also have to ascertain that these fundamental FV vibrations induced to the ether by SMPs are elastic by nature, to enable them to propagate through a real body (ether). This is why such propagation should have a finite velocity c_F (Fig. 2) and a finite frequency υ_F.

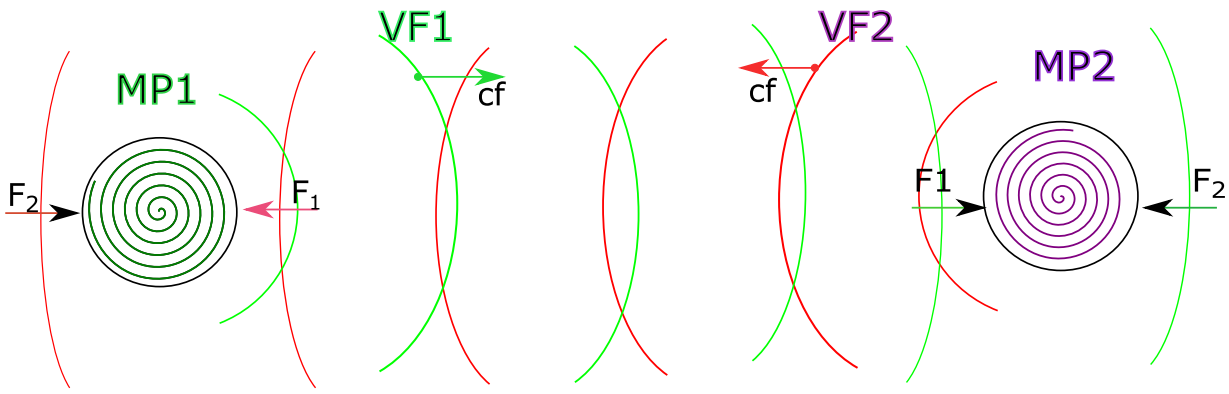

Fig. 2. Representation of the fundamental vibrations FV and the forces they generate in the ether upon the MPs or SMPs.

The velocity c_F and frequency υ_F should depend essentially on the elastic and inertial properties of the ether, while υ_F should also depend on the nature of the MPs/SMPs generating the FV vibrations.

These primordial background FV vibrations in the ether, which exist near any MP or SMP (Fig. 2) and propagate in the ether probably as an ideal frictionless crystal (with no energy loss), neither take new energy from SMPs nor transmit energy at a distance over time in the infinitely continuous ether, as long as the FVs are in a stationary state or a permanent constant state over time.

Meanwhile, during a special state of vibration for SMPs, which is a non-permanent state and variable over time and space (for instance, SMPs in motion with respect to ether or undergoing structural modifications, as well as in the initial moment of the creation of SMPs), it is possible that the background FV vibrations in the ether may acquire an amount of energy W_E stored in the nearby ether, through its strains ε and γ (Fig. 1) or its vibrations, and not included in the energy stored in the SMPs.

The energy W_E stored in the ether, due to the effect of some SMPs being in a non-permanent state, can be stored through the two known mechanisms from nature and physics:

- Deformation energy can appear in the ether in the situation where α and β etherons (Fig. 1) exhibit rigidity/elasticity at volumetric ε deformation or γ distortion, including its vibrations, as

we assume hereafter.

- Kinetic energy may only appear in the ether in the situation where α and β etherons have their own proper mass. That said, it is more likely that α and β etherons (Fig. 1) do not have such mass because their presence as mass particles would otherwise be observed in relation to movements of SMP; therefore, the kinetic energy is not likely to appear in the ether.

The energy W_E accumulated in the ether is proportional to the specific deformation/distortion of the ether as ε or γ strains (Fig. 1).

In a permanently stationary state in time for SMPs, the fundamental FV vibrations induce only the spherically symmetrical volumetric distortions ε in the nearby Ether. In this case, in a fixed point in space, the periods of energy-accumulating vibrations, due to the compression resulting from the elastic deformation of the ether, will alternate with the periods of energy-releasing vibrations due to the relaxation in elastic deformation. In this permanent state, the energy, which is initially accumulated at compression, is entirely ceded by relaxation under our assumption of crystal- and *perpetuum mobile*-type ether with ideal behaviour.

If the two integrals of the work over the volume of ether, in which the two types (compression/relaxation) of volumetric variations ε occur are equal, then there will be no energy accumulation in the ideal ether during any interval of time in any point of the ether.

This situation is valid for the particle SMP1, which is alone in a permanent state and fixed in the ether that is free of other SMPs.

The only amount of energy transmitted to the ether through FV vibrations was that from the initial moment of the occurrence of SMP or the moment of a change in its state.

4. **Description of the phenomenon of electrical interaction between the MPs, including gravitational interaction**

In this section, we start from the observation that any two MPs, SMPs or ESMPs lying in two different points in the space occupied by ether must interact with each other on the basis of the laws currently admitted in physics:

- According to Coulomb's law, there will be an interaction of electric nature F_C between any

two MPs that each have an electrical charge.

-- According to Newton's law, there will also be an interaction of a gravitational nature F_N between any two MPs that each have mass, regardless of the presence of an electrical charge.

We must admit that Coulomb's and Newton's laws, in any of their once- admitted expressions, should not be limited or modified with respect to the span of their application by distinguishing between any range in terms of the distance between the two MPs, since they are general laws for the entire universe, regardless of the distinction between macro and micro universes.

Today, by not admitting the existence of ether, the interactions between the two MPs are considered to manifest through the respective fields of forces F_C and F_N, namely, electrical field E and gravitational field G, but without any clear definition of natural physical grounds or material support for fields E and G, with regard to their internal constitution, their belonging to a certain state of matter etc.

In our work series completed with [7], we recently took an analytical procedure to justify the possibility of the real existence of ether, whose presence in nature and reality eliminates the necessity of considering the actual electrical field E without physical support; as we will argue, this also applies to the actual magnetic field H.

More recently, in our work series completed with [9], we theoretically proved the possibility of explaining and obtaining gravity forces, through the electrical interaction forces F_{DC}, between the electric dipoles of material bodies. This was done, however, by considering a modified Coulomb's law for F_{CC} in the form of an n-term series of powers r^{-n} in relation to the distance *r* between charges, as in (2). As this result dismisses the necessity of the presence of the gravitational field G, Newton's law in its actual form is no longer justified either, such that it will be subsequently replaced by a new law of type F_{DC}, as in (3).

The ether that we need to rediscover is a form of mechanical-electromagnetic ether, which is different from classical mechanical ether, as mentioned by physicists from the 19th century and earlier. The new ether should allow us to explain the wide majority of phenomena from physics and other scientific disciplines about nature, including cosmology, chemistry, biology and

medicine, as they are known in the 21st century, among which are natural situations and phenomena that remain unexplained.

Among these phenomena, the one of greatest importance is the interaction between MPs with an electrical charge, which will be analysed in the following section.

For this analysis, we shall consider the model of ether presented in Sec. 2, (Fig. 1), in variant A (crystalline type), within which we shall consider two MPs, MP1 and MP2, placed in two fixed positions in the ether and each electrically charged with charges $+ne$ or $-ne$.

The crystalline-type ether consists of first-order α and β etherons. In turn, the α and β etherons could consist of second-order γ, δ... etherons which could have smaller sizes with about 10^{-6} than those of first-order ether, but this aspect does not require our focus in the current analysis.

As for MPs, we shall assume, through a hypothesis that will be further confirmed or denied by the derived results, that an MP or SMP consists of a certain number of α and β exhibiting vibrations or rotations/vortexes (Fig. 2), which accumulated the total energy W_1 given by equation [15]:

$$W_1= mc^2=m_0c^2\ [1-v^2/c^2]^{-1/2} \qquad (5)$$

We observe that Eq. (5), known as Einstein's equation within the SRT since 1905, is just one variant of some similar equations in the case of mass variation with velocity, which were previously obtained by Lorenz, Hasenohrl, Abraham, Poincare *et al.* [15].

MP1 and MP2, placed at the fixed distance *r*, can interact with each other through the surrounding ether. Thus, we have a force acting on MP2, which is created by the ether adjacent to that MP. This ether is stimulated by MP1, which generates the fundamental FV vibrations in the ether that will arrive in the neighbourhood of MP2 (Fig. 2); here, the FVs will create different pressures for the ether upon the two surfaces of MP2 that are oriented towards MP1, which give birth to force F_2 on the surface opposite and force F_1 on the surface adjacent to MP1 (Fig. 2). The resulting force $F_R=F_2-F_1$ will simply be the modified Coulomb-type force Fcc from Eq. (2), accordingly to [9].

If the electrical charge of MP2 has a sign opposite that of MP1, then the resulting force for distances r_0 <65.0m (according to [9]) is:

$$F_R = F_2 - F_1 > 0 \quad (6)$$

As such, MP1 creates a force of attraction Fr upon MP2 because this force has a positive sign, given by F_{CC} from Eq. (2) as a completed type of Coulomb's law.

For distances r_0 >65.0m (according to [9]), the resulting electric force F_{CC} from Eq. (2) changes its sign and, implicitly, its orientation as follows:

$$F_R = F_2 - F_1 < 0, \quad (7)$$

where MP1 creates a force of rejection F_R upon MP2: that is, the orientation of this force is opposite to the orientation given by the classical Coulomb's law F_C.

If the electrical charge of MP2 has the same sign as that of MP1, then results (7) and (6) above change their sign; in turn, the orientations of the actions at distances of about r_0 =65.0m are also changed (according to [9]).

But this force F_R = Fcc should be given through an expression of the modified Coulomb law force Fcc, according to [9], in the form of a series of negative powers of *r*, plus the term in *–lnr*, as seen in Eq. (2). And so at distance r_0 take place the nullification of Fcc.

We observe that the fundamental FV vibrations in the ether, produced by a fixed MP, actually create an electric-type potential field Ecc in space, which is given by the modified Coulomb's law Fcc, such that this field now has the ether as its physical support. The field Ecc analytically provides the forces F_1 and F_2, which act on any of the other MPs; meanwhile, the F_{CC}-type forces will generate the F_{DC}-type forces, as seen in Eq. (3), between dipoles, which create gravity [9].

We also observe that the permanent FV vibrations, which do not transmit energy, cannot be identified with the actual EM waves that are characterized by permanent energy transmission. Therefore, the speed c_F of travel for the FV vibrations in the ether should not equal to the speed of light c, which is the speed of movement of the F photons from the EM waves, a phenomenon that is discussed in Sec. 6.

5. The description of the phenomenon of magnetic interaction between MPs

In Secs. 3 and 4, we analysed the fundamental background of FV vibrations in the ether,

which exist around any MP in a stationary state, that is, in a fixed position with respect to the ether (Fig. 2). These FVs are spherical (hence, they have a spherical symmetry) and, because of them, the electrical forces Fcc of the modified Coulomb's law type appear between MPs. In this spherically symmetrical situation for the FVs, the deformations induced in the ether through them will only be of the volumetric type ε.

In the situation where an MP is in permanent motion in the ether, the background FV vibrations in the ether, at a given point M, will no longer be simple, spherical (Fig. 2) and with deformation of volumetric type ε only. In this case the FVs in a point M will be complex, while the deformation of the basic orthogonal network, induced by FV in the ether, will be of both volumetric type ε and distortional type γ (Fig. 1).

The deformation of the ether of volumetric type ε creates the electrical forces Fcc, which can be considered as deriving from an electrical potential Ecc.

The deformation of the distortions of type γ remains in a permanent state, only provided that the motion of an MP is permanent. The strain γ generates new forces Fm of a magnetic origin, which act upon the moving MP. The force Fm can be considered as deriving from a magnetic potential Hm, which remains in permanent state if the motion of MP is permanent.

We can say that force Fm corresponds to the force of magnetic action F_L on an electrical charge that is in motion, in the same way as a Lorenz-type force, on a laboratory scale. The permanent distortional state of the ether with the γ strain actually corresponds to the presence in the ether of a magnetic field Hm in a permanent state, which will persist as long as the MP is moving in a permanent state in the ether.

In the case of the presence of a permanent magnetic field Hm, no energy is transmitted to the ether over time by a moving MP in a permanent state. The fulfilment of this condition is also due to the behaviour of the Ether as an ideal frictionless crystal (thus with no energy loss), which behaves like a *perpetuum mobile*. It is possible that, in this permanent state of motion of an MP in time, but variable in space, the background FV vibrations produced an accumulation in ether of an energy of the γ-type, albeit only at the beginning of the motion of the MP (thus in a temporary non-permanent state); this energy was responsible for the initial creation of the magnetic field Hm. The

energy accumulated in Hm will be proportional to the γ distortion of the ether. However, the energy, which was accumulated on the creation of Hm, will be entirely ceded by the ether when Hm disappears once the motion of MP ceases, given that the ether will also behave ideally, like a *perpetuum mobile*, during this phenomenon.

6. The description of the phenomenon of the creation and transmission of EM waves

Based on the most recent theoretical approaches and experimental results in the field of EM waves, we shall consider henceforth that EM waves possess the so-called dual character wave-particle, which incidentally deserves a physical explanation, that have been absent until now for the wave character.

We mention that the particle character of EM waves can be easily explained by classical physics, as well as by the SRT. In other words, the presence of a light particle, namely, the photon (F) that moves with speed of light *c* through space (considered as a void), appears to be somehow natural within the actual concept in which the presence of ether is not admitted.

However, the wave character of the EM phenomenon has not benefitted by a correct physical support in the absence of the ether, since it lacks the support for the propagation of these waves. Granting the electric (E) and magnetic (M) fields a wave character is simply palliative, given that electric and magnetic fields themselves lack the physical support in a correct analysis of the non-ether space, which is considered to be a vacuum.

The current claims, that electric (E) and magnetic (M) fields have a material nature for the EM waves, lack experimental evidence and correct logical arguments. This difficulty can be eliminated by admitting the existence of the new HM16 model of ether, as we did in Sec. 2.

We shall admit that, in the presence of ether, the MPs or SMPs, when they modify their energetic state by passing between two different energetic levels, will expel (or absorb) the difference in energy ΔW through the emission/absorption of a special particle, namely the F photon, which contains the energy ΔW itself.

The F photon should also be a micrpparticle which is elementary, but stable, and moves through the ether at the speed of light *c*; this property is given by the ether itself. In this stage, we

can assume that the F photon has properties similar to those of SMPs, as discussed in Sec. 3.

In a first hypothesis Ip1, we shall consider the F photon to be constituted from a local vibration/vortex of a certain number (obviously lower than that specific to MPs) of α and β etherons and that this vortex moves through the ether with velocity *c* without moving etherons (Fig. 3).

In a second hypothesis Ip2, the F photon has a special property, whereby the vortex consisting of a certain number of its own etherons moves through the ether, while also transporting these etherons, which would ordinarily move themselves with velocity *c*, splitting the etheron grid when passing, followed by the immediate recovery of the grid after passing.

Both hypotheses Ip1 and Ip 2 look possible at this stage of the analysis, while the final bias for one of them will follow a detailed analysis of the EM phenomenon; however, the result of the current analysis is actually the same for both hypotheses. For the sake of simplicity, we hereafter endorse hypothesis Ip 1.

In both hypotheses, we can assume that the speed of light *c* in ether is the result of equalizing the forces that resist the movement of the F photon, which appears on the front surface of F on the one hand, and those forces supporting its movement through the ether, with velocity *c* appearing on back surface of F, on the other hand. This equilibrium occurs probably in the first sequences of the expulsion of F by the MPs. Thus, this equilibrium and implicit velocity *c* could depend on the F photon's own variable frequency υ_{pi} in relation to *i* in the range of EM waves or light. Hence, velocity *c* of the EM waves (the speed of light) could depend, to some extent, on the variable frequency υ_{pi}. Here we have a phenomenon that is somewhat similar to the movement of an aeroplane in the air when the sonic speed of the air is taken as the first threshold of its speed.

On other hand, as presented in Secs. 3 and 4, we can observe that velocity c_F of the FV background waves of the ether represents the propagation speed of a free compression/relaxation wave in the mass of the ether. Due to this distinction between the physical phenomena, which occur for the FV waves and the EM waves (through F photons), it is likely that the two velocities c_F and *c* are not equal. We have enough arguments at this stage of the analysis to assume that $c_F > c$. For the speed of light *c,* we rely on a sufficient quantity of theoretical results and experimental measurements, indicating, as we know, that c≈300.000km/s, at least in the range of the frequencies

υ_{pi} from the visible domain of the spectrum of EM waves.

For velocity $c_{F,}$, we have no information available at the present time. Based on the way that the FV wave was defined in Secs. 3 and 4, it would result that its velocity c_F corresponds to the speed of the "gravitational" waves. This implication is correct because, according to what was presented in Sec. 1, these gravitational waves are actually the effect of the interaction between the electric dipoles through the FV waves, which are based on the formula of F_{CC} from the modified Coulomb's law.

If, during the F photon journey through the ether, some small quantity of energy ΔW is still feeding off/ceding to some MPs/SMPs encountered by F or in direct contact with the ether, this energy ΔW could be taken through the crystal of the ether, but only from the photon's own energy $h\upsilon_{Pi}$ through the reduction of its own frequency with the corresponding $\Delta\upsilon_{Pi}$. This can explain the red shift of the light waves coming from long-distance sources, without appealing to the velocity of departure of the light source with respect to the terrestrial observer, for which velocity increases with distance; in fact, it involves the reduction of the photon's own energy and frequency when travelling through ether.

The certain frequency υ_{Pi} of the F photon can be determined by the frequency υ_{VPi} of the internal vibrations/rotations of the photon's own etherons in relation to its vortex. This υ_{Pi} could be different to the frequency υ_{FPi} in the ether's background FV vibration of the SMP of the F photon, as discussed in Sec. 3. It is probable that the υ_{FPi} is equal to, or correlated with, the υ_{VPi}, although this aspect will not be discussed here.

This happens because, on its creation/emission, the F photon, as an ESMP, produces a modification around itself in the ether's state by generating the fundamental FV vibrations in the ether, as discussed in Sec. 4.

These FV vibrations propagate with a velocity c_F, which should exceed the speed of light/the photon c, that is, $c_F > c$. This is also because the velocity c_F of the fundamental FV vibrations of F is simply the result of the elastic property of the ether, such that this property is materialized through the free oscillations of free etherons α and β, which are not influenced by any external agent or factor. Velocity c_F, as the maximal speed of free proper FVs of F in the ether,

could in turn conceivably depend on the frequency υ_{FPi} of FV vibrations of F, although again this aspect will not be discussed here.

It is the presence of F's own FV vibrations around itself that justifies the dual character particle-wave of the F photon and of the EM wave. The FV vibrations of an F photon or group of photons can slightly forerun the F photons themselves, if $c_F > c$ and so we can explain the interactions/entanglements between photons, between electrons and other MPs in reference to quantum mechanics.

7. The description of the interactions between EM waves and MPs

According to Sec. 3, MPs are permanent vibrations/ vortexes, in which a certain number of α and β etherons from the ether are engaged, while MPs accumulate a certain amount of energy W. When MPs move with constant speed over/through the ether in the network of α and β etherons, they will not lose any energy and thus will not face resistance from the ether. The movement of MPs must be assumed as discrete, with quantified steps, probably those of the grid of first-order etherons or, better still, with those of second-order etherons, in which these grids remain fixed in space and time.

The MPs constitute the material/physical bodies (MB) through the spatial arrangement in the ether of their mutual position. Furthermore, these positions are precise due to the interaction between the various MPs given by the forces Fcc of the modified Coulomb's law type.

The relative and precise positions of MPs within the MBs are given through the quantification of forces Fcc as functions of distances *r* between all MPs, on the basis that the constitution of the ether is discrete and non-continuous, according to first- or second-order etherons.

This precise space positioning of MPs is best exemplified at the level of the atoms of MB, where the MP electrons are placed at constant and precise distances from the atom's MP nucleus over infinite time, such that the atoms are collections of *perpetuum mobiles*.

At the moment of the approach of an EM wave of a material body MB, which consists of a collection of MPs, there are actually F photons arriving in that zone, which also consist of etherons in a vortex state as SMPs, as discussed in Sec. 5.

However, in the proximity of MB, F photons and their fundamental vibrations FV will first meet the waves of the fundamental vibrations FV generated by MPs from MB, with the intensity increasing due to F approaching CM.

F photons are accompanied and even preceded by their own fundamental vibrations/wave FV of a spherical form centred in F, which is created in the ether by F at any moment, while this wave travels with velocity c_F (Fig. 3).

This FV1 wave of F1 will first meet the FV wave of MP1, in which the latter also takes a spherical form centred in MP1. The two waves will interfere and generate a resulting vibration (RV), which has a potential field (PF) of interaction in terms of attraction between F1 and MP1 from MB1. This PF is located physically in the ether, while its force of interaction (of the F_{CC} type) will be oriented towards MP1 (Fig. 3).

The intensity of F_{CC} increases quickly with the decrease in the distance r between F1 and MP1, causing their meeting or impact. In this way, through the associated FV1 vibrations/waves, which are much more extended in space than MP1 and F1 photon (Fig. 3), the initial indirect contact between them (through FVs and the resulting F_{CC}) is ensured, while the interaction (even impact) between F1 from the EM wave and the MP1 from the MB is facilitated (Fig. 3).

Thus, the interaction between the Fs and the MBs is initially an interference of the waves from the fundamental FV vibrations of Fs and MPs. This explains the particle-wave behaviour of the EM waves and implicitly of the F photons.

The interaction between MPs and the EM wave could be one of the following well-known types:

a) reflection of the EM wave by some types of MB

b) crossing some MBs through refraction by the EM wave

c) absorption of the EM wave by some MBs

The occurrence of one or another of the three types of interaction above will be the result of the interference of the waves from FVs of the two entities, from Fs and from an MPs (from a MBs). Moreover, this result will be also influenced by the physical properties of the MBss and the undulatory properties of the EM waves as vibrations of Fs.

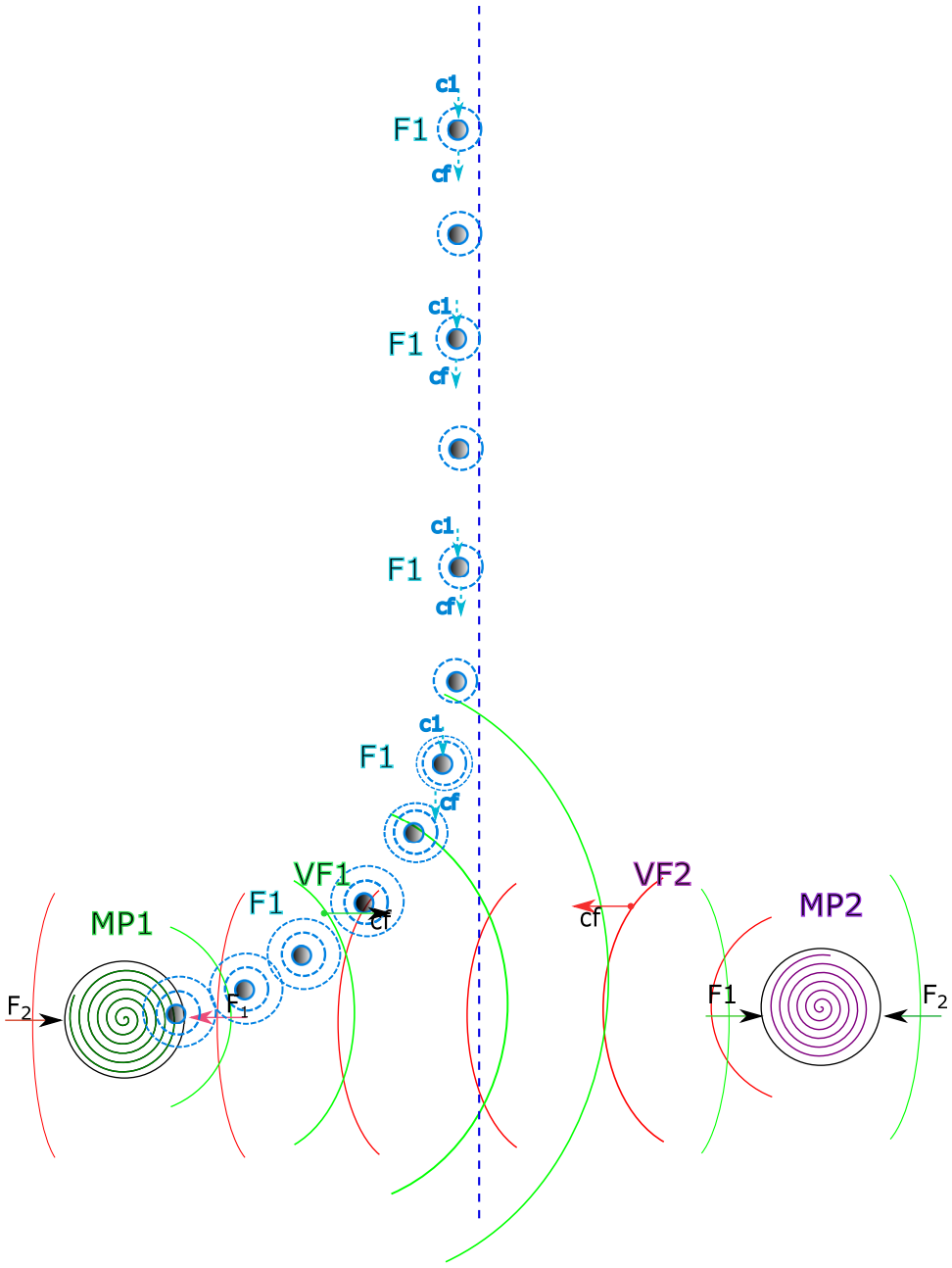

Fig. 3. Model of the interaction between the photon F1 with random direction and MP1, by FVs in the ether.

Physical properties include the nature of the atoms from MBs, the distances between them, and their arrangement in space, including the FV vibration type of MPs in MB, as well as the frequency and intensity of the EM wave (hence, F's vibrations in ether).

Otherwise, in the absence of the FV vibrations of F and MP, and because of the size of F in the order of 10^{-15}m, and of the distance between MPs within the CMs of the order of 10^{-9}m (the

particles diameters are shown on a significantly larger scale in Fig. 3), the direct meeting of Fs and MPs would have a negligible probability of occurrence. In such circumstances the reflection, refraction and absorption phenomena would not occur. Instead only a non-interaction phenomenon of passing through the MBs may be admitted for the EM waves and in such a case, the MBs would behave similarly to the vacuum, which does not actually happen in reality.

The mechanisms producing these three types of interaction in reality, between Fs and MBs, in order to create the three phenomena above on a macro scale, could run according to the following descriptions:

a) Reflection of the EM wave by MB1

Let us take the case of the phenomenon of reflection of the EM wave at the surface between MB0 as an incident body and the reflector body MB1. The interference of the two FV vibrations of F1 and MP from MB1 will create a potential field PF, as well as an interaction/attraction between F1 and MP1 from MB1, with a field located spatially in the ether in the grid of the α and β etherons. The potential field PF acts upon F1 and MP1 from MB1 with a force Fcc of the modified type of Coulomb's law (Fig. 3), as presented in Sec. 3. Since the position of MP1 from MB1 is relatively fixed in space (with respect to F), in terms of obtaining the effective interaction between F1 and MP1/MB1, a final deviation of F1's trajectory alone towards MP1/ MB1 eventually occurs (Fig. 3).

Alternatively, an interaction is produced through the absorption or direct transfer of energy between the two FVs, that of F1 and that of MP1/MB1, which first come into contact (Fig. 3).

Thus, the absorption of F1 by MB1 through MP1 will be possible when an electron performs a quantum jump within the suitable frequency range, according to the energy W of the absorbed F1 photon from EM waves.

In case of reflection of the EM wave, the absorption of F1 will be immediately followed by the re-emission by MP1/MB1 of the same type of F1 photon, which will be expelled back towards the exterior of MB1, in MB0, following a direction, which makes an angle equal to the angle of incidence, for obeying the conservation of the quantity of the movement of F1 in the direction parallel to the surface of MB1, due to F1's own inertia. Obviously, the speed c_0 of F1 reflected in

the same medium MB0 as that of incidence, equals the speed c_0 of the incident F photon. It is likely that the processes of absorption and re-emission/reflection will occur in the first few layers of the crystalline network of MB1. Due to a delay in time between the moments of absorption and re-emission of F1, a loss of half of the wavelength of EM of F1 occurs.

b) The refraction through MB1 of the EM wave

In the case involving a phenomenon of the refraction of the EM wave through the body MB1, the absorption of F1 will be followed immediately by the re-emission by MP1/MB1 of the same type of F1 photon that will be expelled towards the interior of MB1. The speed c_1 of F1 refracted in a medium MB1, other than that of incidence MB0, will differ compared with the incidence speed c_0, such that the difference depends on the ratio between the refracting indexes of the materials from CM0 (existing in the incidence space of F1) and MB1 into which F1 enters. The direction of the F1 photon refracted in the medium of MB1 will also be modified, depending on the ratio of the refractive indexes of the materials from MB0 and MB1 for the conservation of the quantity of movement in the direction parallel to the surface of MB1. It is likely that the process of refraction/re-emission of F1's FV vibration will successively develop in relation to all the layers of the crystalline network of MB1 with the frequency υ_i of the incident EM wave.

c) The absorption of the EM wave by MB1

Regarding the phenomenon of the absorption of the EM wave by MB1, the absorption of F1 could lead to the creation of stable states in MPs of MB1, with the energy increased by the energy W of F1. Alternatively, the absorption could lead to the transformation of W from F1 in other forms of energy than that of the EM type: for example, caloric waves, sonic waves, electrical waves or EM waves of another frequency than the incident one.

8. The description of interaction between MPs within collision experiments

In collision experiments between MPs reaching high speeds (close to *c*) and a MB material body as target, we should take into account the constitution of MPs and MBs according to Sec. 3, as well as the presence of ether according to Sec. 2.

Actually, the collision will occur between two MPs, of which MP1 belongs to the MB and is in fact immobile in the fixed grid of the ether. The other MP, of the SMP type, will approach MP1 at high speed (Fig. 3), such that the results from Sec. 7 concerning the interaction between EM waves and MP also apply.

However, this time, there might be a breaking of MP1 as result of the direct collision between the MP1 and SMP0 (F1 in Fig. 3), or even as a result of the absorption of SMP0 by MP1. The breaking of MP1 will, in fact, result in new MPs, namely, MP1a, MP1b, MP1c and so on, which will in turn consist of vortexes of groups of etherons corresponding to some SMPs.

The new vortexes are created out of the fragmentation of the vortex of the initial group of etherons of MP1 into vortexes of smaller groups of etherons corresponding to new SMPs.

The new SMPs may exhibit entirely new specific properties corresponding to any of the ESMPs identified in preceding experiments and classified within the Standard Model of the nucleus. Among these ESMPs, some will be unstable and actually disintegrate instantly on creation, while their vortex of etherons will be retrieved in other MPs or SMPs.

9. Conclusions and consequences

This article is based on the results obtained by the authors in two previous series of articles. In the first series, dedicated to reanalysing the theory that grounded Michelson's experiment, the authors have analytically proven the existence of an error made by Michelson in the theoretical analysis of his interferometer experiment. Following this result, we have admitted in the current article that ether is present and real, as well as represents the support of all existent forms of matter and all phenomena produced in the micro and macro universe.

In the second series of articles, dedicated to gravity, the authors started with the hypothesis that a form of Coulomb's law, which would better correspond to the complex physical reality of nature, including ether, can be obtained by adding the rest of the terms of the power series to the term in r^{-2}, including a term in $-\ln r$, which results in the force F_{CC}. In turn, the interaction force F_{DC} between two dipoles, which are determined by the application of the F_{CC}, resulted in the primary dependence upon a term in r^{-2}, as in Newton's law of gravitation.

By computing the force F_{DC} between two dipoles placed at an astronomical distance, F_{DC} numerically equals the gravitational force F_N, as given by Newton's law (R=2.6 is the interim ratio), between the masses of the particles corresponding to those dipoles.

As such, our hypothesis regarding the necessity to modify Coulomb's law received an initial theoretical confirmation through the actual quasi-coincidence of the two forces: the electric force F_{DC} between dipoles calculated with the use of the current EM constants, as well as the gravitational force F_N, calculated with the current gravitational constant. The quasi-coincidence of these two forces is practically improbable unless our hypothesis is valid.

For the constitution of the ether, we have adopted a rigid crystalline-type structure called the HM16 model of ether.

Within this model, we assumed that the ether consists of two types of elements called α and β etherons. The α and β etherons, which attract/reject each other, are displaced in the space within the nodes of a regular crystalline grid. Etherons and ether behave like ideal frictionless mechanisms, such that they have no energy loss and function like a *perpetuum mobile*.

The ether is the physical support of MPs (atoms, ions, molecules etc.) and SMPs (protons, neutrons, electrons, neutrinos, muons etc.). We have assumed in this article that MPs and SMPs are local zones of the ether, in which an intake of energy W occurred that induced a state of vibrating or rotational/vortex motion in that group of etherons. Moreover, the etherons accumulate the energy W that initially received and preserved it entirely through an unlimited period of time.

Vibrating MPs will transmit FV vibrations to the ether background, created around any MP, vibrations which move away from MPs in the ether continuously in time and space. The permanent (in time) type FVs will not transmit energy over time from MPs to the nearby ether. The FV vibration in the ether induced by MPs has an elastic nature, such that the propagation of this vibrating wave must have a finite velocity c_F specific to the ether and frequencies υ_F, which are specific to MPs. The permanent FV vibrations, which do not transmit any energy, cannot be identified by the EM waves that perform such an energy transmission.

Two immobile MPs placed at distance r from each other can interact electrically through means of some forces upon MPs, created by the adjacent ether, due to the FV vibrations

transmitted by each MP to the other through ether. The resulting force $F_R=F_2-F_1$ is just the force Fcc of the completed/modified type of Coulomb's law.

If an MP is found in a state of permanent motion in the ether, the FV vibrations in the ether at a given point M would be complex, but permanent (in time), while the deformations induced by the FV of MPs in the ether would be of both volumetric type ε and distortional type γ. The γ distortions of the ether will generate a magnetic potential Hm, which exerts magnetic forces Fm upon a moving MP. Meanwhile, the magnetic potential Hm is physically located in the ether, which is composed of α and β etherons. The force Fm corresponds to the force of magnetic action of the Lorenz type, while the state of γ permanent (in time) distortion of the ether corresponds to the effect of a permanent magnetic field Hm, which is present in the ether.

Moreover, in the case of the presence of a permanent magnetic field Hm, no energy will be transmitted over time from the MP in permanent motion to the ether, given the behaviour of the ether as an ideal crystal of the *perpetuum mobile*-type.

We have suggested in the current article that, in the presence of ether, when MPs pass between two different energetic levels, they will expel (or absorb) the difference in energy ΔW by emitting (absorbing) an SMP, namely the F photon, which may contain the energy ΔW. The Fs photons, as an SMPs, move through the ether at the speed of light *c*, which movement constitutes the EM waves, such that this property *c* is given by the ether itself. The F photon can be considered as having a constitution similar to that of an MP in terms of a local vortex of a certain number of etherons α and β, which could either be engaged in vibration or transported.

Due to the distinction between the physical phenomenon occurring in the case of the FV vibrations and that of the EM waves (through moving F photons), it is likely that the two velocities c_F and *c* are not equal, meaning that there are good reasons to assume that $c_F > c$. From the way in which the FV wave has been defined in Sec. 3, it seems that the velocity c_F should correspond to the "gravitational'' waves, which are effectively the result of the interaction between the electric dipoles F_{DC} on the basis of the completed Coulomb's law.

During the long journey of the photon F in the cosmos through the ether, there may occur some energy loss ΔW, whereby such a loss will be taken from a photon's own energy $h\upsilon_i$. If so,

through the reduction of its own frequency υ_i, this way may explain the red shift of the light waves coming from long-distance light sources, without employing the speed away of sources, which apparently increases with distance, with respect to the terrestrial observer.

At the same time, at the arrival of an EM wave near to a material body consisting of MPs, Fs photons arrive in that zone. Fs photons also consist of etherons in a state of special vibration, which are specific to the EM wave, and will be accompanied or even preceded by the waves of fundamental vibration FV, which are produced by F itself. Close to the MB, the FV waves of F photons will first encounter the waves of the fundamental vibration FV, which are produced by MPs from CM, in which their intensity increases with the approach of MB. Thus, the interaction between the MB and Fs is actually an interference of the FVs vibrations of the two MPs; this explains the particle-wave behaviour of the EM waves and implicitly of the F photons , as well as the MP de Broglie waves.

The interaction between the MP and EM waves could be of one of the types of reflection, refraction or absorption (of the EM wave). The occurrence of one or another of the three types of interactions will be the result of the interference of the FV vibrations/waves by the two entities, F and MP from MB, while the physical properties of the MB and the EM waves will also be involved.

In the absence of the FV waves of F and MP, due to the size of F, on the order of 10^{-15}m, and of the distance between MPs, on the order of 10^{-9}m, the direct contact between F and MPs from MB will have a negligible probability of occurrence, such that the above phenomena will not happen. As such, we can only admit a phenomenon of the crossing over of MB by the EM waves with no interaction, as in the case of the vacuum, which does not actually happen in reality.

Acknowledgements

The first author acknowledges the initial advice on the subject and encouragement of his late professor N. Barbulescu. He is sincerely grateful to late prof. P. Mazilu from TUCB Bucharest for his rigorous lessons of rationality. He is also indebted to Gen. prof. G. Barsan from LFA Sibiu, to prof. D. Stoicescu from ULBS Sibiu, to prof. D. Siposan from MTA Bucharest, to Miss Veronica Has.

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Figure legends.

Fig. 1. Constitution of the HM16 model of ether from a grid of etherons in contact and involving a structure of MPs from groups of vibrating etherons.

Fig. 2. Representation of the fundamental vibrations FV and the forces they generate in the ether upon the MPs or SMPs

Fig. 3. Model of the interaction between the photon F1 with random direction and MP1, by FVs in the ether.