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Physics and Space Science

Highlights

- Great Cosmic Sea of Reality
- Effects of Electromagnetic Waves
- Force Interaction of the Current
- Described by the Great Cosmic Sea

Discovering Thoughts, Inventing Future

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Force Interaction of the Current-Carrying Systems and Ponderomotive Effects of Electromagnetic Waves

By F. F. Mende

Abstract- From the times of Lorenz and Poincare the Lorentz force was introduced as experimental postulate, and up to now there was no explanation of its physical nature. in the article is proven that the Lorentz force is the consequence of the dependence of the scalar potential of charge on the speed. This made possible to explain physics of power interaction of the current carrying systems, and also operating principle of unipolar generators. It is shown also, that the ponderomotive action of electromagnetic waves is the consequence of the dependence of the scalar potential of charge on the speed, but not by the consequence of the fact that, as it was considered earlier, electromagnetic wave possesses mechanical impulse.

Keywords: *maxwell's equation, lorentz force, scalar- vector potential, ponderomotive force.*

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I. Introduction

From the times of Lorenz and Poincare the Lorentz force was introduced as experimental postulate, and up to now there was no explanation of its physical nature. From a physical point of view the force, which acts on the material object, must be connected with its acceleration. Forces can also bear potential nature, being the gradient scalar potential field, in which it to be located. But Lorentz force is not placed in the category of the forces examined and is an exception to these rules. in the article is proven that the Lorentz force is the consequence of the dependence of the scalar potential of charge on the speed. This made possible to explain physics of power interaction of the current carrying systems, and also operating principle of all existing types of unipolar generators. It is shown also, that the ponderomotive action of electromagnetic waves is the consequence of the dependence of the scalar potential of charge on the speed, but not by the consequence of the fact that, as it was considered earlier, electromagnetic wave possesses mechanical impulse.

II. Dynamic Potentials and The Field of The Moving Charges

As already mentioned, in the classical electrodynamics be absent the rule of the conversion of electrical and magnetic fields on upon transfer of one inertial system to another. This deficiency removes SR, basis of which are the covariant Lorenz conversions. With the entire mathematical validity of this approach the physical essence of such conversions up to now remains unexplained [1].

In this division will made attempt find the precisely physically substantiated ways of obtaining the conversions fields on upon transfer of one IRS to another, and to also explain what dynamic potentials and fields can generate the moving charges. The first step, demonstrated in the works [2-4], was made in this direction a way of the introduction of the symmetrical laws of magnetoelectric and electromagnetic induction. These laws are written as follows [5, 4-9]:

$$\begin{aligned}\oint \mathbf{E}'dl' &= -\int \frac{\partial \mathbf{B}}{\partial t}d\mathbf{s} + \oint [\mathbf{v}\times\mathbf{B}]dl' \\ \oint \mathbf{H}'dl' &= \int \frac{\partial \mathbf{D}}{\partial t}d\mathbf{s} - \oint [\mathbf{v}\times\mathbf{D}]dl'\end{aligned}, \qquad (2.1)$$

or

$$\begin{aligned}rot\mathbf{E}' &= -\frac{\partial \mathbf{B}}{\partial t} + rot[\mathbf{v}\times\mathbf{B}] \\ rot\mathbf{H}' &= \frac{\partial \mathbf{D}}{dt} - rot[\mathbf{v}\times\mathbf{D}]\end{aligned}. \qquad (2.2)$$

For the constants fields on these relationships they take the form:

$$\begin{aligned}\mathbf{E}' &= [\mathbf{v}\times\mathbf{B}] \\ \mathbf{H}' &= -[\mathbf{v}\times\mathbf{D}]\end{aligned}. \qquad (2.3)$$

In relationships (2.1-2.3), which assume the validity of the Galileo conversions, prime and not prime values present fields and elements in moving and fixed IRS respectively. It must be noted, that conversions (2.3) earlier could be obtained only from the Lorenz conversions.

The relationships (2.1-123), which present the laws of induction, do not give information about how arose fields in initial fixed IRS. They describe only laws governing the propagation and conversion fields on in

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the case of motion with respect to the already existing fields.

The relationship (2.3) attest to the fact that in the case of relative motion of frame of references, between the fields $\mathbf{E}$ and $\mathbf{H}$ there is a cross coupling, i.e., motion in the fields $\mathbf{H}$ leads to the appearance fields on $\mathbf{E}$ and vice versa. From these relationships escape the additional consequences, which were for the first time examined in the work [10]. Ifthe chargedrod has alinearcharge g ,its electric field $E = \frac{g}{2\pi\varepsilon r}$ decreases according to the law $\frac{1}{r}$, where r isdistance from the centralaxis of the rodto the observation point.

If we in parallel to the axis of rod in the field E begin to move with the speed Δv another IRS, then in it will appear the additional magnetic field $\Delta H = \varepsilon E \Delta v$. If we now with respect to already moving IRS begin to move third frame of reference with the speed Δv, then already due to the motion in the field ΔH will appear additive to the electric field $\Delta E = \mu\varepsilon E(\Delta v)^2$. This process can be continued and further, as a result of which can be obtained the number, which gives the value of the electric field $E'_v(r)$ in moving IRS with reaching of the speed $v = n\Delta v$, when $\Delta v \to 0$, and $n \to \infty$. In the final analysis in moving IRS the value of dynamic electric field will prove to be more than in the initial and to be determined by the relationship:

$$E'(r, v_\perp) = \frac{gch\frac{v_\perp}{c}}{2\pi\varepsilon r} = Ech\frac{v_\perp}{c}.$$

If speech goes about the electric field of the single charge e, then its electric field will be determined by the relationship:

$$E'(r, v_\perp) = \frac{ech\frac{v_\perp}{c}}{4\pi\varepsilon r^2} \quad ,$$

where $v_\perp$ - normal component of charge rate to the vector, which connects the moving charge and observation point.

Expression for the scalar potential, created by the moving charge, for this case will be written down as follows:

$$\varphi'(r, v_\perp) = \frac{ech\frac{v_\perp}{c}}{4\pi\varepsilon r} = \varphi(r)ch\frac{v_\perp}{c}, \qquad (2.4)$$

where $\varphi(r)$ - scalar potential of fixed charge. The potential $\varphi'(r, v_\perp)$ can be named scalar-vector, since it depends not only on the absolute value of charge, but also on speed and direction of its motion with respect to the observation point. Maximum value this potential has in the direction normal to the motion of charge itself. Moreover, if charge rate changes, which is connected with its acceleration, then can be calculated the electric fields, induced by the accelerated charge.

During the motion in the magnetic field, using the already examined method, we obtain:

$$H'(v_\perp) = Hch\frac{v_\perp}{c}.$$

where $v_\perp$ - speed normal to the direction of the magnetic field. The same result can be obtained by another method.

Let us designate field variables in the fixed frame of reference without the prime, and in the mobile – with the prime. In the differential form let us write down the formulas of the mutual induction of electrical and magnetic fields on in the mobile frame of reference as follows:

$$dH' = \varepsilon E' dv_\perp, \qquad .. \qquad (2.5)$$

$$dE' = \mu H' dv_\perp. \qquad (2.6)$$

Or otherwise,

$$\frac{dH'}{dv_\perp} = \varepsilon E', \qquad (2.7)$$

$$\frac{dE'}{dv_\perp} = \mu H', \qquad (2.8)$$

where (2.7) it corresponds (2.5), and (2.8) it corresponds (2.6).

After dividing equations (2.7) and (2.8) on E and H , we will obtain respectively:

$$\frac{d(H'/E)}{dv_\perp} = \varepsilon\frac{E'}{E}, \qquad (2.9)$$

$$\frac{d(E'/E)}{dv_\perp} = \mu\frac{H'}{H}. \qquad (2.10)$$

Differentiating both parts (2.10), we have:

$$\frac{d^2(E'/E)}{d^2 v_\perp} = \mu\frac{d(H'/E)}{dv_\perp}. \qquad (2.11)$$

After substituting (2.9) in (2.11), we will obtain:

$$\frac{d^2(E'/E)}{d^2 v_\perp} = \mu\varepsilon \frac{E'}{E}. \qquad (2.12)$$

The function is the general solution (2.12) of differential equation

$$\frac{E'}{E} = C_2 ch\left(\frac{v_\perp}{c}\right) + C_1 sh\left(\frac{v_\perp}{c}\right), \qquad (2.13)$$

where c – the speed of light, C_1, C_2 – arbitrary constants.

Since with $v_\perp = 0$ must be made $E' = E$, that from (2.13) we will obtain:

$$C_2 = 1. \qquad (2.14)$$

After substituting (2.14) in (2.13), we finally have the general solution, into which enters one arbitrary constant C_1:

$$\frac{E'}{E} = ch\left(\frac{v_\perp}{c}\right) + C_1 sh\left(\frac{v_\perp}{c}\right).$$

Selecting $C_1 = 0$, we obtain

$$E' = Ech\left(\frac{v_\perp}{c}\right).$$

If we apply the obtained results to the electromagnetic wave and to designate components fields on parallel speeds IRS as $E_\uparrow$, $H_\uparrow$, and $E_\perp$, $H_\perp$ as components normal to it, then conversions fields on they will be written down:

$$\begin{aligned}
&\mathbf{E}'_\uparrow = \mathbf{E}_\uparrow,\\
&\mathbf{E}'_\perp = \mathbf{E}_\perp ch\frac{v}{c} + \frac{Z_0}{v}\left[\mathbf{v}\times\mathbf{H}_\perp\right] sh\frac{v}{c},\\
&\mathbf{H}'_\uparrow = \mathbf{H}_\uparrow,\\
&\mathbf{H}'_\perp = \mathbf{H}_\perp ch\frac{v}{c} - \frac{1}{vZ_0}\left[\mathbf{v}\times\mathbf{E}_\perp\right] sh\frac{v}{c},
\end{aligned} \qquad (2.15)$$

where $Z_0 = \sqrt{\frac{\mu_0}{\varepsilon_0}}$ - impedance of free space, $c = \sqrt{\frac{1}{\mu_0\varepsilon_0}}$ - speed of light.

III. Power Interaction Of The Current Carrying systems, Homopolar Induction And The Pondermotive Forces

It was already said, that Maxwell equations do not include information about power interaction of the current carrying systems. In the classical electrodynamics for calculating such an interaction it is necessary to calculate magnetic field in the assigned region of space, and then, using a Lorentz force, to find the forces, which act on the moving charges. Obscure a question about that remains with this approach, to what are applied the reacting forces with respect to those forces, which act on the moving charges.

The concept of magnetic field arose to a considerable degree because of the observations of power interaction of the current carrying and magnetized systems. Experience with the iron shavings, which are erected near the magnet poles or around the annular turn with the current into the clear geometric figures, is especially significant. These figures served as occasion for the introduction of this concept as the lines of force of magnetic field. In accordance with third Newton's law with any power interaction there is always a equality of effective forces and opposition, and also always there are those elements of the system, to which these forces are applied. A large drawback in the concept of magnetic field is the fact that it does not give answer to that, counteracting forces are concretely applied to what, since. magnetic field comes out as the independent substance, with which occurs interaction of the moving charges.

Is experimentally known that the forces of interaction in the current carrying systems are applied to those conductors, whose moving charges create magnetic field. However, in the existing concept of power interaction of the current carrying systems, based on the concepts of magnetic field and Lorentz force, the positivelyharged lattice, which is the frame of conductor and to which are applied the forces, it does not participate in the formation of the forces of interaction.

That that the positively charged ions take direct part in the power processes, speaks the fact that in the process of compressing the plasma in transit through its direct current (the so-called pinch effect) it occurs the compression also of ions.

Let us examine this question within the framework of the concept of scalar- vector potential. We will consider that the scalar- vector potential of single charge is determined by relationship (2.4), and that the electric fields, created by this potential, act on all surrounding charges, including to the charges positively charged lattices.

Let us examine from these positions power interaction between two parallel conductors (Fig. 1),

along which flow the currents. We will consider that g_1^+, g_2^+ and g_1^-, g_2^- present the respectively fixed and moving charges, which fall per unit of the length of conductor.

The charges g_1^+, g_2^+ present the positively charged lattice in the lower and upper conductors. We will also consider that both conductors prior to the start of charges are electrically neutral, i.e., in the conductors there are two systems of the mutually inserted opposite charges with the specific density to g_1^+, g_1^- and g_2^+, g_2^-, which electrically neutralize each other.

In Fig. 1 these systems for larger convenience in the examination of the forces of interaction are moved apart along the axis z. Subsystems with the negative charge (electrons) can move with the speeds of v_1, v_2. The force of interaction between the lower and upper conductors we will search for as the sum of four forces, whose designation is understandable from the figure.

The repulsive forces F_1, F_2 we will take with the minus sign, while the attracting force F_3, F_4 we will take with the plus sign.

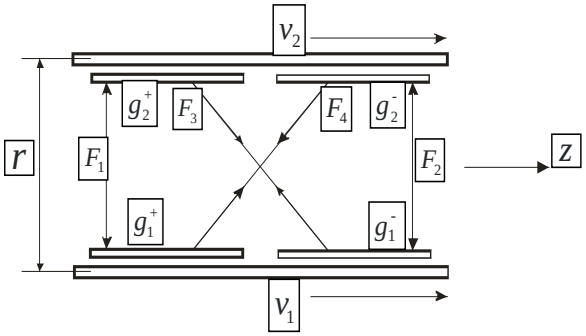

Fig. 1: Schematic of power interaction of the current carrying wires of two-wire circuit taking into account the positively charged lattice

For the single section of the two-wire circuit of force, acting between the separate subsystems, will be written down

$$F_1 = -\frac{g_1^+ g_2^+}{2\pi\varepsilon r},\ F_2 = -\frac{g_1^- g_2^-}{2\pi\varepsilon r} ch\frac{v_1 - v_2}{c},\ F_3 = +\frac{g_1^- g_2^+}{2\pi\varepsilon r} ch\frac{v_1}{c},\ F_4 = +\frac{g_1^+ g_2^-}{2\pi\varepsilon r} ch\frac{v_2}{c}. \quad (3.1)$$

Adding all force components, we will obtain the amount of the composite force, which falls per unit of the length of conductor,

$$F_\Sigma = \frac{g_1 g_2}{2\pi\varepsilon r}\left(ch\frac{v_1}{c} + ch\frac{v_2}{c} - ch\frac{v_1 - v_2}{c} - 1\right) \quad (3.2)$$

In this expression as g_1, g_2 are undertaken the absolute values of charges, and the signs of forces are taken into account in the bracketed expression. For the case $v << c$, let us take only two first members of expansion in the series $ch\frac{v}{c}$, i.e., we will consider that $ch\frac{v}{c} \cong 1 + \frac{1}{2}\frac{v^2}{c^2}$. From relationship (3.2) we obtain

$$F_{\Sigma 1} = \frac{g_1 v_1 g_2 v_2}{2\pi\varepsilon c^2 r} = \frac{I_1 I_2}{2\pi\varepsilon c^2 r}, \quad (3.3)$$

where g_1, g_2 are undertaken the absolute values of specific charges, and v_1, v_2 take with its signs.

Since the magnetic field of straight wire, along which flows the current I, we determine by the relationship

$$H = \frac{I}{2\pi r},$$

From relationship (18.2) we obtain

$$F_{\Sigma 1} = \frac{I_1 I_2}{2\pi\varepsilon c^2 r} = \frac{H_1 I_2}{\varepsilon c^2} = I_2 \mu H_1,$$

where H_1 - the magnetic field, created by lower conductor in the location of upper conductor.
It is analogous

$$F_{\Sigma 1} = I_1 \mu H_2,$$

where H_2 - the magnetic field, created by upper conductor in the region of the arrangement of lower conductor. These relationships completely coincide with the results, obtained on the basis of the concept of magnetic field.

The relationship (3.3) represents the known rule of power interaction of the current carrying systems, but is obtained it not by the phenomenological way on the basis of the introduction of phenomenological magnetic field, but on the basis of completely intelligible physical procedures, under the assumption that that the scalar potential of charge depends on speed. In the formation of the forces of interaction in this case the lattice takes direct part, which is not in the model of magnetic field. In the model examined are well visible the places of application of force. The obtained relationships coincide with the results, obtained on the basis of the concept of magnetic field and by the axiomatically introduced Lorentz force. In this case is undertaken only first

member of expansion in the series $ch\frac{v}{c}$. For the speeds $v \sim c$ should be taken all terms of expansion. In terms of this the proposed method is differed from the method of calculation of power interactions by the basis of the concept of magnetic field. If we consider this circumstance, then the connection between the forces of interaction and the charge rates proves to be nonlinear. This, in particular it leads to the fact that the law of power interaction of the current carrying systems is asymmetric. With the identical values of currents, but with their different directions, the attracting forces and repulsion become unequal. Repulsive forces prove to be greater than attracting force. This difference is small and is determined by the expression

$$\Delta F = \frac{v^2}{2c^2}\frac{I_1 I_2}{2\pi\varepsilon c^2 \varepsilon},$$

but with the speeds of the charge carriers of close ones to the speed of light it can prove to be completely perceptible.

Let us remove the lattice of upper conductor (Fig. 2), after leaving only free electronic flux. In this case will disappear the forces F_1, F_3, and this will indicate interaction of lower conductor with the flow of the free electrons, which move with the speed of v_2 on the spot of the arrangement of upper conductor. In this case the value of the force of interaction is defined as:

$$F_\Sigma = \frac{g_1 g_2}{2\pi\varepsilon r}\left(ch\frac{v_2}{c} - ch\frac{v_1 - v_2}{c}\right) \qquad (3.4)$$

Lorentz force assumes linear dependence between the force, which acts on the charge, which moves in the magnetic field, and his speed. However, in the obtained relationship the dependence of the amount of force from the speed of electronic flux will be nonlinear. From relationship (3.4) it is not difficult to see that with an increase in v_2 the deviation from the linear law increases, and in the case, when $v_2 >> v_1$, the force of interaction are approached zero. This is very meaningful result. Specifically, this phenomenon observed in their known experiments Thompson and Kauffmann, when they noted that with an increase in the velocity of electron beam it is more badly slanted by magnetic field. They connected the results of their observations with an increase in the mass of electron. As we see reason here another.

Let us note still one interesting result. From relationship (3.3), with an accuracy to quadratic terms, the force of interaction of electronic flux with the rectilinear to determine according to the following dependence:

$$F_\Sigma = \frac{g_1 g_2}{2\pi\varepsilon r}\left(\frac{v_1 v_2}{c^2} - \frac{1}{2}\frac{v_1^2}{c^2}\right) \qquad (3.5)$$

From expression (3.5) follows that with the unidirectional electron motion in the conductor and in the electronic flux the force of interaction with the fulfillment of conditions $v_1 = \frac{1}{2}v_2$ is absent.

Since the speed of the electronic flux usually much higher than speed of current carriers in the conductor, the second term in the brackets in relationship (3.5) can be disregarded. Then, since

$$H_1 = \frac{g_1 v_1}{2\pi\varepsilon c^2 r}$$

we will obtain the magnetic field, created by lower conductor in the place of the motion of electronic flux

$$F_\Sigma = \frac{g_1 g_2}{2\pi\varepsilon r}\frac{v_1 v_2}{c^2} = g_2 \mu v_2 H .$$

In this case, the obtained value of force exactly coincides with the value of Lorentz force. Taking into account that

$$F_\Sigma = g_2 E = g_2 \mu v_2 H ,$$

it is possible to consider that on the charge, which moves in the magnetic field, acts the electric field E, directed normal to the direction of the motion of charge. This result also with an accuracy to of the quadratic terms $\frac{v^2}{c^2}$ completely coincides with the results of the concept of magnetic field and is determined the Lorentz force, which acts from the side of magnetic field to the flow of the moving electrons.

As was already said, one of the important contradictions to the concept of magnetic field is the fact that two parallel beams of the like charges, which are moved with the identical speed in one direction, must be attracted. In this model there is no this contradiction already. If we consider that the charge rates in the upper and lower wire will be equal, and lattice is absent, i.e., to leave only electronic fluxes, then will remain only the repulsive force F_2.

Thus, the moving electronic flux interacts simultaneously both with the moving electrons in the lower wire and with its lattice, and the sum of these forces of interaction it is called Lorentz force. This force acts on the moving electron stream.

Regularly does appear a question, and does create magnetic field most moving electron stream of in the absence compensating charges of lattice or positive ions in the plasma? The diagram examined shows that

the effect of power interaction between the current carrying systems requires in the required order of the presence of the positively charged lattice. Therefore most moving electronic flux cannot create that effect, which is created during its motion in the positively charged lattice. At the same time, if we examine two in parallel moving electron streams, then appears the extra force of interaction, which depends on the relative speed of these flows.

Let us demonstrate still one approach to the problem of power interaction of the current carrying systems. The statement of facts of the presence of forces between the current carrying systems indicates that there is some field of the scalar potential, whose gradient ensures the force indicated. But that this for the field? Relationship (3.3) gives only the value of force, but he does not speak about that, the gradient of what scalar potential ensures these forces. We will support with constants the currents I_1, I_2, and let us begin to draw together or to move away conductors. The work, which in this case will be spent, and is that potential, whose gradient gives force. After integrating relationship (3.3) on r, we obtain the value of the energy:

$$W = \frac{I_1 I_2 \ln r}{2\pi\varepsilon c^2}.$$

This energy, depending on that to move away conductors from each other, or to draw together, can be positive or negative. When conductors move away, then energy is positive, and this means that, supporting current in the conductors with constant, generator returns energy. This phenomenon is the basis the work of all electric motors. If conductors converge, then work accomplish external forces, on the source, which supports in them the constancy of currents. This phenomenon is the basis the work of the mechanical generators of emf.

Relationship for the energy can be rewritten and thus:

$$W = \frac{I_1 I_2 \ln r}{2\pi\varepsilon c^2} = I_2 A_{z1} = I_1 A_{z2},$$

where

$$A_{z1} = \frac{I_1 \ln r}{2\pi\varepsilon c^2}$$

is z - component of vector potential, created by lower conductor in the location of upper conductor, and

$$A_{z2} = \frac{I_2 \ln r}{2\pi\varepsilon c^2}$$

is z - component of vector potential, created by upper conductor in the location of lower conductor.

The approach examined demonstrates that large role, which the vector potential in questions of power interaction of the current carrying systems and conversion of electrical energy into the mechanical plays. This approach also clearly indicates that the Lorentz force is a consequence of interaction of the current carrying systems with the field of the vector potential, created by other current carrying systems. Important circumstance is the fact that the formation of vector potential is obliged to the dependence of scalar potential on the speed. This is clear from a physical point of view. The moving charges, in connection with the presence of the dependence of their scalar potential on the speed, create the scalar field, whose gradient gives force. But the creation of any force field requires expenditures of energy. These expenditures accomplishes generator, creating currents in the conductors. In this case in the surrounding space is created the special field, which interacts with other moving charges according to the special vector rules, with which only scalar product of the charge rate and vector potential gives the potential, whose gradient gives the force, which acts on the moving charge. This is a Lorentz force.

In spite of simplicity and the obviousness of this approach, this simple mechanism up to now was not finally realized. For this reason the Lorentz force, until now, was introduced in the classical electrodynamics by axiomatic way.

Let us examine the still one interesting consequence, which escapes from the given examination. If we as the planes of long line use an superconductor, then the magnetic field on its surface, equal to specific current, can be determined from the relationship:

$$H = nev\lambda \qquad (3.6)$$

where $\lambda = \sqrt{\frac{m}{ne^2\mu}}$ - depth of penetration of magnetic field into the superconductor.

If we substitute the value of depth of penetration into relationship (3.6), then we will obtain the unexpected result:

$$H = v\sqrt{\frac{nm}{\mu}}.$$

Occurs that the magnetic field strength completely does not depend on the magnitude of the charge of current carriers, but it depends on their mass. Thus, the density energy of magnetic fields

$$W_H = \frac{1}{2}\mu H^2 = \frac{nmv^2}{2} \qquad (3.7)$$

is equal to density of the kinetic energy of charges. But the magnetic field, connected with the motion of current carriers in the surface layer of superconductor, exists not only on its surface, also, in the skin-layer. Volume, occupied by magnetic fields, incommensurably larger than the volume of this layer. If we designate the length of the line, depicted in Fig. 2 as l, then the volume of skin-layer in the superconductive planes of line will compose $2lb\lambda$. Density energy of magnetic fields on in this volume we determine from the relationship:

$$W_{H,\lambda} = nmv^2 lb\lambda,$$

however, density energy of magnetic fields on, accumulated between the planes of line, it will comprise:

$$W_{H,a} = \frac{nmv^2 lba}{2} = \frac{1}{2} lba\mu_0 H. \qquad (3.8)$$

If one considers that the depth of penetration of magnetic field in the superconductors composes several hundred angstroms, then with the macroscopic dimensions of line it is possible to consider that the total energy of magnetic fields on in it they determine by relationship (3.8). Therefore, the formation of magnetic fields on H between the planes of line, which appear in connection with the motion of charges in the skin-layer, it requires the same expenditures of energy, as if entire volume of line was filled with the particles, which move with the speed of v, whose density and mass compose respectively n and m.

Is obvious that the effective mass of electron in comparison with the mass of free electron grows in this case into $\frac{a}{2\lambda}$ of times. This is the consequence of the fact that the mechanical electron motion leads not only to the accumulation of their kinetic energy in the skin-layer, but in the line also occurs accumulation and potential energies, whose gradient gives the force, which acts on the conducting planes of line. Thus, becomes clear nature of such parameters as inductance and the effective mass of electron, which in this case depend, in essence, not from the mass of free electrons, but from the configuration of conductors, on which the electrons move.

The homopolar induction was discovered still by Faraday almost 200 years ago, but in the classical electrodynamics of final answer to that as and why work some constructions of unipolar generators, there is no up to now. Is separately incomprehensible the case, when there is a revolving magnetized conducting cylinder, during motion of which between the fixed contacts, connected to its axis and generatrix, appears emf. Is still more incomprehensible the case, when together with the cylindrical magnet revolves the conducting disk, which does not have galvanic contact with the magnet, but fixed contacts are connected to the axis of disk and its generatrix. In some sources it is indicated that the answer can be obtained within the framework SR, but there are no concrete references, as precisely SR explain the cases indicated. It will be further shown that the concrete answers to all these questions can be obtained within the framework the concept of the dependence of the scalar potential of charge on its relative speed.

Let us examine the case, when there is a single long conductor, along which flows the current. We will as before consider that in the conductor is a system of the mutually inserted charges of the positive lattice g^+ and free electrons g^-, which in the absence current neutralize each other (Fig.2).

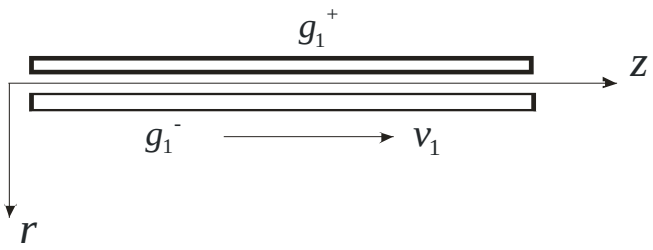

Fig. 2: Section is the conductor, along which flows the current

The electric field, created by rigid lattice depending on the distance r from the center of the conductor that is located along the axis z it takes the form

$$E^+ = \frac{g^+}{2\pi\varepsilon r} \qquad (3.9)$$

We will consider that the direction of the vector of electric field coincides with the direction r. If electronic flux moves with the speed v_1, then the electric field of this flow is determined by the equality

$$E^- = -\frac{g^-}{2\pi\varepsilon r} ch\frac{v_1}{c} \cong -\frac{g^-}{2\pi\varepsilon r}\left(1+\frac{1}{2}\frac{v_1^2}{c^2}\right) \qquad (3.10)$$

Adding (3.9) (3.10), we obtain:

$$E^- = -\frac{g^- v_1^2}{4\pi\varepsilon c^2 r}$$

This means that around the conductor with the current is an electric field, which corresponds to the negative charge of conductor. However, this field has insignificant value, since in the real conductors $v \leq c$. This field can be discovered only with the current densities, which can be achieved in the

superconductors, which is experimentally confirmed in works.

Let us examine the case, when very section of the conductor, on which with the speed v_1 flow the electrons, moves in the opposite direction with speed v (Fig. 3). In this case relationships (3.9) and (3.10) will take the form

$$E^+ = \frac{g^+}{2\pi\varepsilon r}\left(1+\frac{1}{2}\frac{v^2}{c^2}\right) \qquad (3.11)$$

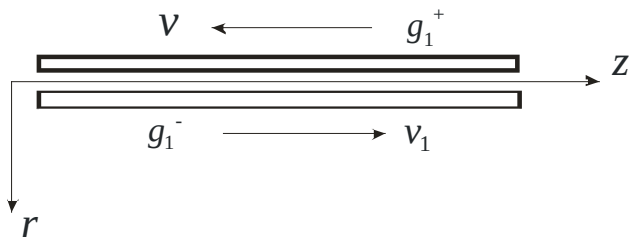

Fig. 3: Moving conductor with the current

$$E^- = -\frac{g^-}{2\pi\varepsilon r}\left(1+\frac{1}{2}\frac{(v_1-v)^2}{c^2}\right) \qquad (3.12)$$

Adding (3.11) (3.12), we obtain

$$E^+ = \frac{g}{2\pi\varepsilon r}\left(\frac{v_1 v}{c^2}-\frac{1}{2}\frac{v_1^2}{c^2}\right). \qquad (3.13)$$

In this relationship as the specific charge is undertaken its absolute value. since the speed of the mechanical motion of conductor is considerably more than the drift velocity of electrons, the second term in the brackets can be disregarded. In this case from (3.13) we obtain

$$E^+ = \frac{gv_1 v}{2\pi\varepsilon c^2 r}. \qquad (3.14)$$

The obtained result means that around the moving conductor, along which flows the current, with respect to the fixed observer is formed the electric field, determined by relationship (3.14), which is equivalent to appearance on this conductor of the specific positive charge of the equal

$$g^+ = \frac{gv_1 v}{c^2}.$$

If we conductor roll up into the ring and to revolve it then so that the linear speed of its parts would be equal v, then around this ring will appear the electric field, which corresponds to the presence on the ring of the specific charge indicated. But this means that the revolving turn, which is the revolving magnet, acquires specific electric charge on wire itself, of which it consists. During the motion of linear conductor with the current the electric field will be observed with respect to the fixed observer, but if observer will move together with the conductor, then such fields will be absent.

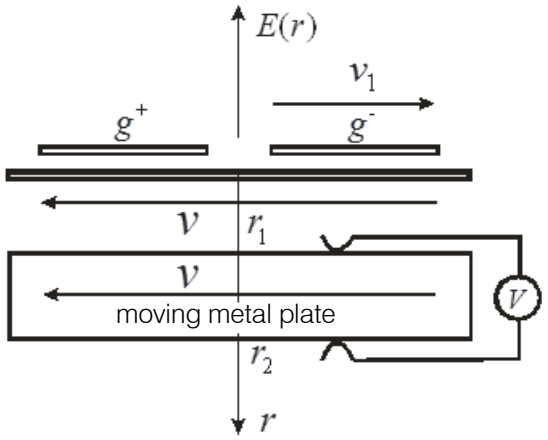

Fig. 4: Diagram of formation emf homopolar induction.

As is obtained the homopolar induction, with which on the fixed contacts a potential difference is obtained, it is easy to understand from Fig. 4.

We will consider that r_1, r_2 of the coordinate of the points of contact of the tangency of the contacts, which slide along the edges of the metallic plate, which moves with the same speed as the conductor, along which flows the current. Contacts are connected to the voltmeter, which is also fixed. Then, it is possible to calculate a potential difference between these contacts, after integrating relationship (3.14):

$$U = \frac{gv_1 v}{2\pi\varepsilon c^2}\int_{r_1}^{r_2}\frac{dr}{r} = \frac{gv_1 v}{2\pi\varepsilon c^2}\ln\frac{r_2}{r_1}.$$

But in order to the load, in this case to the voltmeter, to apply this potential difference, it is necessary sliding contacts to lock by the cross connection, on which there is no potential difference indicated. But since metallic plate moves together with the conductor, a potential difference is absent on it. It serves as that cross connection, which gives the possibility to convert this composite outline into the source emf. with respect to the voltmeter.

Now it is possible wire to roll up into the ring (Fig. 5) of one or several turns, and to feed it from the current source. Moreover contacts 1 should be derived on the collector rings, which are located on the rotational axis and to them joined the friction fixed brushes. Thus, it is possible to obtain the revolving magnet. In this magnet should be placed the conducting disk with the opening, which revolves together with the turns of the wire, which serves as magnet, and with the aid of the fixed contacts, that slide

on the generatrix of disk, tax voltage on the voltmeter. As the limiting case it is possible to take continuous metallic disk and to connect sliding contacts to the generatrix of disk and its axis. Instead of the revolving turn with the current it is possible to take the disk, magnetized in the axial direction, which is equivalent to turn with the current, in this case the same effect will be obtained.

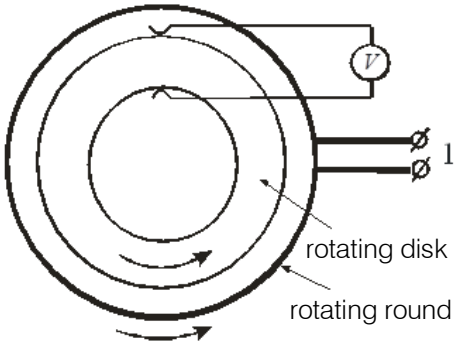

Fig. 5: Schematic of unipolar generator with the revolving turn with the current and the revolving conducting ring.

The case with the fixed magnet and the revolving conducting disk is characterized by the diagram, depicted in Fig. 6, if the conducting plate was rolled up into the ring.

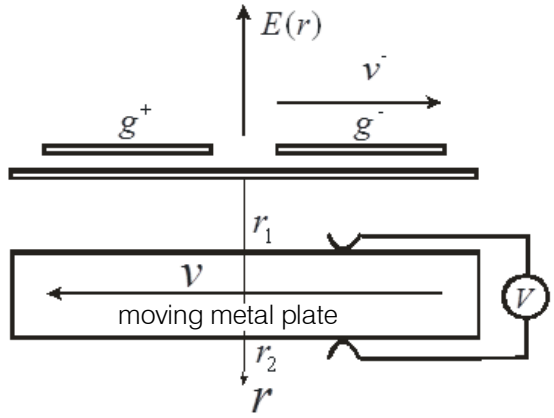

Fig. 6: The case of fixed magnet and revolving disk.

Different combinations of the revolving and fixed magnets and disks are possible.

In this case the following relationships are fulfilled:

The electric field, generated in the revolving disk by the electrons, which move along the conductor, is determined by the relationship

$$E^- = -\frac{g^-}{2\pi\varepsilon r} ch\frac{v_1 - v}{c} = -\frac{g^-}{2\pi\varepsilon r}\left(1 + \frac{1}{2}\frac{(v_1 - v)^2}{c^2}\right),$$

and by the fixed ions

$$E^+ = \frac{g^+}{2\pi\varepsilon r} ch\frac{v}{c} = \frac{g^-}{2\pi\varepsilon r}\left(1 + \frac{1}{2}\frac{v^2}{c^2}\right).$$

The summary tension of electric field in this case will comprise

$$E_\Sigma = \frac{g}{2\pi\varepsilon r}\left(\frac{vv_1}{c^2}\right),$$

and a potential difference between the points r_1 and r_2 in the coordinate system, which moves together with the plate, will be equal

$$U = \frac{g(r_2 - r_1)}{2\pi\varepsilon r}\left(\frac{vv_1}{c^2}\right).$$

Since in the fixed with respect to the magnet of the circuit of voltmeter the induced potential difference is absent, the potential difference indicated will be equal by the electromotive force of the generator examined. As earlier moving conducting plate can be rolled up into the disk with the opening, and the wire, along which flows the current into the ring with the current, which is the equivalent of the magnet, magnetized in the end direction.

Thus, the concept of the dependence of the scalar potential of charge on the relative speed gives answers to all presented questions and SR here it is not necessary.

From these positions it is possible to examine the ponderomotive action of electrical and magnetic fields on to any interface. Current in the region of boundary must be scalar multiplied by the vector potential. The gradient of this work will give the forces, which act on the surface. With this approach calculation of the dependence of the potential gradient energy on the coordinate gives information about the internal stresses, which act in the region of boundary.

Is most easy this it is possible to understand based on the example of superconductors, EM of the waves or presence on their surface of constant magnetic or electrical fields on with the drop on them. In the superconductors the current density is unambiguously connected with the vector potential, and the work of current to the vector potential is potential energy. But since currents in the superconductor diminish exponentially, potential energy of these currents diminishes thus, and the potential gradient energy in the surface layer and On the Border superconductor is the reason for the appearance of ponderomotive forces. By here what defined by example means magnetic field and the incident electromagnetic wave exerts pressure on the surface of superconductor.

Potential electric current energy, which flow in the superconductor is determined by the relationship

$$W = \frac{1}{2}\mu\int \mathbf{jA}dV .$$

Current density in the superconductor changes according to the law

$$\mathbf{j}(z) = \mathbf{j}(0)e^{-\frac{z}{\lambda}} .$$

According to the same law changes the vector potential $\mathbf{A}$. Thus

$$W = \frac{1}{2}\mu\int \mathbf{jA}dV = \frac{1}{2}\mu\int \mathbf{j}(0)\mathbf{A}(0)e^{-\frac{2z}{\lambda}}dz$$

Consequently, ponderomotive force will have a value

$$\mathbf{F} = -gradW = \frac{1}{2}\mu\mathbf{j}(0)\mathbf{A}(0)e^{-\frac{2z}{\lambda}} .$$

In the superconductor the current density is determined by the relationship

$$\mathbf{j} = -\frac{\mu}{L_k}\mathbf{A},$$

where $L_k = \frac{m}{ne^2}$ - the kinetic inductance of charges,

$\lambda = \sqrt{\frac{L_k}{\mu}}$ - London depth of penetration.

Therefore

$$\mathrm{F} = \frac{1}{2}\mathrm{j}^2(0)L_k e^{-\frac{2z}{\lambda}}$$

This force is equal on the surface

$$\mathrm{F} = \frac{1}{2}\mathrm{j}^2(0)L_k$$

The magnetic field on its surface of superconductor, equal to specific current, can be determined from the relationship
by the current, which flows under the surface

$$H = I = \int j(0)e^{-\frac{z}{\lambda}}dz = \lambda j(0)$$

Is consequently the force applied to the surface of superconductor

$$\mathrm{F} = \frac{1}{2}\mathrm{j}^2(0)L_k = \frac{1}{2}H^2\frac{L_k}{\lambda^2} = \frac{1}{2}\mu H^2$$

If electromagnetic wave is incident on the surface of superconductor, $H = H_0 \sin\omega t$, then it generates on its surface the specific current

$$I = H = H_0 \sin\omega t .$$

Ponderomotive force in this case will be equal

$$\mathrm{F} = \frac{1}{2}\mu H_0^2 \sin^2\omega t$$

The constant component of this force to be determined by the relationship

$$\mathrm{F} = \frac{1}{4}\mu H_0^2$$

Since the superconductor does not absorb energy of electromagnetic wave, it will be completely reflected. This is equivalent to the elastic reflection of material object from the body surface, whose mass is considerably greater than the mass of the falling body.

IV. Conclusion

From the times of Lorenz and Poincare the Lorentz force was introduced as experimental postulate, and up to now there was no explanation of its physical nature. From a physical point of view the force, which acts on the material object, must be connected with its acceleration. Forces can also bear potential nature, being the gradient scalar potential field, in which it to be located. But Lorentz force is not placed in the category of the forces examined and yav it lyaetsya by exception from the rules indicated. in the article is proven that the Lorentz force is the consequence of the dependence of the scalar potential of charge on the speed. This made possible to explain physics of power interaction of the current carrying systems, and also operating principle of all existing types of unipolar generators. It is shown also, that the ponderomotive action of electromagnetic waves is the consequence of the dependence of the scalar potential of charge on the speed, but not by the consequence of the fact that, as it was considered earlier, electromagnetic wave possesses mechanical impulse.

The most important results obtained in the paper should include the establishment of dependence of the scalar potential of the electric charge of the rate of relative motion. All the phenomena of charge dynamics and their interactions are the result obtained according to that ideology changes electrodynamics. The adoption of the concept of physically justified as a factor of the charge, taking into account its impact on the surrounding charges may be reflected in its energy characteristics, so that the kinetic energy of the growth acceleration during the charge related to the change of its electric field.

Maxwell's equations, leading to a wave equation for the electron, electromagnetic fields, and relationships for the force interaction with the current-carrying systems postulated by the Lorentz force are the basis of the two actually independent sections of classical electrodynamics. The proposed concept of

connecting them to a single ideological basis. An important outcome of the work can be considered as justification for a long time the impending need for radical changes not only in classical electrodynamics with its mathematical apparatus, but also in physics in general.

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The Universe is Flowing Not Growing within the Great Cosmic Sea of Reality

By T. Fulton Johns DDS

Abstract- The theory that the universe is growing and expanding to oblivion, which has become more of a conclusion by mainstream science, has two problems that seem to be insurmountable. First and foremost is that this theory is based on such a small sample size, 4% of the known total, any findings based on such a small sample size of the total is subject to very questionable credibility no matter what your evidence. This entire arena of inquiry is without foundation given dark matter/dark energy (DM/DE) represent 96% of the subject under investigation, it is unknown and has no workable model to use for understanding its nature and makeup. Second, there is no map, no theory that unifies the functional and structural components to give a vision which leads to an understanding of the dynamics of the known expanse of our cosmos from the Planck quantum scale 10^- 35to the Newtonian based galactic scale 10^35; that can be used as a model or framework for evaluation, comparison and analysis of observational and experimental data collected. I am purposing such a model. This is a workable model that reveals a theory that allows definition and explanation of the great cosmic expanse and it reveals that what our current observations are showing that leads to the widespread opinion that the universe is expanding and even accelerating is possibly being misinterpreted. This is in part because of the two problems mentioned above. What is interpreted as expansion is in all probably actually a flow.

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I. Early Signs Of Dark Matter And Dark Energy

The first hint of DM/DE presence was perhaps from Albert Einstein's work on relativity. He was confronted by what he thought was a mistake at first. His calculations on general relativity were indicating increasing gravity which he thought was predicting an eventual collapse of the universe. This was not in line with a static universe which was a prevailing, widely known and agreed upon cultural "fact" as well as the foundations of then current scientific culture and the previous centuries of scientific thinking. This led Einstein to add, presumably because of cultural pressure, what some called a fudge factor to his calculations. He called it the cosmological constant which brought the results back to a static model of the universe. He would in later years regret that decision calling it the biggest blunder of his career because as we now know our universe is far from isolated and static. It is in fact moving at high velocity in at least three different vectors as a part of a complex web of over 100 billion galaxies in our highly dynamic universe. The presence of dark matter and dark energy (DM/DE) has emerged very recently with more clarity out of the long shadows of a progressive era of amazing science while looking for answers to many questions about our reality. Along the way, there has been incredible consistent developing technology that has truly been astounding and life changing across the globe. All of this progress and the ongoing efforts to explore our universe and its context within the cosmos has been fruitful in many ways but without the realization that most of the cosmos is composed of a vast unknown component which may prove to be foundational to our world as well as ubiquitous. This unknown DM/DE has given indications of its presence for about a century, however, there is much more evidence now; so much so, that it is difficult to deny and much needed attention has now been focused on efforts to explore this mysterious enigma.

http//globaljournals.org/GJSFR_Volume18/1-Entropyis-Not-a-One.pdf

The true result of Einstein's unaltered calculations were actually the first known evidence of the predicted presence of much more mass/gravity than could be accounted for in the known science of that time. Therefore, the discovery of dark matter and dark energy is really a story about missing mass that was first found then cancelled out in a math formula, then needed to explain expansion of the universe; then found again by other astronomers. These astronomers who began to notice in their calculations while studying galaxies that there was not enough mass that was verifiable in the visible spectrum to keep the galaxies in there characteristic cycloneshaped formation. This was first noticed by Swiss astronomer Fritz Zwicky in 1933, which was largely dismissed and later confirmed more recently by many others such as American astronomer Vera Rubin.

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II. Discovering an Expanding Universe

The theory of an expanding universe came shortly after Einstein's discovery of General Relativity and was first proposed in 1927 by the French astronomer Georges-Henri Lemaître. Lemaitre's calculations showed that an expanding universe was consistent with Einstein's general relativity theory and Lemaître provided an explanation consistent with Einstein's equation. It was his theory that the universe is expanding, so he explained as time goes by the galaxies are moving away from us. The observed redshift is the Doppler effect that results from their recessional speeds which was the finding by Edwin Hubble who was working on his newly discovered galaxies around that time and the result showed that the galaxies were moving away from one another confirming Lemaitre discovery, revealing what appeared to be an expansion where those galaxies with higher speeds have moved the farthest apart.

The concept of an expanding universe led to the theory known as the Big Bang. However, these same findings by Hubble could also be consistent and fit with the concept put forth by the Cosmic Dark Matter Fractal Field Theory which predicts that space-time flows like a current in a great sea; the source or head waters originating from the Planck scale flowing to the super massive scale of the most massive objects in our universe. A true flow through the multiple scalar levels of dimensions of our reality interpreted as expansion of space-time in Earths layer of that scale but actually is a scalar dimensional flow of space-time from smaller to larger not closer to farther away at the same scalar level. This new paradigm has thus far helped me to understand how our reality operates at different scales in a fractal format unraveling some of the complexity of the cosmic puzzle.

This YouTube video should help you envision what I mean by scalar dimensional flow. Notice in particular the last half of the video that starts at the Planck level as it flows from that scale to the supper massive scales at 10^35. That is the direction of the flow of The Great Cosmic Sea that is an actual direction of flow of space-time. If this is true it has great implication for what we know and have observed about Special and General Relativity! The focus of one of my future papers that I hope will soon be published by GJSFR.

https://www.youtube.com/watch?v=5AAR7bNSM_s&t=6s

The theory is based on the concept that DM/DE not only holds the galaxies together as well as the billions of groups of galaxies across the vast universe but also holds you and everything around you intact with the force of 96% of the gravity of the cosmos. The concepts of this theory are rather difficult at first to understand but you can find the details in the recently published book call "The Great Cosmic Sea of Reality The Dark Matter Fractal Field". Also I have written three other double blind peer reviewed papers published by GJSFR that give some details that you will find helpful and are referenced in the links below as well as a link to a YouTube lecture.

III. Black Hole/Wormhole/White Hole

a) The Flow of Space-Time

When I speak of the flow of the great cosmic sea I refer to space-time in literal terms as did Einstein! The main difference is how and in what dimension this great cosmic sea moves. We must consider the larger scale and what happens at the extremes of that scale as we will examine the extremes of the Planck scale. This extreme comes in the form of a black hole, which was predicted by Albert Einstein using his general theory of relativity and later proven first by astronomer Tom Bolton to exist around the star Cignus X-1 using indirect methods since black holes, by definition, can't be observed directly. This discovery was confirmed by many other researchers in both astrophysics and cosmology who have expanded this discovery and found that black holes inhabit the center core of all galaxies, there are estimated to be 100 billion galaxies in our visible universe. Also, through the work of Stephen Hawking, Hal Haggard and Carlo Rovelli black holes as well as white holes are thought to exist at the Planck scale. There is almost total agreement in the scientific community on the existence of both of these extremes of our reality. What is not agreed upon is the explanation of how they are alike or unified and what role they play in the whole workings of the cosmos.

There is absolutely nothing in our reality that is stationary (at rest) a fact that I don't hear discussed much in other theories and explanations of the dynamics of our universe as it relates to quantum gravity, or string theory. This multi-dimensional motion is a crucial undeniable fact of our overall understanding of the universe and holds the secret to understanding how the cosmos is structured and how our 4% universe functions as a component of the much larger 96% total of the cosmos. The Earth rotates on its virtual axis toward the east at approximately 1000 mph, the Earth revolves around the Sun at approximately 66,000 mph that requires 365 days (1 year) to complete a revolution and as a part of our star centric solar system, Earth revolves around the black hole at our galactic center at about 500,000 mph requiring approximately 225,000 earth years to complete a revolution as our galaxy moves in the celestial current of the ever flowing fabric of the great cosmic sea of space-time. Therefore, there is no doubt that there is plenty of dynamic motion out of

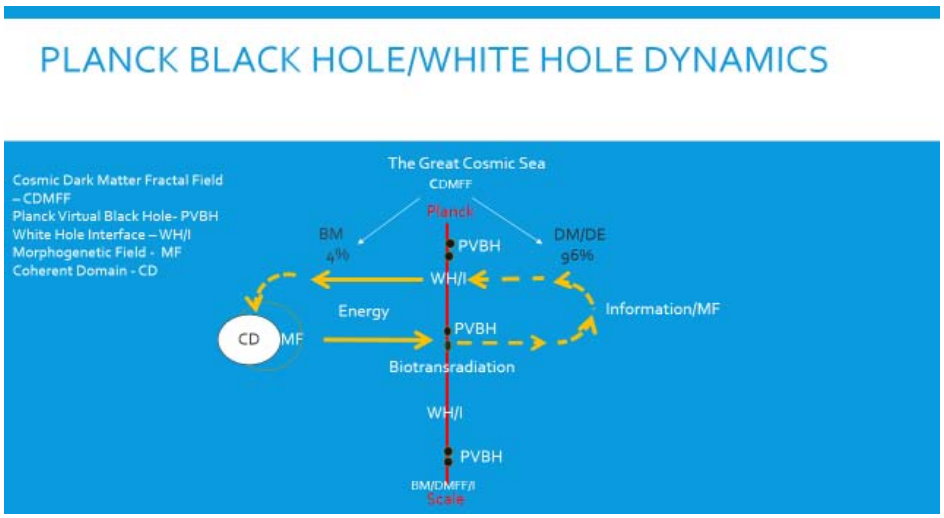
our awareness contributing to the mass therefore the gravity of our reality. This motion, no matter what scale, always occurs, moving through and interacting with the fabric of our cosmic sea and interacting with it at the interface of two different worlds the baryonic matter / cosmic dark matter fractal field interface (BM/CDMFF/I).

This interface can best be understood by thinking of it as an oil mixed with water-like relationship and the membrane interface you see as you examine such a mixture. Just as the black hole was predicted from the mathematics of the general theory of relativity, the white hole was also predicted as a space-time reverse singularity. It is the prediction of the CDMFFT that this white hole isn't a hole at all but an interface of these two dissimilar worlds, like oil and water which occurs at the opposite end of the cosmic scale at the Planck level of our reality. This interface, at the Planck scale, is the point of creation of virtual particles which provide the subatomic particles as this White Hole interface acts with a Planck Virtual Black Hole wormhole connection under certain conditions producing the raw material of the atoms that make up our baryonic world. See
https://globaljournals.org/GJSFR_Volume17/1-Possible-Origins-of-Virtual.pdf
https://cosmicdarkmatterfractalfield.wordpress.com/

What I am really saying is that DM/DE permeates our baryonic world in the form of morphic fields. "Morphic fields, like the known fields of physics, are nonmaterial regions of influence extending in space and continuing in time. They are localized within and around the systems they organize. When any particular organized system ceases to exist— as when an atom splits, a snowflake melts, an animal dies— its organizing field disappears from that place. But in another sense, morphic fields do not disappear: they are potential organizing patterns of influence and can appear again physically in other times and places." (Dr. Rupert Sheldrake) These fields cross this interface moment by moment complete with the information needed to guide the causative formation of baryonic matter. This produces massive amounts of energy/mass by way of the dynamo-like motion of these dissimilar worlds which generates through our moment by moment motion as a part of the constant dynamo action of the scalar fractal components of our entire universe within the cosmos.

This all starts at the Planck scale as Earth and all other objects of our baryonic universe travel as a part of this fractal framework of a never ending corkscrew path as one of many rotating planets orbiting a star, as one of many solar systems moving around the galactic center, as one of many hundreds of billions of self-similar galactic black hole centric galaxies. All as a part of a cosmic recursive fractal action pattern in our universe and also perhaps in the fractal pattern revealed, possibly one of many universes moving in self-similar motion accounting for at least part of the missing 96% mass of our cosmos.

This energy/mass produced from this highly dynamic universal inertia provides the mechanism by which information/ energy/bipolar entropic feedback loops are setup. This occurs through morphic fields by the recycling of these baryonic loaded coherent domains through the process of these fields being stripped of their baryonic matter as they are engulfed within the singularity of Planck Virtual Black Holes and returned to our baryonic world through the White Hole Interface. See
https://globaljournals.org/GJSFR__Volume18/1-Entropy-is-Not-a-One.pdf



IV. Conclusions

The introduction of a new way of thinking about our reality is without a doubt difficult to gain acceptance by the mainstream science community. This is not without past precedence, however, new ideas and theories have always been met with resistance. I only

ask that you read it completely through and email me with your conclusion or questions. I truly have found no questionsyet that this theory could not give a plausible answer or at least provide direction to look for more information that leads me to other questions. This pattern has historically been a reliable indicator of a valid theory. I have posed many questions and used the working model I developed for this theory to help understand the possible answers. That is the path that has now led to four scientific papers published through a double blind peer review process with GJSFR and currently with two more in the research phase. I am giving such an unusual plea for action in this conclusion because I am hoping to awake some true original thinking in what I believe still exist in the scientific community. I fear that in this new information driven age and competitive position seeking behavior we let ambition cloud original intuitive thinking which can stifle new discovery. When discourse is impeded by concern for power and position or fear of losing funding of the next project we lose one of our great natural resources the gift of our intellect…intuition!

I hope to reveal to you in an upcoming paper that the Cosmic Dark Matter Fractal Field Theory reveals that your intuition has a deep reservoir of information out of your conscious awareness through access to what Dr. Carl Jung called the collective unconscious a zone of mental connection that can stimulation your intuition. It is high time we find some workable theory that at least addresses some of the difficult questions of our reality that includes the life force. This theory may not be the one that is the final answer to a true Theory of Everything but at least it is a start and so far it is doing well. What is needed now is more people in the dialog, discussion and experimentation phase to test the assertions made from this theory.

Let's get to work!

This link below takes you to a 27 minute lecture explaining the CDMFFT

https://www.youtube.com/watch?v=R-DLHuiGgy8&t=28s

These links lead to related papers:

https://globaljournals.org/GJSFR_Volume18/1-Entropy-is-Not-a-One.pdf

https://globaljournals.org/GJSFR_Volume17/1-Possible-Origins-of-Virtual.pdf

Global Journal of Science Frontier Research: a
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C & BN-Foundation for Atomic-Crystalline Orbitals

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Abstract- The experimental data accumulated over a hundred years of modern physics, if brought together, can demonstrate "regularities" lying on the surface, which, sometimes, are not described by the "first principles." And this is normal, since the very first principles were formulated when, in the hands of the researchers, there was only a fragment that we now have in our database. So, as Planck demonstrated in his time, it is not surprising that the previously constructed basic models that abstractly describe the phenomenon from "zero" to "infinity", beyond the limits of their applicability, give singularities.

The quantum-mechanical model of a hydrogen-like atom constructed at the dawn of the last century described qualitatively the entire periodic table and made it possible to calculate atomic orbitals, in principle, for any quantum number. However, relativistic corrections were used to quantitatively match the allowed (model) energy levels. In addition, in order to describe chemical bonds in materials, the model orbitals were practically ejected and were replaced in the first approximation by the so-called hybridized ones.

These contradictions, in fact, were revealed in the complex analysis of C & BN, the results of which are presented in this paper. A general view of the hydrogen-like model of the atom showed that it gives a quantitative catastrophic divergence in the first order with an increase in the atomic number. Those. In fact, this model was linearly used, and 100% discrepancies were attempted to "correct" due to corrections in the order of smallness.

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This approach does not take logarithmic relativity into account ("Scientific misconceptions" Part III - http://www.rusnor.org/pubs/articles/15503.htm).

Correction of the external atomic orbitals of C & BN Pauling, taking into account the scale of the atomic number, resulted in the replacement of the hydrogen-like atom model by a model that takes into account the screening of the nucleus by internal electrons. And when describing many chemical elements within the framework of this quasi-nuclear model, the starting point is not a primitive hydrogen, but an elementary but not a primitive carbon atom.

So carbon, not only the basic element on the basis of which life on Earth arose, but also the basic element for describing many chemical elements. With this approach, the catastrophic divergence (singularity) is eliminated depending on the atomic number of the material properties.

I. Introduction

Well-known graphite and its white, dielectric analogue of boron nitride, first obtained from chlorides on laboratory work at the 3rd year of the Leningrad Institute of Technology by student Boris Sharupin, were rightly entered theorists into extremely anisotropic crystals from the existing on the Earth. But their high anisotropy was associated not with their most rigid connection of hexagons, but with the complete absence of chemical bonds in the crystal lattice between mono-atomic layers along the C axis. Although such so-called Van der Waals crystals without chemical bonds can exist only at helium temperatures, and C & BN do not fall apart and at 3000C, theorists "skidded".

The beginning of this "drift" can be related to the name of the classic, Linus Pauling, who invented sigma and pi-electrons [1].Although he personally found deep contradiction in his concept, and tried to introduce new, "curved" chemical bonds, the Van der Waals crystal model firmly entered the textbooks on solid-state physics under a modified name-two-dimensional crystals [2]. "Drifted" so far that the difference between real C & BN crystals from two-dimensional ones tried to describe, in the form of quasi-two-dimensionality, small corrections to the two-dimensionality. And the majority, like the same Dresselhaus, where we should "remember" about the two-dimensionality, and where it should be "forgotten". By the same principle, the non-existent "graphene" even "earned" the Nobel Prize.

Doubts in some basic physical models initially arose in my analysis of the anomalies of crystal optics of incommensurate crystals. But the optical anomalies observed on them I considered quite natural for a qualitatively new four-dimensional object [3].

However, I decided to test the crystal-optical models of plasma and lattice oscillators on the asymptotic behavior of the anisotropy of classical crystals, on an "ideal" anisotropic conductor -graphite, and on "ideal" anisotropic dielectric-boron nitride.

But the first experiments on C & BN samples (and on the grown by B.N. Sharupin [4], and on American), showed that:

1. and the samples are far from ideal crystals,
2. and the fact that their properties are not described by ideal models in any way (as indicated by the authors of the first papers [5]).

And now, after 7 years of our joint work, BN. Sharutin grew "ideal" C & BN crystals, and I experimentally examined them, and showed that:

3. properties of C & BN and can not be described by two-dimensional models, since they do not take into account chemical bonds between atomic planes.

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And then me, a young employee, a venerable scholar BN. Sharupin invited me to a conference on the conference he was holding at the First Atomic Station of the USSR. He invited me to a report refuting what was written in the books, including what was written in his book, with a report refuting the van der Waals interaction between monoatomic layers in C & BN.

Perestroika, one can say bluntly, killed Boris Nikolaevich. And the results we have obtained, I was able to publish in a physical journal, only after including it in co-authors posthumously [6].

But there was a gap between purely physical, inconsistent with the usual notions, the conclusions of our publication and a huge layer of purely technological research by Sharupin's staff, without which it would be impossible to obtain perfect crystals and, as it turned out, understand and accept our conclusions.

His hole was reflected in the books published after our work. Even in the handbook published in Schringer by the employee of our Institute, the conclusions of our publication on the basis of a huge number of little-known works by the best technologists of the world were not reflected (when Japanese Americans learned to grow perfect crystals 5 microns thick, Boris Nikolayevich gave me more palm- on which I measured all the crystal optics, and not just the normal planes, which is reflected in our publication). Partially this hole I tried to fill with physical research, spent some time with the former (in GIPH) officers B.N. Sharupina. But the great purity of the results obtained was published only in the works of Russian conferences [7 - 12] and are not known in the world so far.

Now, when the world began to be interested in my previous publications, I was asked to send their originals. But in post-perestroika time not all reports of Russian conferences were published. To some extent, this prompted me to write a book in which not only the final conclusions for ideal anisotropic crystals are shown, but also shows a purely experimental basis for the observed regularity-the dependence of the physical properties of the pyrocrystals on the ordering degree of both their crystal lattice and the complex ordering hierarchy crystallites.

But when analyzing the structure and properties of C & BN [13, 14, 15, 16, 17], a catastrophic discrepancy was revealed in the most general physical laws. The dependence of the upper filled level on the atomic number within the base model of the hydrogen-like atom is qualitatively different from the experimental data on the first ionization potential, and the atomic orbitals calculated to arbitrarily large principal quantum numbers are not the first approximation even for the elementary carbon atom (require 100%).

Soitturnedout that

1. that an elementary, but at the same time, non-primitive carbon atom, and not an ideal model based on the hydrogen atom, is a "brick" for atomic physics and the description of chemical bonds.

So, the "brick" of organic life carbon is the real "brick" of atomic physics, and graphenology takes away from reality even the physics of carbon itself.

The research of C & BN was also of a purely applied nature. In particular, the C + BN composites tested not only the correctness of the use of optical models for interpreting the properties of incommensurate superstructure crystals, but also the analysis of the effect of potential barriers on thermoelectric efficiency [18]. And although a conductive C + BN was obtained, and its Seebeck coefficient exceeded the thermoelectric power of pure graphite by a factor of tens, but it reached only 500 μV / C and did not find any practical application.

However, these experiments put the finishing point in the analysis of barriers, showing the need for artificial asymmetry of the barrier on a nano scale. So C & BN to the formation of semiconductor structures with local thermo-emf [19-24]. Now the circle is closed - the analysis on the basis of C & BN allowed levels (zones) of electron energy has made it possible to come closer to an understanding of "What materials and how to make artificial semiconductor structures with high energy conversion efficiency.

II. Basic Similarity And Difference Between C & BN.

C & BN are the most elementary similar in basic parameters compounds for a whole class of actively used elementary semiconductors Si and Ge and similar and semiconductor-analogues A3B5: Si & AlP (N, As), Ge & GaAs (P, Sb), Sn & In Sb ((As, Bi). namely, the elementary nature of C & BN at the atomic level makes it possible to estimate with good accuracy also their crystal properties at the lowest, atomic level, which allows them to be used as a base point of departure for the whole class.

a) Similarities of C & BN, which give the overall picture

Although the hydrogen-like model of atoms used for the qualitative explanation of atomic-molecular bonds of any chemical elements of the Mendeleyev table gives significant quantitative discrepancies with experiment already in the first period, it nevertheless describes fairly well the first two periods. Moreover, as will be shown below, the quantitative discrepancies observed in these periods with experiment indicate the need for modification of the elementary model, the possibility of its modification, and the possibility of using (at least in principle) at least the DEFINITIONS s and p - orbitals of the hydrogen-like model, and! - the similarity of electronic orbits C & BN. And although the number of external electrons in boron and nitrogen is different, but their external orbitals (allowed in the atoms of the

electron state) are similar and, therefore, external electrons are distributed between the boron and nitrogen atoms approximately in carbon. At the same time, both materials have 4 valence electrons per atom. As a consequence, the crystalline structures of all phases of BN are in many respects similar to the corresponding structures of C (similar to the rest of A3B5, the similarity to the structures of the corresponding elements of the fourth group is observed). And, as a result, the phase diagrams of graphite and boron nitride are similar (Fig. 1).

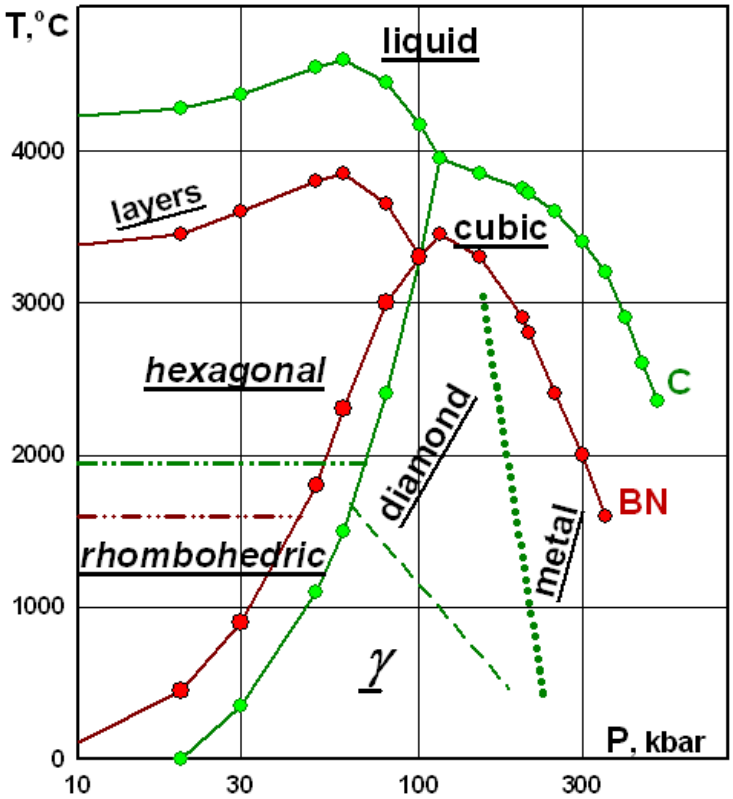

Fig. 1: Similar phase diagrams of carbon (the boundaries of the phases are marked in green) and boron nitride (the boundaries of the phases are marked in red). Conditionally, the boundaries between two cubic phases of carbon and a metallic "diamond" are shown.

In the low-pressure region, both materials exist in two layered modifications: hexagonal and rhombohedral, in the spirit phases, which are different, as will be shown in the analysis of lattice vibrations, not by the rigidity of interatomic bonds, but by their ordering. In the high-pressure region, two cubic modifications are observed: brittle, diamond-like, with bond stiffness about 30% lower than in hexagons, and the γ phase is elastic-viscous, diamond-like, but with interatomic bonds close to the interlayer in layered phases. At very high pressures, the existence of a denser metal phase than diamond is assumed, which corresponds to the realization of a diamond structure with four internal hexagonal bonds.

Although the boundary between layered and cubic modifications strongly depends on time and catalysts, the fundamental similarity of phase diagrams further confirms the similarity in them of the transformation of atomic orbitals into crystalline ones and the similarity of the transformation of crystalline orbitals during phase transitions. Some displacement of the boundary layer / cube transition for boron nitride in the low-pressure region can be attributed to an additional, naturally, contraction due to the additional ionic contribution to the potential energy of the crystal. A shift in the boron nitride of the solid-phase transition to lower temperatures is associated with an additional contribution to the kinetic energy of the crystal due to ion oscillations (optical branches).

The rhombohedral phase of graphite was not observed in nature at all, which led earlier to draw the wrong conclusion that in boron nitride and in graphite it is under normal conditions a metastable phase (like a diamond). While experiments on the annealing of perfect rhombohedral boron nitride crystals directly, on the transformation of lattice oscillators, have shown a phase transition at a temperature of about 1250C to a hexagonal state. So, and hexagonal C & BN hexocarbon crystals, as well as natural hexagonal graphite, under normal conditions, are just in a metastable quenched state, but in a stable as a diamond. And just like a diamond, the hexagonal phase can not be transformed into rhombohedral phase at low temperatures because of large interatomic forces in the plane of hexagons and

because of the very low rate of the solid phase transition [16, 17].

A rigorous three-dimensional one, taking into account interplanar ion-covalent bonds, the ordering of the crystal lattices of C & BN is possible only in the rhombohedral phase (with a translation period along the C axis equal to the tripled interplanar distance). And, as is clearly seen in the construction of the crystal lattice of boron nitride, the doubled interplanar spacing observed in the hexagonal phase does not correspond to the translational invariance of the interplane bonds. Thus, the hexagonal phase, in principle, corresponds to a random (with defects) distribution of interplane bonds, and the rhombohedral / hexagonal phase transition is an order-disorder transition in their distributions (between layers). This chaos leads to a high slip of the layers (potential minimum blurred-wide), and the formation of solitons in the distribution of interlayer bonds, contributes to the formation of small-crystalline polycrystals, and as a result, to slip and cleave only crystallites (flakes).

Cubic modifications of C & BN also exist and were studied in two phases. In the form of a so-called gamma phase, obtained by the hydrostatic compression method or by explosion from a hexagonal or rhombohedral phase of a denser, diamond-like package, and in the form of a hydrostatic compression from the so-called isotropic C & BN pyrocrystals of a more loose package. But as will be shown in the analysis of lattice reflection, the so-called amorphous C & BN obtained is also a cubic C & BN, differing not only in the space symmetry group, but in the rigidity of the interatomic bonds.

Similarity is manifested in the growth of C & BN, and the technology of their cultivation [4], and in the microstructure arising in the microcrystals.

The least ordered and the least dense phase is the so-called pipe-stratum phase (Fig. 2).

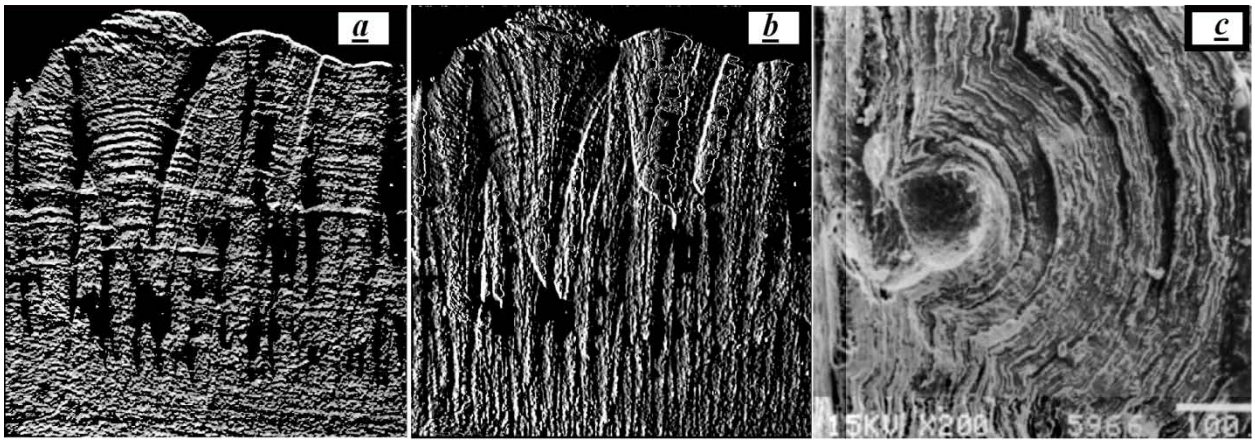

Fig. 2: Electron microphotographs of the pyrolytic crystals of the C-BN pipeline stratum: a and b are the plane parallel to the growth axis C (preferential orientation of crystallographic axes of microcrystallites), c is the plane perpendicular to the growth axis (the edge of the figure is approximately 1 mm).

The micrographs of the pipe-stratified phase shown in Fig. 3.1 have an almost equivalent character, both for graphite and for boron nitride. They demonstrate what follows from the whole complex of studies, and from the natural nano-state of C & BN - the appearance of embryos in the form of fulerenes. As shown in [1], the natural state of embryos from atoms: three (rigid, "straight") orbitals are closed to neighboring atoms in a collapsed plane, and the fourth orbital (softer, but not a "curve" according to Powling), closing to a similarly torn interlayer orbital of one of the neighboring atoms of the same layer. This leads to the specification of the curvature of the surface of the mono atomic layer. As shown in Fig. 3, some amount of fullerene-like defects is also observed in the most perfect samples of the rhombohedral phase.

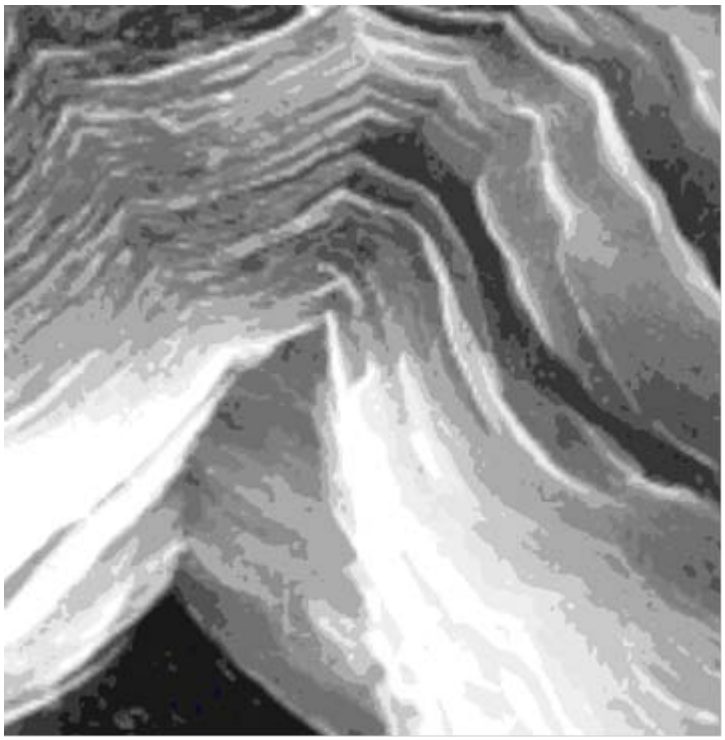

Fig. 3: A microphotograph of the growth defect, whose small concentration is also observed in perfect rhombohedral C & BN rhombo-crystals.

Under conditions of a lot of germinal growth of a hexagonal-linked cryocrystal, a weakly ordered least dense, the least anisotropic (as will be shown below), a brittle, coarse, low-density, pipe-stratified phase appears in the layer. As can be seen from Fig. 2, these cryocrystals are textured polycrystals consisting of interlaid spacing packets with a large spread and the mean orientation of the C-axis of the packet, and the orientation of the C-axis of the crystallites $\Delta\gamma$ in the stack.

At high precipitation temperatures, hexagonal pyrocrystals with a low concentration of growth cents with a much higher density and with a strict orientation of the C-axis of the packets, but precisely packets of fine and well-ordered crystallites, can also be formed (Fig. 4).

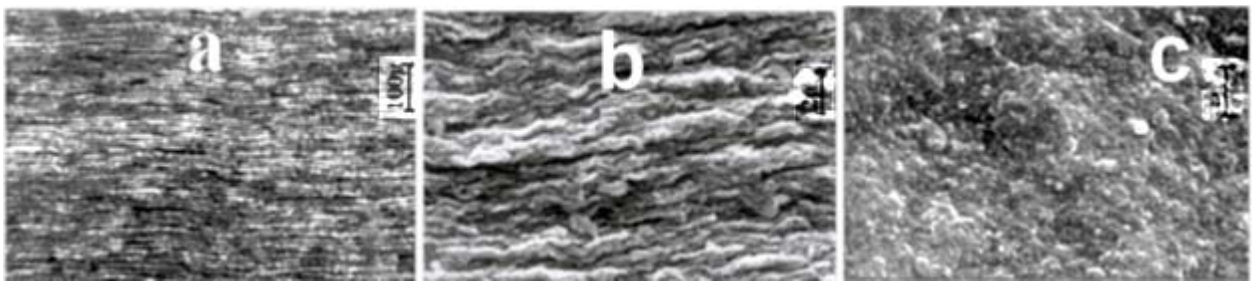

Fig. 4: Electron micrographs of hexagonal C and BN hexagonal pyrocrystals: a and b - a plane parallel to the growth axis C - the preferential orientation of the axes of microcrystallites C, c is the growth surface (perpendicular to the C axis).

In this case, as can be seen from Table 1 and Fig. 5, the degree of ordering of the crystallites (including the transitions between the phases: trubostrata - hexagonal-rhombohedral - uniquely correlates with the degree of disorder of the interatomic distance in hexagons, which we will use later for quantitative characteristics and microstructure and physical properties of pyrocrystals.

Table 1

Type pyrocryst-als	Rh	Ge	High-density pyrocrystals			Low-density pyrocrystals				Isotropic pyrocrystals		
N°	0	1	2	3	4	5	5'	6	7	7'	8'	8
d,Å	3,34	3,36	3,37	3,38	3,41	3,44	3,44	3,44	3,44	3,44	3,44	3,44
δd,Å	0	0,005	0,018	0,022	0,13	0,2	0,22	0,23	0626	0,16	0,18	0,21
a, Å	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46
δa, Å	0	0,001	0,003	0,006	0,01	0,011	0,012	0,015	0,019	0,010	0,011	0,019
L_c,A	2000	1000	275	260	111	80	84	30	20	154	110	90
La,Å	∞	$>10^4$	320	359	70	45	42	32	25	58	50	47
ρ, g / cm^3	2,26	2,25	2,24	2,23	1,86	1,86	1,76	1,6	1,34	2,08	1,9	1,82
ρ*, g / cm3	2,26	2,247	2,24	2,233	2,214	2,194	2,194	2,194	2,194	2,194	2,194	2,194
Δγ,°	0	0	20	25	30	45	50	55	60	90	90	90

As can be seen from Table 1, the x-ray densityρ* of weakly ordered samples is above the pycnometric densityρ, which is due to the presence of voids in these samples. In this case, the crystal-like, phase transformations of the crystal lattice of pyrocrystals from Table 1 were obtained by comparing the microstructure with X-ray spectra (Fig. 5).

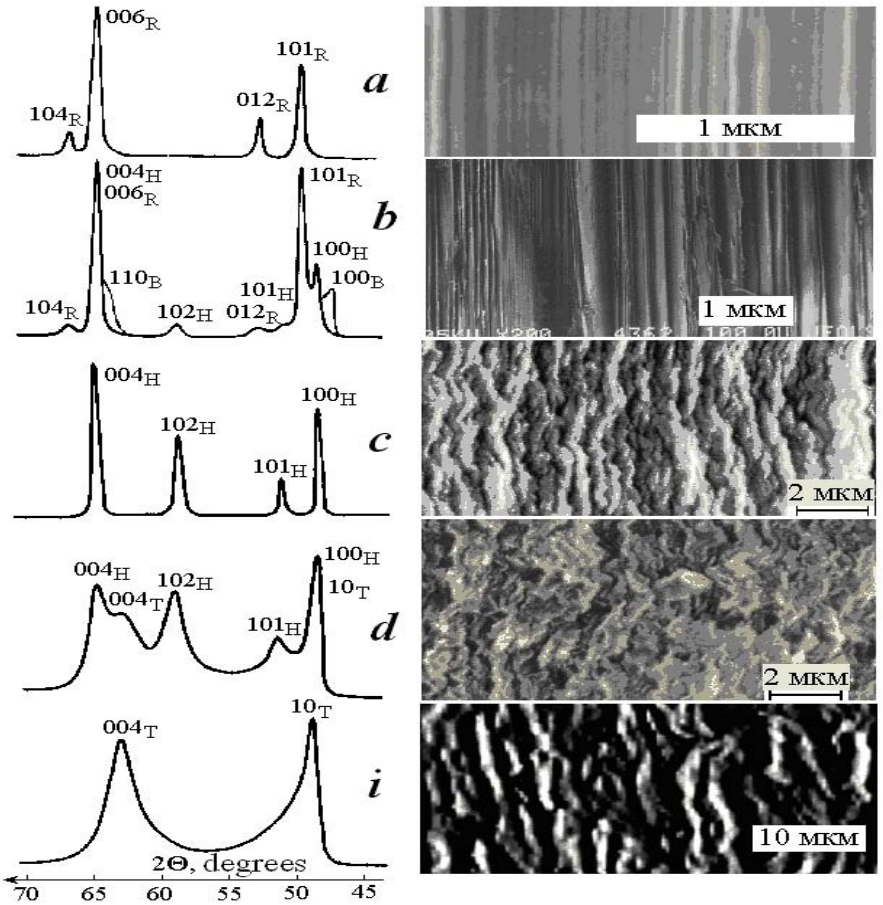

Fig. 5: Correlation of a complex hierarchy of ordering of crystallites with the ordering and structure of the crystal lattice of C & BN based on the results of X-ray structural measurements and electronic photographs of the plane parallel to the growth axis of a series of samples of different phases of C & BN with different degrees of ordering of the crystal lattice and microcrystals: a is a highly ordered rhombohedral, b mixture of layers of rhombohedral and hexagonal, c - highly textured hexagonal, d - low-order hexagonal and e - the so-called pipe-stratum phase a.

As seen from Fig. 5, the most ordered crystal lattice, and the maximum size of highly ordered crystallites, are the C & BN pyrocrystals of the rhombohedral phase. At the same time, the change in the interatomic distance in hexagons when the samples are disordered is practically determined by its own blurring δa (Tab.1). This is quite natural, since hexagonal links are the toughest in C & BN. Therefore, a clear correlation is also observed between the interplanar distances in the crystal lattice (Fig. 6a), and the crystallite size of the C & BN pyrocrystals.

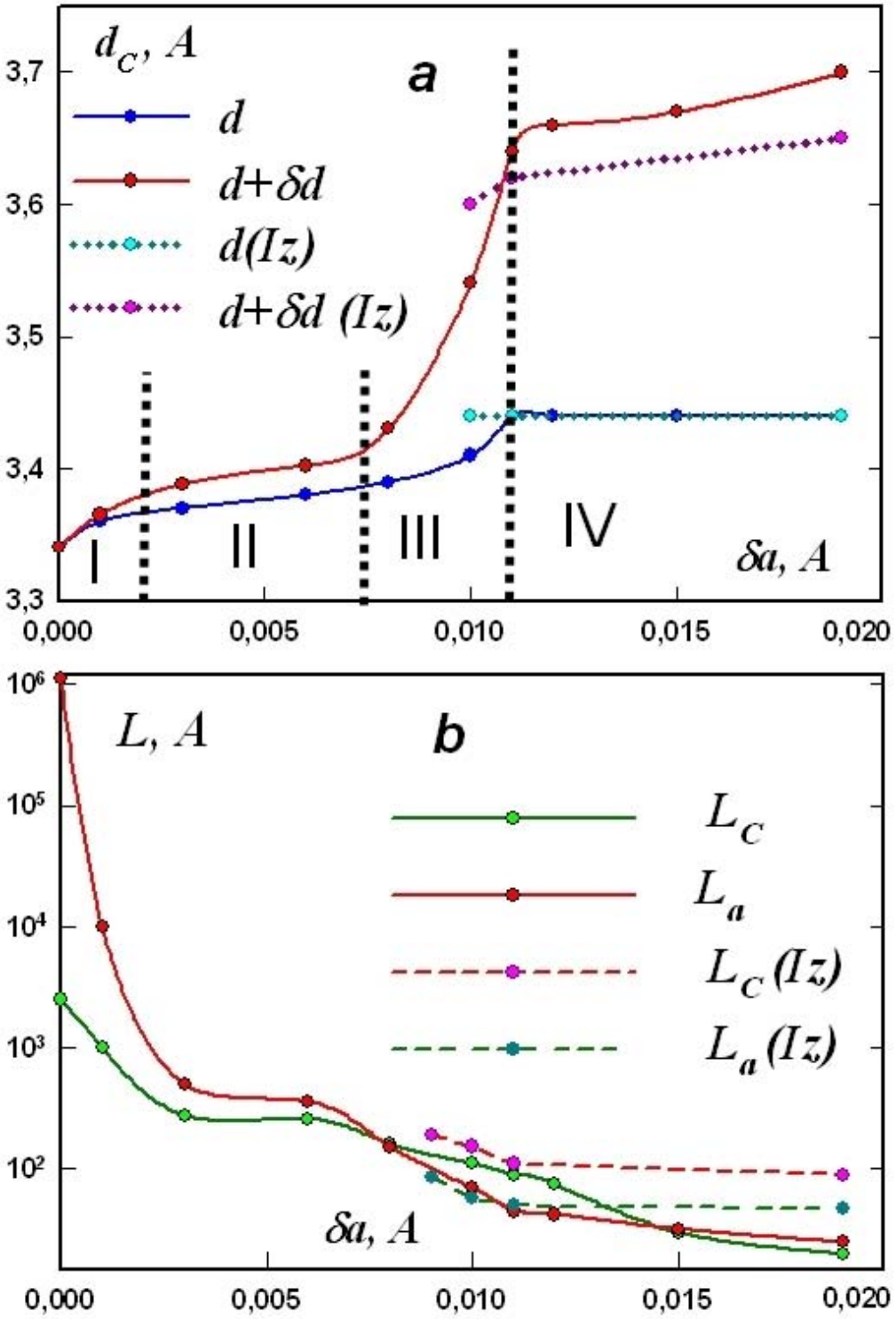

Fig. 6: The regular dependence of the secondary parameters of the C & BN crystal lattice on the blurring of interatomic distances in hexagons δa: a - the interplanar distance d and its smearing δd, b - L_C - the crystallite size along the C axis and L_a - the crystallite size across the C axis.

In the dependences of the additional (on the binding energy) parameter of the C & BN crystal lattice and the sizes of the crystallites on the parameter δa, which is characteristic of the ordering of bonds in hexagons, the parameter δa is clearly seen in certain regularities. The relatively sharp growth of interplanar parameters at the initial section is accompanied by a transition from a three-dimensionally ordered rhombohedral phase into a two-dimensionally ordered one. Hexagonal and a sharp reduction in the size of crystallites with a decrease in their geometric anisotropy.

Further, there is a slow increase in the interplanar spacing d (which correlates with a slow decrease in the LC crystallite size along the C axis), but a faster increase in the blurring of the interplanar spacing δd (which correlates with a faster decrease in crystallite sizes along the La hexagon layers, leading to the disappearance of their geometric anisotropy, and then to its inversion).

In the third segment, the growth of the interplanar distance is again accelerated, although being much smaller than the blur, and it itself is already determined by the blur, and further diminution of both sizes of crystallites is also determined by this blurring. This blurring of the interplanar distance also determines the further decrease in the crystallites in the fourth section. But within the crystallites, a further increase in the interplanar distance is impossible, as shown by the d (δa) observed in the fourth section. And this shelf is an additional confirmation of the existence of interplanar connections in C & BN. It gives the maximum length of the "interplanar" orbitals observed (as will be shown below) in the cubic gamma phase.

Isotropic pyrocrystals - polycrystals obtained from technology with a high concentration of nuclei from randomly oriented small hexagonal crystals (sometimes called the "amorphous" phase), as seen in Fig. 6, also fit into the described regularities with some quantitative correction.

b) Differences between C & BN, which complement the overall picture

The band structure of layered carbon modifications and boron nitride is fundamentally different because of the presence of a dipole in the latter. As a consequence of the large difference in the concentration of free carriers, their electrical conductivity and other kinetic parameters are radically different. But the electronic contribution to the binding energy of atoms in the lattice and in graphite is much less than the binding energy between the mono-atomic layers. Therefore, the kinetic properties of graphite characterize the given crystal lattice in general. On the other hand, a slight difference in the charge and mass of the boron and nitrogen atoms, which have become in many respects equivalent in the crystal lattice of boron nitride, are reliable markers, which, as will be shown, make it possible to exclude irregularities that violate the translational invariance of the arrangement of monoatomic layers. In addition, the presence of a dipole in the boron nitride lattice makes it possible to analyze quantitatively the strength of interatomic bonds also in general, because The energy of the dipole interaction does not substantially distort the crystal lattice.

Therefore, the difference in the properties of C & BN not only does not interfere with the analysis of their physical properties, but even helps. And the kinetic properties of the ideal conductor (which does not have dipole scattering) of graphite, and the optical properties of the ideal (practically free of the masking contribution of free carriers) of the boron nitride dielectric and are in good agreement with the "similarities" listed above, and even supplement / explain them. The results of the experiments presented in this section will be used rather to demonstrate the manifestation of the "similarities" noted above (and their complements). Although, along the way, taking into account and clarifying the identified "similarities," some adjustment of the commonly used working models will be carried out.

i. *Dependence of the kinetic parameters of C & BN on the degree of ordering*

Studies of graphite, both natural crystals and pyrographite, have been devoted to many works [25-43]. And not by chance, since it is a unique material.

The electrical conductivity over the layers of graphite hexagons is in some ways unique, especially its anisotropy, reaching a million. But the use of the Van der Waals assumptions [44], rather, made it difficult to understand the true nature of it, than it helped. So the highest anisotropy of the electrical conductivity was attributed not to the peculiar motion of the current carriers along the hexagons (as was pointed out for a long time by the giant oscillations of de Haas-van Alphen oscillations in graphite), but with the alleged total absence of electron overflow from one mono layer another. Then, as shown in Fig. 7, the dependence of the electrical conductivity on the basic ordering parameter of the C & BN crystal lattice directly gives a different explanation.

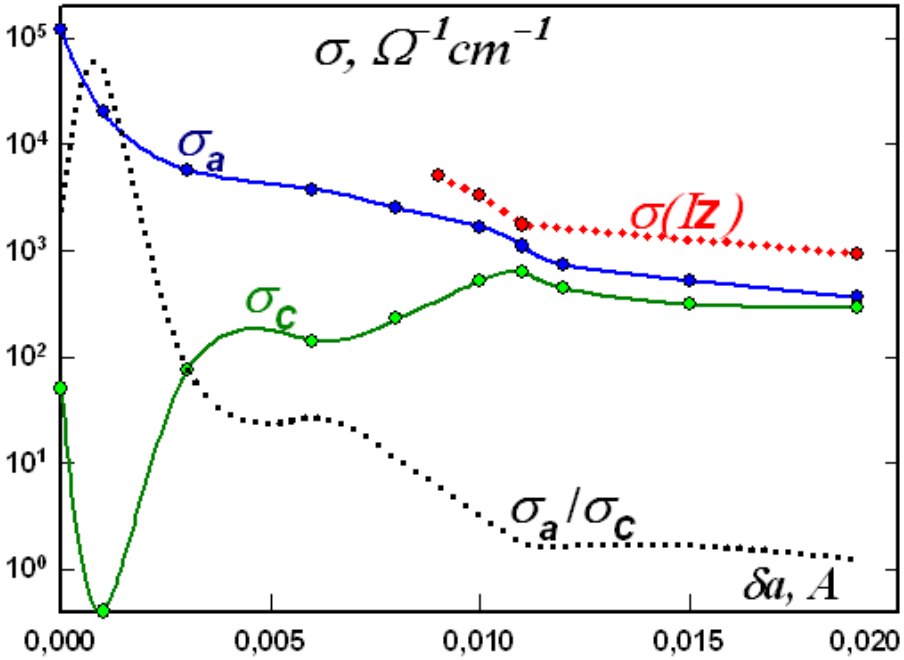

Fig. 7: Dependence of the electrical conductivity along σ_a and across σ_C of the mono-atomic layers of graphite on the hexagon ordering parameter δa.

From a comparison of Figures 7 and 6, it is clearly seen that a sharp drop in the initial (first) section of σ_a and σ_C occurs during a transition from a three-dimensionally ordered one, and as a consequence, having a considerable conductivity across the mono atomic layers, the rhombohedral phase into a two-dimensional ordered hexagonal phase. However, a catastrophic decrease in macroscopic σ_C during the transition to a highly ordered and strictly textured hexagonal phase occurs not only due to the termination of the flow of electrons between mono atomic layers (the concentration of interlayer bonds in the hexagonal phase is not much smaller than in the rhombohedral phase, they are simply disordered), but and because of the concomitant decrease in the crystallite thickness along the C axis by an order of magnitude (for the rhombohedral phase of macroscopic packets with thicknesses of thousands of angstroms).

Scattering of electrons at the boundaries of crystallites in the hexagonal phase gives a significant contribution to the macroscopic resistance of hexagonal pyro graphite along the C axis, and the weak, almost van der Waals bond between the crystallites, determines the high sliding of the "layers" of graphite against each other. She also ensured the possibility of obtaining a Nobel Prize with the help of a sticky tape "inventors" of graphene.

A fundamentally new for understanding / explaining "similarity" gives a subsequent sharp rise in the electrical conductivity σ_C at the boundary of the first and second sections. Since no growth of crystallite thickness is observed at all, and no sharp disruption is observed, a sharp increase in the electrical conductivity of the pyrocrystal along C indicates that a critical disruption of the ordering of hexagons in the grid leads to interlacing of hexagonal nets.

The course of the dependence of the electrical conductivity on the further increase in the disordering of hexagons is in good agreement with the regularities shown in Fig. 6 and have not revealed anything radically new. And the main interest was the properties of highly ordered pyrocrystals of the hexagonal and rhombohedral phase. Therefore, without dwelling on the model description, just to demonstrate the above-described regularities, we will give the polarization spectra of the plasma reflection of pyrocrystals of different degrees of ordering (Fig. 8, where the sample numbers correspond to Table 1).

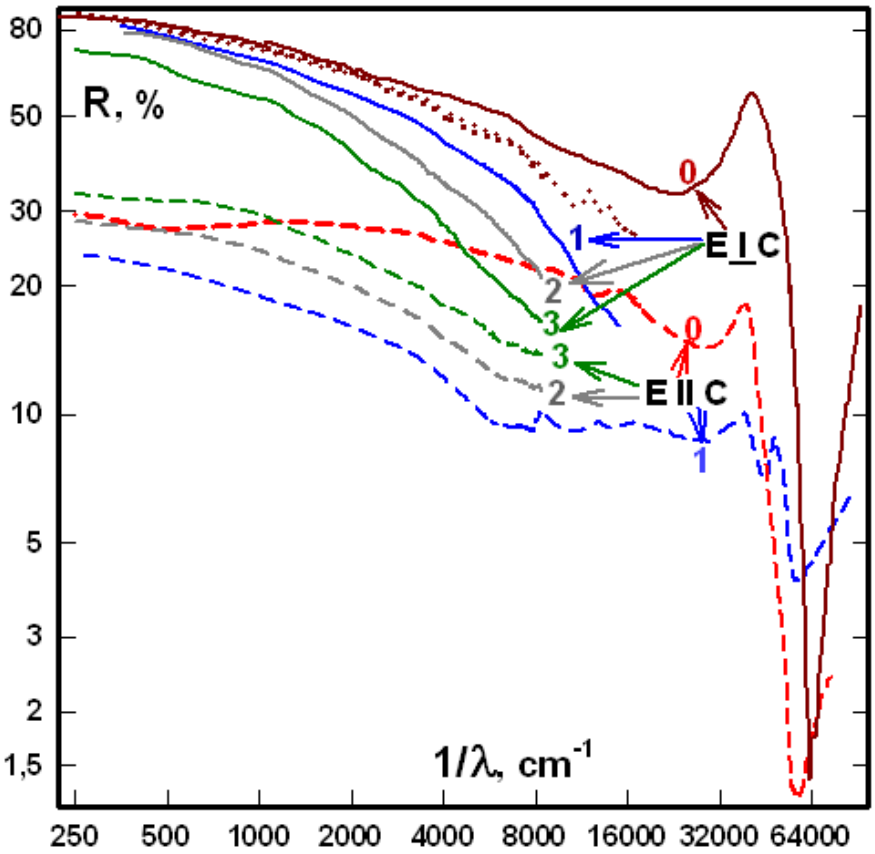

Fig. 8: Conjugated with reflection of local plasma oscillations, the polarization spectra of plasma reflection on free carriers for pyrographs with different degrees of ordering: 0 - rhombohedral crystal, 1 - highly ordered hexagonal phase, 2 and 3 - hexagonal phase with increasing degree of disordering of hexagons.

As can be seen from the comparison of spectra 0 and 1 in Fig. 8, the transition from the rhombohedral phase to the hexagonal leads, primarily to a sharp decrease in the conductivity along the C axis. Moreover, it is seen from the high-frequency part of the reflection spectra that there is a mixing of localized plasma oscillations and, respectively, the transformation of the electronic band structure. And when passing from spectrum 1 to spectrum 2 with E || C, an increase in plasma reflection is observed, analogous to an increase in the electrical conductivity σ_C at the boundary of the first and second sections of Fig.7. That is, the dependence of the reflection on free carriers on the degree of ordering is similar to the analogous dependence of the anisotropy of the electrical conductivity on a direct current.

Also briefly, without going into the description of experiments at different temperatures, we demonstrate the effect of disordering hexagons on the thermoelectric power of pyrographs along and across the C axis at one room temperature (Fig. 9).

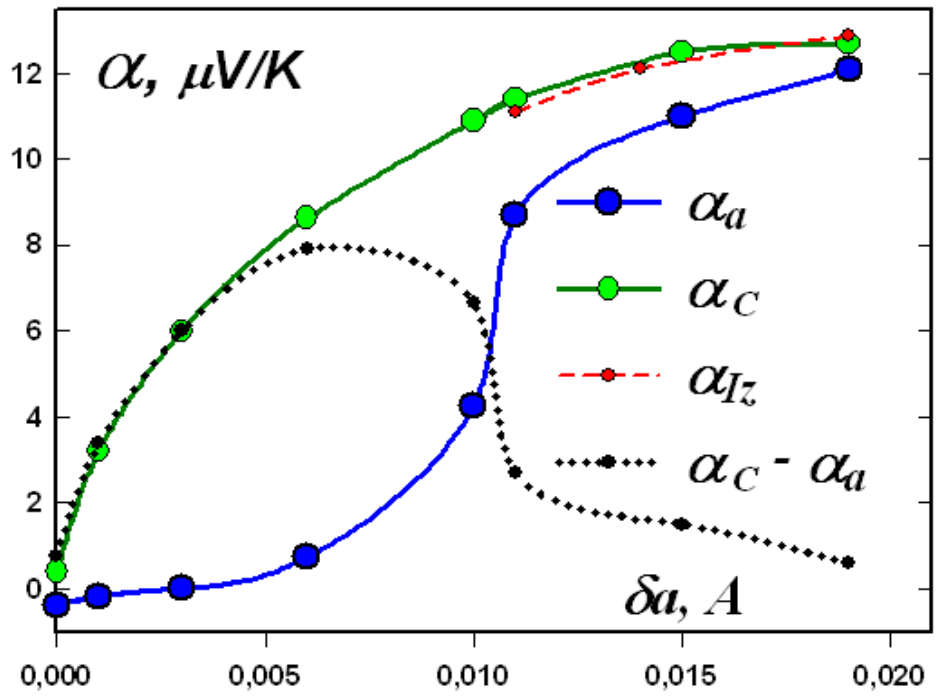

Fig. 9: Dependence of the thermoelectric power along α_C and across α_a axis C at room temperature on the degree of ordering of hexaons δa.

As can be seen from Fig. 9, up to room temperature, the thermo power in perfect rhombohedral pyrographite is practically zero for both crystallographic directions. Those. despite the giant anisotropy of the electrical conductivity, and along the C axis, and across it the ideal graphite behaves like a good semimetal in which the contributions to the conductivity are weak, that is, the active losses due to interband / phonon scattering are small in both directions.

Moreover, for α_a these contributions are small up to the critical value of the disordering of hexagons corresponding to the boundary of the fourth section in Fig.6. However, for the direction along the C axis, the active scattering processes that determine the diffuse Seebeck coefficient are sharply manifested in α_C starting from the minimal degrees of disordering of the hexagons. This is quite natural, because In the first place, weaker interplane bonds / orbitals are destroyed.

The anisotropy of local plasma oscillations (curves 0 for E parallel and perpendicular to the C axis) observed at the high-frequency edge of the reflection spectra (Fig. 8) of rhombohedral pyro graphite sharply decreases upon transition to the highly ordered hexagonal phase, while the low-frequency reflection anisotropy on free carriers, in full agreement with anisotropy of DC conductivity, maximum.

From the analysis of the influence of the degree of ordering of hexagons on the kinetic and optical parameters, one can make an unambiguous conclusion that the ideal rhombohedral graphite has not an abstract two-dimensional conductivity and a mythical dielectric nonconductivity along the C axis, but an ordinary semiconductor one. And, from the corresponding reflection spectrum "0" at E // C, the refractive index of the order of 3, follows the width of the forbidden band $E_g \sim 1.6$ eV. I'm not sure that anyone measured the width of the forbidden zone of the van der Waals crystal, but I think it is no less than 10 eV.

The results obtained make it possible to construct a band model of graphite qualitatively describing the change in its properties with a change in its degree of disordering and eliminating the contradictions inherent in the Slonchevsky-Weiss band model for ideal graphite [26]. In addition, the proposed model has fewer in dependent parameters, so all the described experimental results can be explained without using additional, heavy b ands for electrons and holes [42].

The internal contradiction of the CB model is due to the mutually exclusive assumptions: on the one hand, it is assumed that the lattice of an ideal graphite corresponds to a strictly two-dimensional material, that is, with an infinite effective carrier mass in the C direction; on the other hand, finite effective electron masses and holes. The three-dimensional correlation observed in x-rays in the crystal lattice of highly ordered pyrographs is in complete agreement with the physical properties of these materials described above. Therefore, the widely used purely two-dimensional band conduction model in graphite (Fig. 10a) can not be accepted even for the coarsest approximation.

The band structure of graphite, in the first approximation, should be described by the model depicted in Fig. 10b.

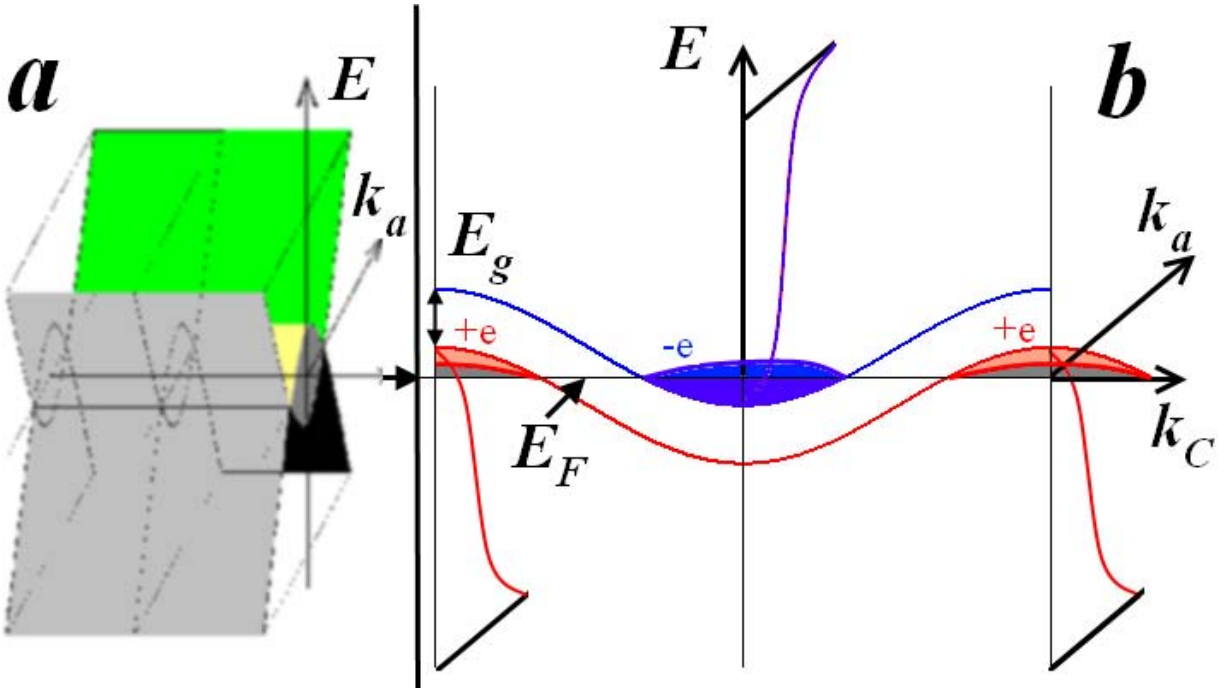

Fig. 10: Model of a two-dimensional zone (on the left) and a zone of 3-dimensionally ordered graphite (right).

The principal point of the proposed band model is that the semimetallic overlap is indirect, since the maximum and minimum of the zones are spaced in the k space along k_C The placement of electrons and holes in energy-overlapping bands, which are not overlapping in the pulse, explains their small mutual scattering (at not very low temperatures, when the phonon momentum is less than the displacement due to the momentum of the extrema-the total absence of scattering). On the other hand, the motion of the current carriers along the C axis has an additional reactance connected with the need to overcome a potential barrier equal to the width of the forbidden gap shown in Fig. 10.

Thus, the limiting anisotropy of an ideal graphite is determined by the fact that it is semimetal along the planes and the semiconductor is perpendicular to it. But the estimate of the width of the forbidden band obtained earlier on the basis of an empirical relation for isotropic semiconductors gives an obviously overestimated value. Therefore, direct measurements of the energy gap were made by passing thin dispersed graphite films deposited on an IR transparent substrate (Fig. 11)

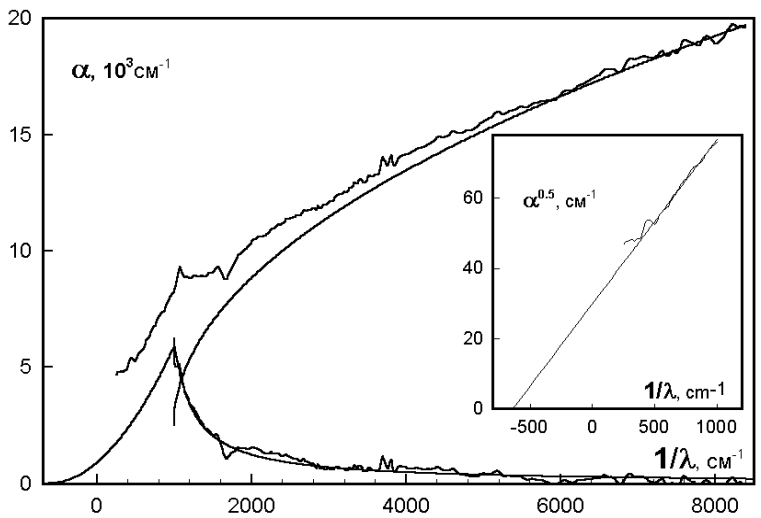

Fig. 11: Absorption spectrum of a film of finely dispersed pyrographite.

Dispersing graphite eliminated through conductivity, masking narrow slit effects.

The obtained absorption spectra of pyrographs are well described by the additive contributions of two processes:

indirect permissible transitions: $\alpha \sim (E - (\Delta E_1 + E_{ph}))^2$, with the characteristic frequency $(\Delta E_1 + E_{ph})/h = -640$ cm^{-1}, where E_{ph} is the phonon frequency and by direct allowed transitions: $\alpha \sim (E - \Delta E_2)^{1/2}$, with $E_{ph} / h = +1000$ cm-1.

Taking into account that the maximum phonon frequency for graphite is about 1400 cm-1, the obtained values of the edges of the inter band transitions correspond to a band structure with a direct slit near the Fermi level of about 0.125 eV and an indirect overlap of 0.25 eV. From the above analysis it follows that with a decrease in the degree of disorder in pyrographs, the forward energy gap decreases, and the overlap of the zones increases.

ii. *Dependence of C & BN optical parameters on the degree of ordering*

Pyrocrystals of boron nitride, as well as graphite, are a unique technological and technical material, inferior to pyrography only in heat resistance, but superior in diffusion of impurities (diffusion gate) and in radio transparency. Therefore, since the creation of boron nitride BN Sharupin, he was also actively investigated [11-17, 45-50].

The optical properties of graphite have already been used in analysis. But many optics and optically useful optical effects in highly conductive graphite are strongly shielded by current carriers. Therefore, they are either practically inaccessible for measurements, or require special indirect methods: measuring - the type of disturbed total internal reflection and technological - the type of graphite dispersion described above, in order to suppress through conductivity at the wavelength of the radiation used for the diagnosis.

Both the first and second numerous, and not only the above methods, were used to analyze C & BN. But they were used only for qualitative, testing analysis. As with the correct modeling of physical processes, it is necessary to build on the model describing the effect in the first approximation, and not in the form of the tenth correction, and with the right experiment, one must build on a reliably established direct effect, and not indirect ones.

In this respect, the Raman scattering, which has become fashionable and in many respects superseding classical spectroscopy, is by definition an indirect effect, i.e. interpretation of the results of these measurements is incorrect without reference to the base effect. In addition, the indirect effect of the effect also strongly influences the experimental conditions: the radiation flux used is many orders of magnitude greater than the fluxes of nondestructive IR spectral diagnostics, and the recorded signals, which are attenuated by 7 orders of magnitude, are also orders of magnitude lower than in classical spectroscopy. The same can be said about the use (mainly because it has nowhere to go for the colliders) of synchrotron radiation.

But it is better to talk not about what is useless or unreliable, but about what is useful. Classical spectroscopy, in principle, allows recording directly, in reflection, many effects even in highly conductive samples. But for this it is necessary to take into account the general phenomenon - logarithmic relativity and to increase the accuracy of measurements. And this was also repeatedly tested and used. The results presented below were interpreted taking into account the logarithmic dependence of the responses, and were measured not with a standard "optical" accuracy of 2-3%, but with an accuracy of the order of one thousandth percent. To increase the sensitivity of the optical technique, the optical zero was improved and a computer technique for noise analysis was used.

But, in addition to the measuring technique, it is also necessary to have an "instrument" - an effect that gives directly and unambiguously information, in our case, a crystal lattice. And in boron nitride, this "tool" is a residual "memory" of the fact that the boron and nitrogen atoms are different, the dipole in the crystal lattice allowing both the recording and stiffness of the interatomic bonds and the degree of ionicity of the dipole to be recorded both directly and in reflection [51]. As was shown above, the contribution of this dipole in boron nitride (and its difference from the contribution of a small concentration of free carriers in graphite) can be neglected to a first approximation. And the change in the parameters of the same type of crystal lattices during the transition from boron nitride to graphite is less than their change in phase transitions and disorder, and the above C & BN characteristics, starting with their phase diagrams, are similar and differ only quantitatively. Therefore, the results of the dipole analysis of the crystal structure of boron nitride are also applicable in the first approximation to the crystal structure.

The polarization spectra of the lattice reflection of a perfect rhombohedral boron nitride picr crystal are shown in Fig.12.

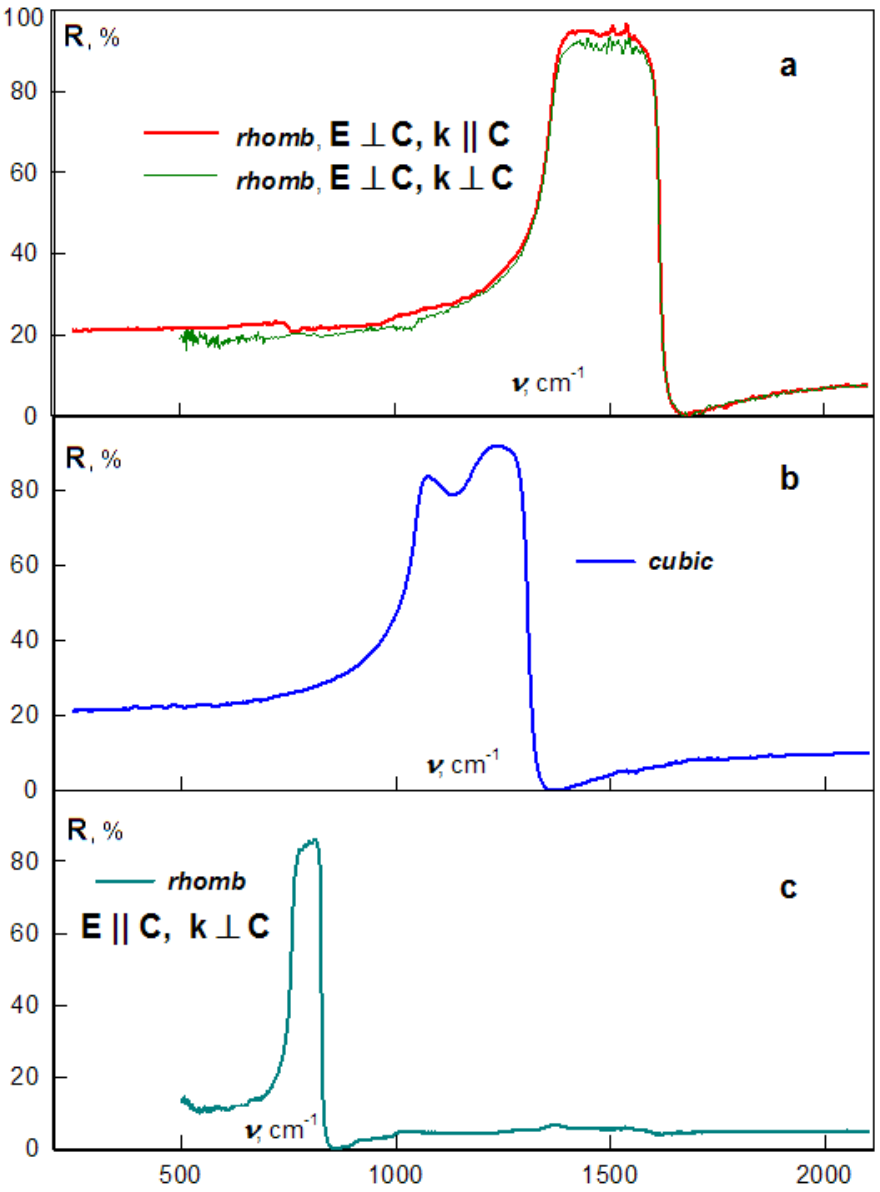

Fig.12: Lattice reflection spectra of perfect (with a low concentration of defects and penetrating at several millimeters thick) crystals of boron nitride: rhombohedral phase (a and c) and diamond-like cubic phase (b).

The reflection spectra of rhombohedral boron nitride shown in Fig. 12 demonstrate practically ideal, weakly damped lattice oscillators that exist in the lattice in both the hexagon plane (Fig. 12a) and between the mono-atomic layers (Fig. 12c). In this case, the frequency of transverse vibrations (the low-frequency edge of the lattice peak) characterizing the rigidity of atomic bonds is approximately 1.8 times lower for interlayer bonds than for bonds in hexagons. In addition, the width of these oscillators, and strictly - the difference in the squared frequencies of the high-frequency edge of the grating oscillator (longitudinal vibration) and the said low-frequency gives the ratio of the concentration of dipoles in the shown orthogonal directions 1: 3. This ratio strictly corresponds to the ratio of the number of orbitals between the layers and in the layer and shows that all 4 external electrons are involved in the lattice on ion-covalent bonds. And the limiting anisotropy (with respect to the lattice stiffness) is not a theoretical two-dimensional infinity, but 1: 7.2

Fig. 12b shows a lattice oscillator of a cubic, diamond-like, equivalent in hardness, but more durable and wear-resistant boron nitride obtained by the rhombohedral explosion method. Its grating oscillator is also sufficiently weakly damped. And although the damping of this oscillator appears somewhat more than in the rhombohedral phase, and directly from the graph, the model processing of the spectrum also gives the stiffness of the interatomic bonds intermediate between the interlayer and interlayer bonds, and the width of the peak gives the concentration of dipoles 4 per atom, i.e. the total number of orbitals per atom.

Thus, in the phase transition from the rhombohedral phase to this cubic phase, the orbitals of the hexagons are somewhat stretched, and the interplanar orbitals somewhat contract and move to the mean equivalent position. The transformation of the lattice described in boron nitride is even more natural and rigorous for graphite, but the assumption that there is no chemical bond between the monoatomic layers in graphite, as will be shown below, is unnatural!

Naturally, before the results shown in Fig. spectra of reflection and before the presented conclusions were made, the whole series of samples of boron nitride with different degrees of ordering of the crystal lattice was obtained and investigated. For a logical description it is necessary to go in the reverse order and in the following figure 13 the spectra of the reflection of a pyrocrystal with a minimum degree of disorder are presented - a strictly textured hexagonal boron nitride boron crystal.

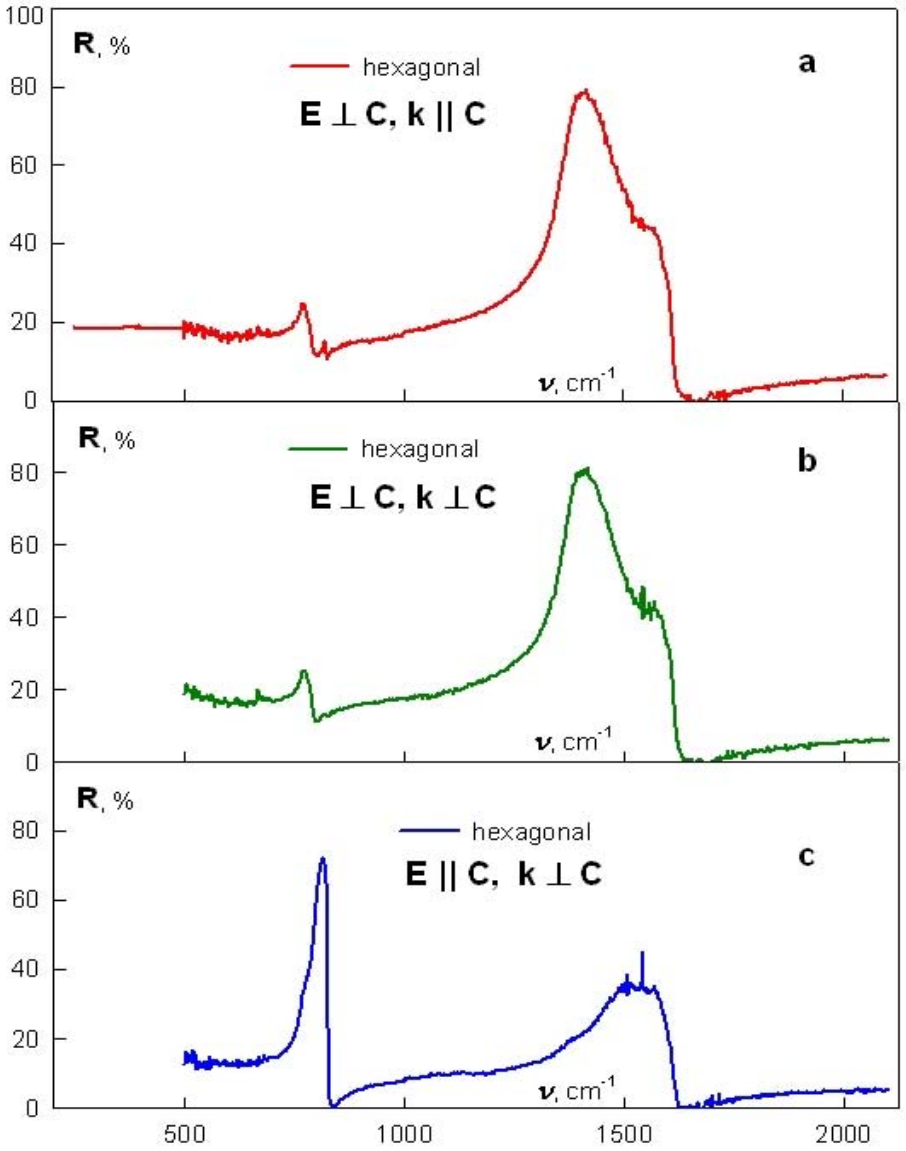

Fig.13: Polarization spectra of lattice reflection of strictly textured hexagonal boron nitride.

Just as in a rhombohedral crystal, the reflections of three normal modes were studied to control the dependence of the optical properties of the crystal on the orientation of the wave vector relative to the crystallographic axes. Spatial dispersion, which is manifested as a first approximation in long-period structures, is not revealed here, and the crystal-optical effects due to the smallness of the disorientation of the crystallites and their size are much smaller than the lengths of the investigated waves, also were insignificant (in contrast to weakly ordered pyrocrystals, where they are large).

So, the mixing of normal oscillators (the transformation of the shape of the oscillator due to the

"creeping" for a given polarization of the oscillator), which is observed in the reflection spectra of the hexagonal phase, strictly corresponds to the mixing of orthogonal oscillations in the crystal lattice itself due to the previously described disruption of the ordering of the interlayer bonds (and the concomitant entanglement of neighboring hexagonal meshes on solitons - boundaries of crystallites). The corresponding "overflow" of normal vibrations in the hexagonal phase is also clearly seen in the absorption spectra of the plates perpendicular to the C axis shown in Fig.14

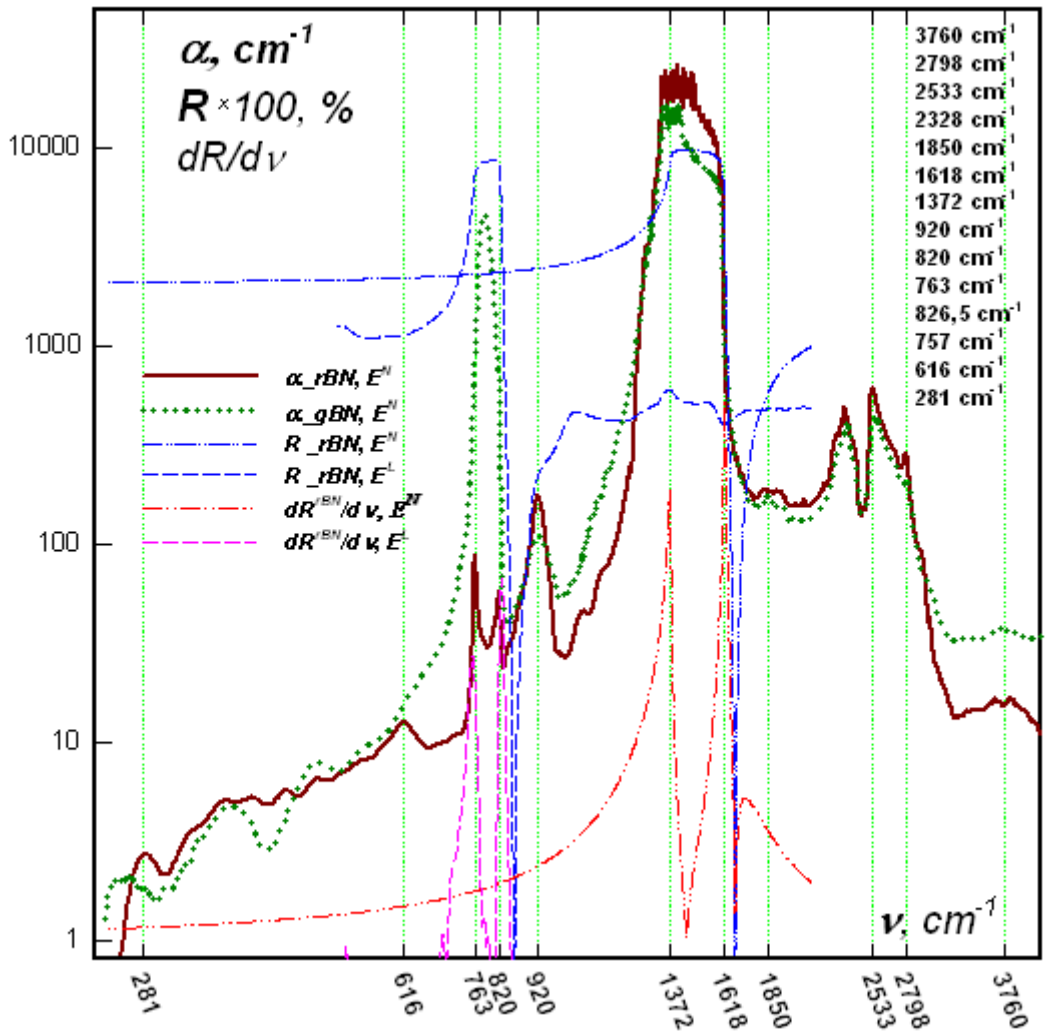

Fig. 14: IR absorption spectra of rhombohedral and hexagonal boron nitride (against the backdrop of reflection of a rhombohedral crystal).

The IR absorption spectra shown in Fig. 14 clearly show that in addition to the "allowed" (in the orientation of the wave vector and polarization) high-frequency high-power absorption band in the region of 1372 cm-1 in the region of transverse "forbidden" oscillations along the C axis at 763 cm- 1 in the hexagonal phase, a sufficiently powerful absorption band characterizing the energy flow is also observed. In the rhombohedral phase, there is also a "strange" band in this region, but this, as shown by a special polarization analysis, the transmission-scattering band, whose shape depends on the aperture, and whose nature is the parametric interaction of modes, present in principle, in any, even ideal anisotropic crystal.

The used rhombohedral and cubic samples had insignificant scattering on the defects, but so insignificant even in the ultraviolet, that it did not interfere with the measurement of the absorption spectrum (Fig. 15 from above) and reliably determine the width of the forbidden band (Fig. 15 from below).

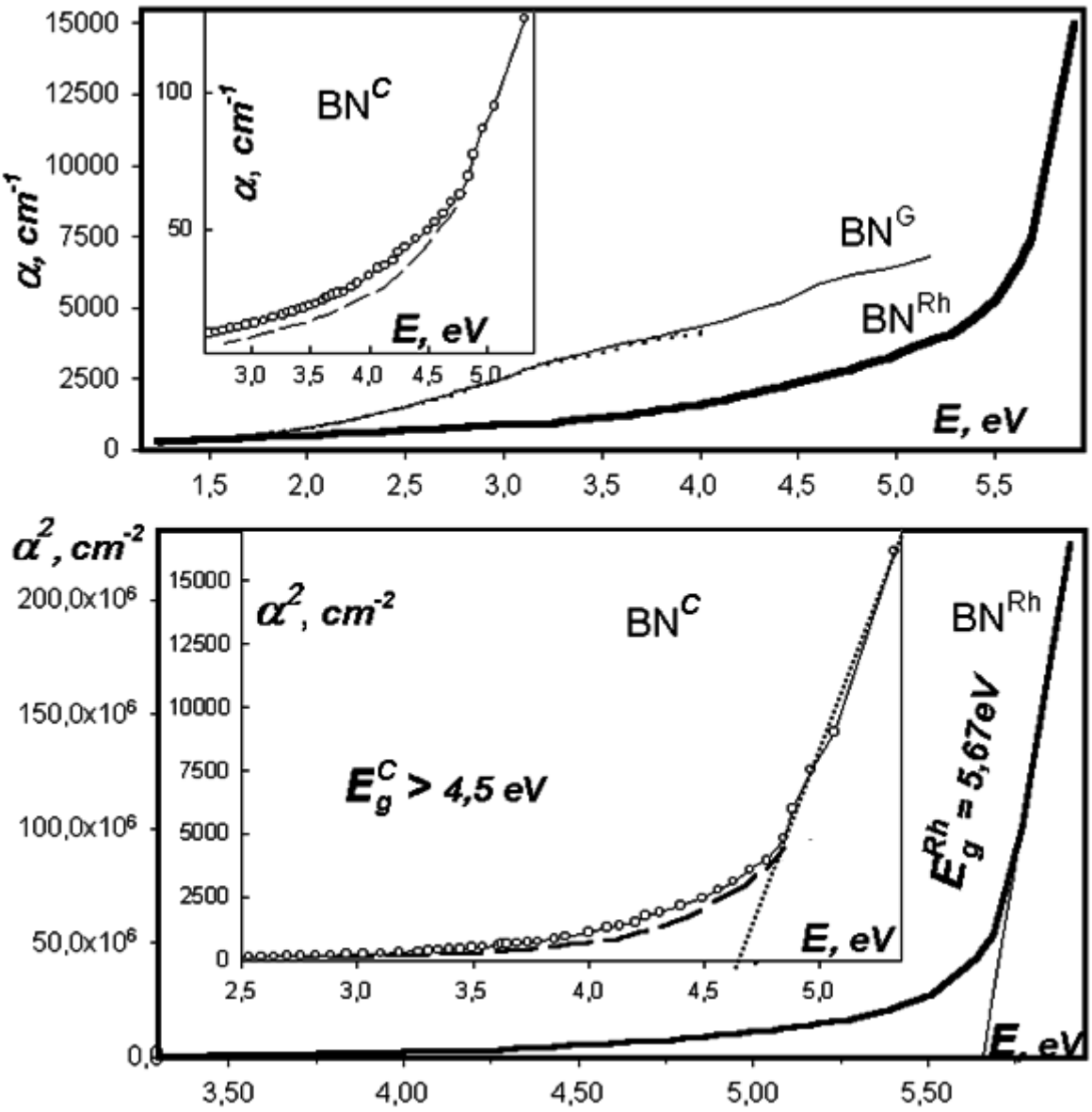

Fig.15: Absorption spectra in the region of interband transitions of various modifications of boron nitride.

Whereas the haze of a large-grained textured hexagonal sample, as shown in the upper Fig. 15, it was not possible to determine its width optically.

The dullness obtained from an isotropic sample at relatively low pressures of the cubic gamma phase was also high, but in the IR region, due to the smallness of the crystals, its mirror grating reflection was reliably recorded (Fig. 16).

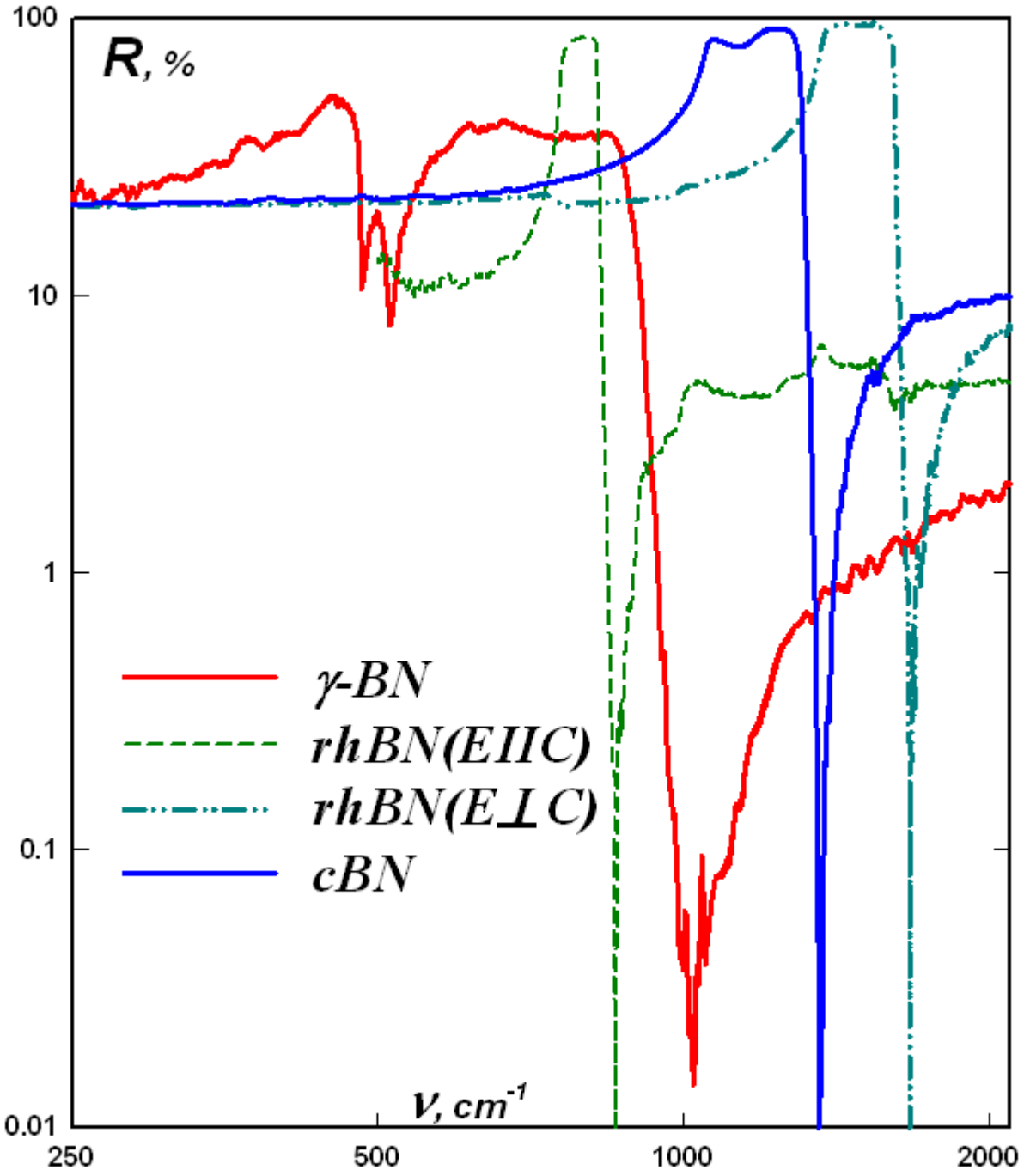

Fig. 16: Comparison of lattice oscillators of gamma-phase with intralayer in hexagons, with diamond-like and interlayer oscillators.

The spectrum of lattice reflection of the boron nitride gamma phase directly demonstrates that in this cubic phase there is an interatomic orbitals akin to interplanar in the rhombohedral phase.

III. Analysis Of Resolvedenergy Level Of Electron

For chemical bonds, first of all, the upper electron-filled atomic level (which corresponds to the first ionization potential of the atom and the work function of the solid body formed from these atoms) is important, and the empty level closest to the filled level (which corresponds to the electron affinity).

On the example of the "elementary" C & BN, the relationship of the macroscopic properties of a substance with properties at this "elementary" atomic level can be continued, at the same time, and correcting it, rather than confining itself to its statement in the introduction. And on the atomic level, this chain has necessarily continued with the correction of the basic

model of the crystal bonds of the "elementary" C & BN [6]. Elementary C & BN can only be said to be He and Li, but only the simplest s-orbital is filled with them. And for most materials used, the electronic structure is richer and it needs to be represented in the first approximation.

Such a correct approximation, in fact, is the model of the electronic structure of C & BN, and not the model of the hydrogen atom. While most calculations of atomic orbitals of complex atoms (electron density distribution) are conducted in the form of numerous corrections to the model of the hydrogen atom. Here is a refinement of the C & BN crystal model based on electronic orbitals and led to the need to comb the model of the atom, which, in principle, is correct only for the hydrogen atom.

The basic formula describing the allowed energies of ALL electronic levels (respectively, and all orbitals) and used for any atoms has long been obtained by quantum mechanics and is well known:

$$E_n = -\frac{hcRZ^2}{n^2}, \qquad (1)$$

где eZ - nuclear charge, а n - principal quantum number [23].

The sign in the formula stands minus, as is customary in semiconductor physics, but traditionally ionization potentials are depicted as positive, which separates chemical and some physical letters of the type of solid-state physics. Adhering to the correct sign in Formula 1 and putting the world's constants equal to unity, one can construct a graph of the dependence of the energy of each allowed (according to the main quantum number n) energy level of the electron E_n on the atomic nucleus charge (Fig. 17).

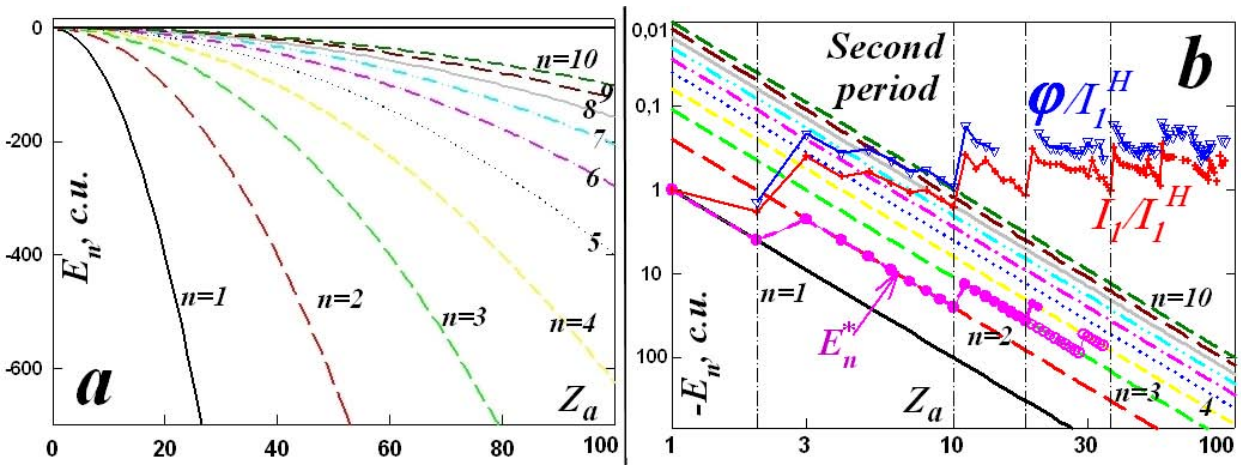

Fig. 17: Dependence of the energy of allowed electronic levels (in conventional units) on the atomic number in linear (a) and double logarithmic scale (b). Pink dots show the maximum filled levels (within the framework of the elementary model). Red crosses and blue triangles show normalized reference data on the first ionization potential I_1/I_1^H and the work function φ/I_1^H.

In order to avoid confusion, I note at once that the generally accepted term "first ionization potential I_1," refers to the minimum excitation energy of an electron of an atom i.e. to the most highly filled level E^*_n. So I_1 relates to the first quantum $n = 1$ only for the first period, for the second period I_1 refers to the level with $n = 2$.And so on, the electrons of the atom tend to occupy an energetically favorable state at the allowed energy levels, i.e. the filling of levels by electrons begins with the deepest, first, then second and so on up to the total number of electrons equal to the atomic number on (in Fig. 1b the pink lines and points are E^*_n in accordance with the experimental period, pink circles - E^*_n in accordance with the model of the hydrogen-like atom).

But each level of electron energy resolved (the main quantum number) corresponds to a different number of allowed states of the electron, distinguishable both in spin-2 and in orbital quantum number- $\{l = 0,1,2,...n-1\} \Rightarrow k = n$ and in terms of the magnetic quantum number having the number of values determined by the chosen orbital number $\{m_l = l, l-1, ...-l\} \Rightarrow r = 2l+1$ (c taking into account the spin-the placement of two electrons on the level, the number of states doubles and by additional quantum number-states). So the filling of the levels with the increasing principal quantum should go stepwise, as shown by the pink dots in Fig. 1b.

However, as can be seen from Fig. 1, the basic model of a hydrogen-like atom widely used (in introductions) gives the level filling by electrons (pink dots) qualitatively different from reality (red crosses and blue triangles in Fig. 1b). The observed first ionization potentials of atoms demonstrate that the

energy of the top-filled allowed atomic level for $Z_a >> 1$ (for long periods) does not increase by orders of magnitude, as would follow from the hydrogen-like model (pink dots in Fig. 1b).

In this case, for the second "elementary" period, the number of elements is 10, which is in full accordance with the model. In addition to filling two s-states, we have two more orbital numbers $n = 2 \Rightarrow \{l = 0,1\}$ and, correspondingly, four additional allowed states of the electron, the allowed states of electrons (pink circles in Figure 1b violation, taking into account spin-eighteen).

This long-known violation is simply accompanied by words about the greater difference in energy levels within the period than between periods. But this difference is so great that it casts doubt on the very expediency of using the calculations of the electron orbitals of large atoms based on the nucleus of the hydrogen atom.

So a completely filled s-p-hybridized electron shell of neon is similar to a completely filled s-shell of helium, and neon itself with a partially shielded nucleus is similar to helium. In general, the weakly increasing course of the first ionization potential observed in Fig. 17b qualitatively differs qualitatively from the model, which decays quadratically. It is more qualitatively more accurate to describe each period using its quasi-nucleus, a core shielded by internal and external electron shells. Moreover, the shape of the outer orbitals calculated on the basis of a bare core, as will be shown in the next section, can in no way be used as the first approximation for describing the crystal structure.

So when using the bare nucleus to describe the atom already in the third period, the formalism itself is violated even in the number of states. And one can use formalism only where the amendments to it are small. And they are not small, as can be seen from Figures 1 and 2, already in the second period.

Of course, there are quantitative differences already in the first period, but there are few points for analyzing the regularity. So, let's take a closer look at the "informal first" period - the second.

The analysis of quantitative differences in the second period gives an understanding that the elementary model for each period has its own "reference point" at approximately the same energy level (see $I_1/I_1(H)$ and $\varphi / I_1 (H)$ in Fig. 1b), and not quadratically decreasing. Therefore, the main attention was paid to a careful analysis of the quantitative differences between the elementary model and the experimental data of this period, the "elementary" and the base for more complex periods (Fig. 18).

$\{l = 0, m_0 = 0\}, \{l = 1, m_1 = 1,0,-1\} \Rightarrow 1+3$ and taking into account the spin, eight (points in Figs. 1b and 2 are the normalized first ionization potential).

But already for the third period there is a difference and the number of filled states from their number, which follows from the base model. The number of elements in the third period, as well as in the second period, corresponds to the filling of four allowed electron states, rather than nine model states for $n = 3 \Rightarrow \{l = 0,1,2\}$,

$$\{l = 0, m_0 = 0\}, \{l = 1, m_1 = 1,0,-1\}, \{l = 2, m_1 = 2,1,0,-1,-2\} \Rightarrow 1+3+5$$

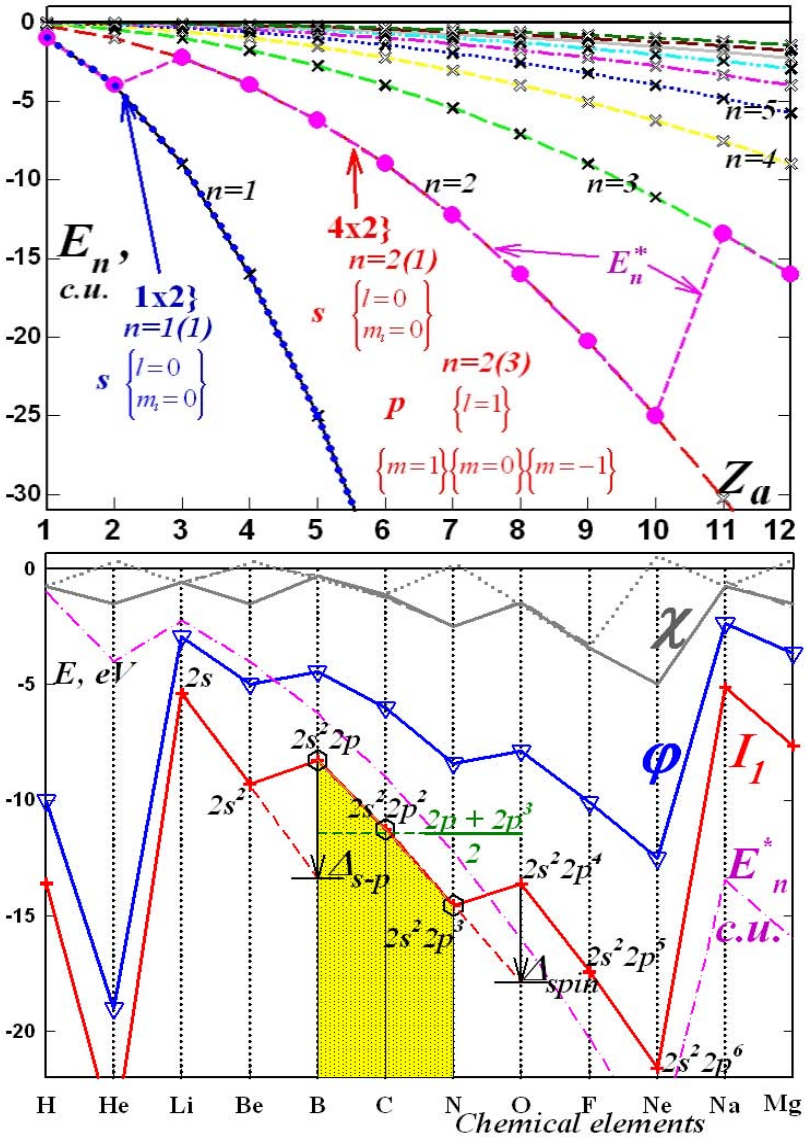

Fig.18: The progress of the upper filled state E^*_n (pink dots is at the top and the pink dotted curve is from below) from the model dependence of the energy E_n on the atomic number and the lower figure is the experimentally observed dependences on the atomic number of the first ionization potential I_1, the work function φ and the electron affinity χ (the data contradicting the definition of affinity are represented by a dotted line).

As can be seen from the lower figure 2, all reliable data on the work function and electron affinity correlate well with the first ionization potential. In this case, the first ionization potential decreases not monotonically, but has two characteristic discontinuities. The first at the beginning of the p-orbit filling determines the s-p-splitting $\Delta_{s\text{-}p}$, the second jump is observed when the p-orbital filling begins with the electrons of the opposite spin and determines the spin splitting of p-levels Δ_{Spin}.

Therefore, it follows from the foregoing that for the third period the helium quasi-atom model also gives the correct length of the period. And the model following from the analysis of the second period, it is possible and it is necessary to use as base model. Instead of using the "through formalism" of a hydrogen-like atom with a level energy that depends only on the principal quantum number.

Moreover, the electronic structure of the elements of the second period clearly demonstrates the regular dependence of the energy of the electron levels on the additional quantum numbers (Fig. 2), and in a slightly modified form these regularities of filling the levels of the second period are almost completely repeated for the third period (in spite of the elementary model having the same number elements, as well as the second period), and the main ones are observed for all subsequent periods (Fig. 17b).

Namely, the first ionization potential of the second period does not have a monotonous dependence on the atomic number of the element (in accordance with the elementary model), but three,

clearly expressed regions. The period begins with the filling of the s-orbitals first with one and then with the second electron with the opposite spin. As far as the spin of the second s-electron itself raises the second level qualitatively (by deviation from the ideal model for the first period of the core already shielded by the s-shell), it is difficult to determine, since and the first s-level is not lower, but above the corresponding s-level of hydrogen.

But when going to p-levels - further filling, a characteristic jump is seen, indicating that the orbital quantum number raises the energy of the level allowed by the principal quantum number. Those. already at the atomic level there is an s-p-splitting. The filling of the p-level by the first three electrons of one spin again goes in qualitative agreement with the ideal dependence on the atomic number (the yellow band in the lower Fig. 2). But the filling of the p-level by the next three electrons of the opposite spin again begins with a jump, but continues in qualitative accordance with the ideal dependence on the atomic number of the element. That is, in addition to the traditionally considered s-p-splitting, there exists and is observed at the atomic level spin splitting.

Conducted analysis of the conformity / non-compliance of an ideal model with experimentally observed regularities allows us to make a number of fundamental amendments and conclusions.

1. The larger size of the screened (by internal electron shells) nucleus-quasidron raises (significantly) the allowed (near the quasinuclear) energy level for the external electron.
2. For the third period, the maximum orbital number remains equal to unity, as for the second period, i.e. this is a quasi-second period with "n" = 2.
3. Only for the fourth period does the orbital quantum number reach 2 and d-shells arise, i.e. period with quasi- "n" = 3.
4. For the properties of materials, the nearest, first unfilled level-the broadening of the electronic levels-their transformation into bands also determines the metal, semiconductor or dielectric properties of the resulting materials. But for barrier effects, this is not enough - a significant difference in the work function from affinity to electron not only in dielectrics and semiconductors, but also in metals directly indicates that the broadened first unfilled level does not reach the level of vacuum (zero). It follows that in the nano-size barriers the maximum height of the barrier is determined by the second unfilled level, which also manifests itself in the electron affinity.

Carbon and its dielectric analogue of boron nitride refer specifically to the second period, which determines their elementarity for a whole class of more complex materials. As can be seen from the lower figure 2, carbon also has on the upper shell two s-electrons with different spins and two p-electrons with identical spins and boron nitride, too, only on average per atom two p-electrons with exactly the same spins, since the spins of the p-electrons of the thief and nitrogen are the same. This is the similarity of the C & BN atomic orbitals and determines the similarity of their crystalline orbitals and many properties, which makes it possible to construct a base element model for most complex chemical elements. So carbon not only spawned life. Most of the other chemical elements are made in its image and likeness. its electronic structure, in principle, is preserved, only scaled.

Also, one more general statement follows from the dependence of the first ionization potential in the second and third periods. The above-mentioned spin splitting, in principle, violates the Pauli principle, which, by and large, requires registration in Fermi-Dirac statistics (and most likely in Bose-Einstein statistics). This, of course, goes well beyond the work on C & BN. Therefore, I only note that these statistics work well in solid bodies, where, as noted above, the atomic repulsion of opposite spins can be offset by the spatial separation of their electron carriers (as analyzed in the framework of the ballistic model - see the article with the same name on the site Nanotechnological Society of Russia [52] and in the book "Refinement of basic physical models" [51]).

IV. Zone Structure And Potential Barriers On The Boundary Of Two Materials

When creating semiconductor devices, the main parameter of the material is the width of the forbidden zone. At the same time, when creating interfaces, the work of the output was not given much importance. The potential barriers at the boundary for semiconductors of the same type were also determined by the width of the forbidden band. But for dissimilar materials, the magnitude of the potential barriers was an order of magnitude smaller than the difference in the work yields of the contact materials of the plates, and as a result, they believed it did not correlate with it in any way. When creating semiconductor structures for local thermo-EMF, this issue had to be given special attention [52].

As can be seen both from the general figure 1 and from the more detailed figure 2 (lower), the work function of metals clearly correlates with the first ionization potential, and for silicon depends on the type of its conductivity, ie, it correlates with the top of the valence band and bottom of the conduction band. This correlation is determined by the fact that the work function corresponds to the ceiling of the allowed zone (the blue band in Fig. 19) formed from the level of the first ionization potential I_1.

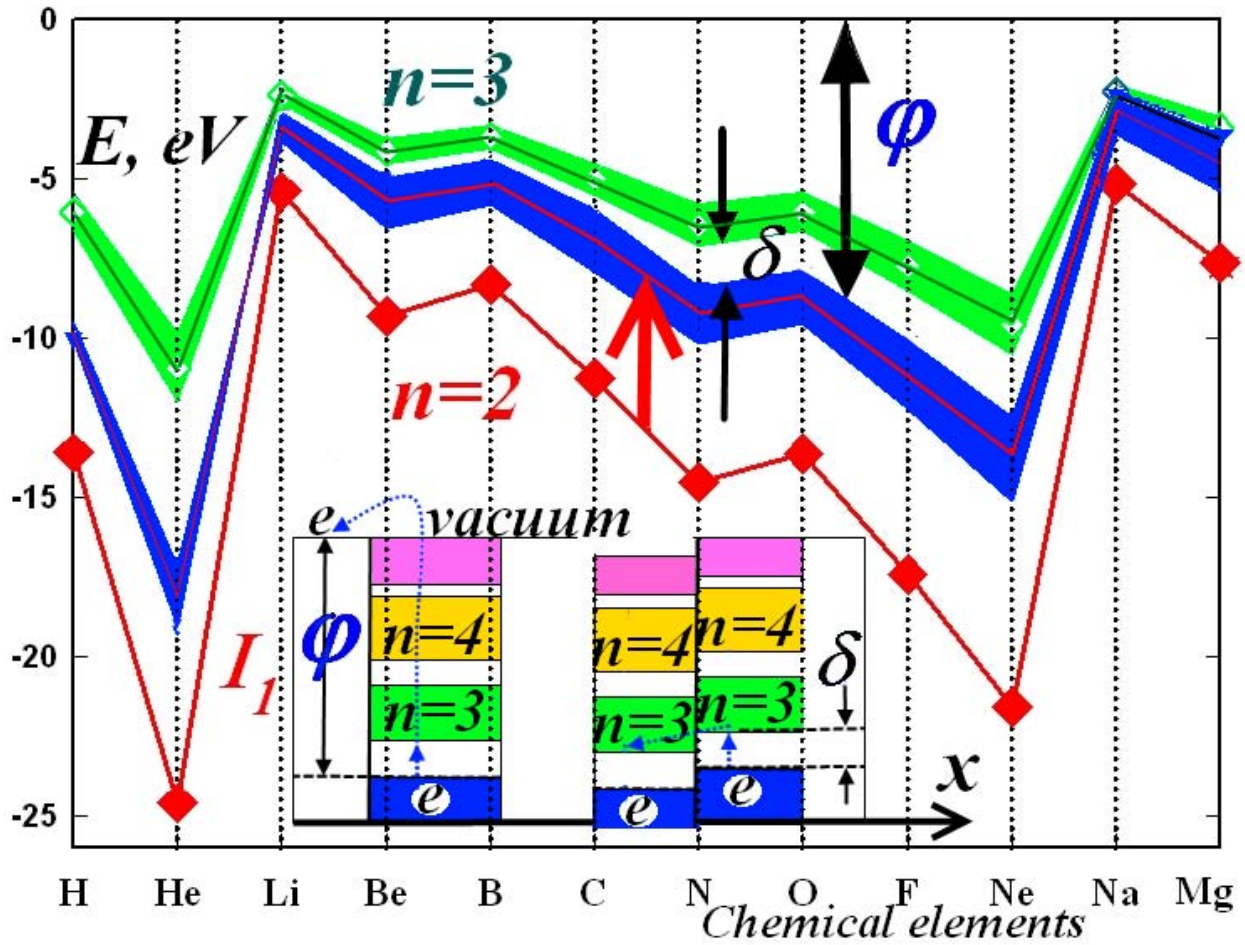

Fig. 19: The scheme of the appearance of allowed and forbidden zones and the internal work function of δ at the boundary of different materials.

As noted earlier, the first ionization potential I_1 corresponds to the maximum electron-filled level of the resolved level, and for the second period shown in Fig. 19 this is the second level in the principal quantum number: : $n=2$. Qualitatively, for each chemical element, being tied to its I_1, it is possible to estimate the position of the nearest to the filled, free allowed level by the formula 1.

To this level, for $n=3$, whose energy is $4/9 \cdot I_1$, there is a corresponding band of the color of the sea wave - a band of free states, a valence band, which is also present in metals, but overlapping with the band of filled states. The asymmetry specified by the polarity of the boundary leads to an external work function φ and to the external photoelectric effect at the boundary with the vacuum, and to the inner work function δ and to the internal photoelectric effect at the interface of the two materials. wave functions of empty levels of different materials on the boundary overlap.

Since the internal work function is generally unequal to zero, it follows that the energy widths of the bands of allowed states are much less than the difference between the level I_1 and the corresponding external work φ. So in this case, due to the crystalline interaction, there is a rise in the level filled with electrons, and the energy gain necessary for the appearance of the condensed state is apparently connected with the interaction of the nuclei with each other, which on the state of the external electrons only appears as compression and extrusion onto the surface. It is more correct to say, as was shown above, with quasinuclear interaction, which leads to a fundamental difference in the experimental characteristics obtained from the hydrogen-like atom model shown in Fig.17.

In order not to overload Fig. 19, there is no strip on it - the dependence on the atomic number of the following free states: $n=4$. The ceiling of this band correlates well with the experimental values of the electron affinity χ. Levels corresponding to quantum numbers greater than 4 are condensed near the vacuum level (Fig. 17), and the corresponding zones merge (the pink region on the inset showing how electrons flow across the vacuum boundary and the boundary with another material).

The circuit shown in Fig. 19 can be said to be a working scheme for microcracking of semiconductor

structures with highly effective local thermo-EMFs [18-24].

V. Analysis Of The Orientation Of Hybridized Atomic Orbitals

Logarithmic relativity is a general physical phenomenon [9], which manifests itself not only in the energy of allowed electronic states (formula 1), but also in the form of their orbitals - the electron density distribution in various allowed orbits. And quantum mechanics using a hydrogen-like model, not only counted the energy of allowed electron states to an unlimitedly large principal quantum number, but a huge number of orbitals corresponding to additional quantum numbers.

But even with the example of allowed electron energies, it was shown that approximations to infinity without taking logarithmic relativity give an error greater than the base value in the zeroth approximation. Therefore, we restrict ourselves to considering only the shape of the first two orbitals, which correspond to the second period of interest to us: one s-orbital and three p-orbitals (Fig. 20a).

The s-orbit is spherically symmetric and does not impose any restrictions on the orientation of the interatomic bonds, while the three resolved p-orbitals are orthogonal and thus ALLOW and the interatomic bonds are only orthogonal, which corresponds to the elementary unit cell in the form of only an elementary cubic (Fig. 20b).

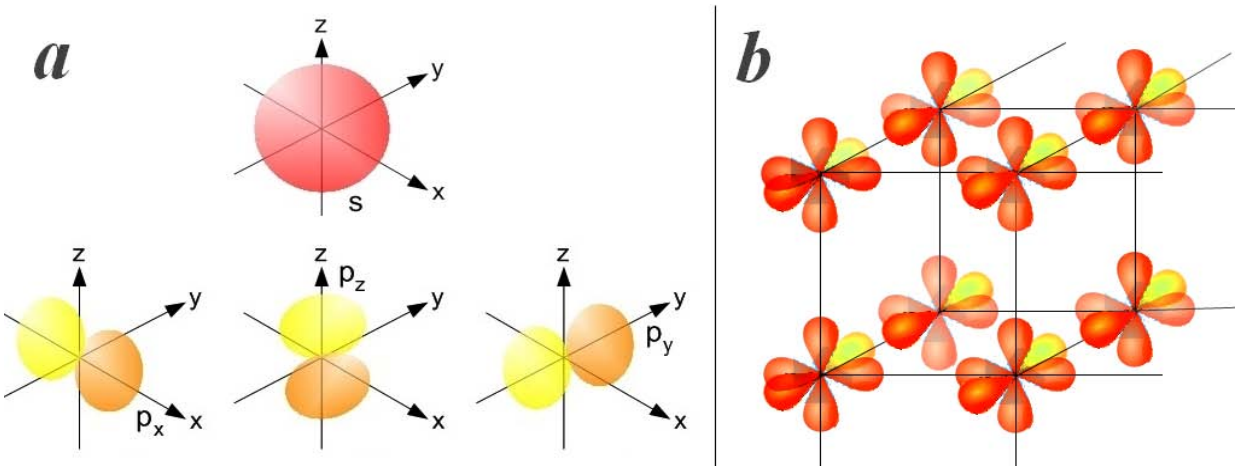

Fig. 20: The set of atomic orbitals of the second period (a) and the corresponding elementary translational cell (b) obtained in the framework of the simplest model.

If we assume that when a chemical bond is formed by an unfilled electron, one p-orbit can be neglected, then the same graphite would form a square grid of atoms. This is not observed in nature - the carbon grid is formed by hexagons.

And since chemical orbitals in both micromolecules and macro crystals can differ substantially in orientation and in shape from the calculated atomic orbitals in general, then their hybridization has been invented.

As a matter of fact, hybridization introduced to describe interatomic interactions was attributed directly to a separate atom, which means that the correction for the corrected orbitals (depicted in Fig. 20) is actually calculated, taking into account the macroscopic properties of matter from these atoms.

In fact, such an approach was a refusal to use atomic orbitals. So Pauling drew his model of sigma and pi-electrons (Fig. 21), directly contradicting the ALLOWED (resolved) atomic orbitals of graphite.

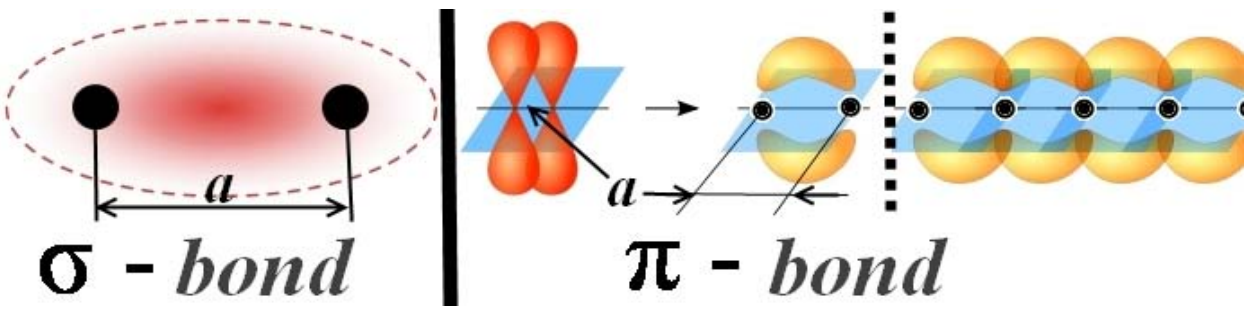

Fig. 21: Pauling fit the chemical orbitals (actually macroscopic) under the atomic idealized model (in fact, the terminology).

In principle, it was a beautiful attempt to look into the unknown microcosm. And in itself this attempt to look into the unknown, deserves the Nobel Prize, because she encouraged many chemists and physicists to do this kind of design, including me.

But already in these basic drawings it is clear that the developers (Pauling himself soon realized that the design is contradictory) is "hidden behind the thought": the diversity of the image of the links of the same size (between the nodes and the pi-link, the distance is also intra-planar ***a***, just like this Naturally, as between the nuclei of the sigma bond), and the "equality" of the size (represented) of the p- and s-orbitals, and the translational smearing of the π -electrons (in contrast to the σ-electrons rigidly fixed between the nuclei).

And the "hidden" blurring of one of the four electrons (true, on both sides of the layer!)Was attributed: both the sliding of the layers along each other, and the high electrical conductivity along the layer, and for one and Van der Waals interaction between the layers. And the atoms of a single layer "liberated" by blurring would seem to be placed anywhere relative to the atoms of the other layer, but from "caution" they drew them (Fig. 22) located strictly above each other (so that all the maxima of the diffused π-bond of the neighboring layers coincide).

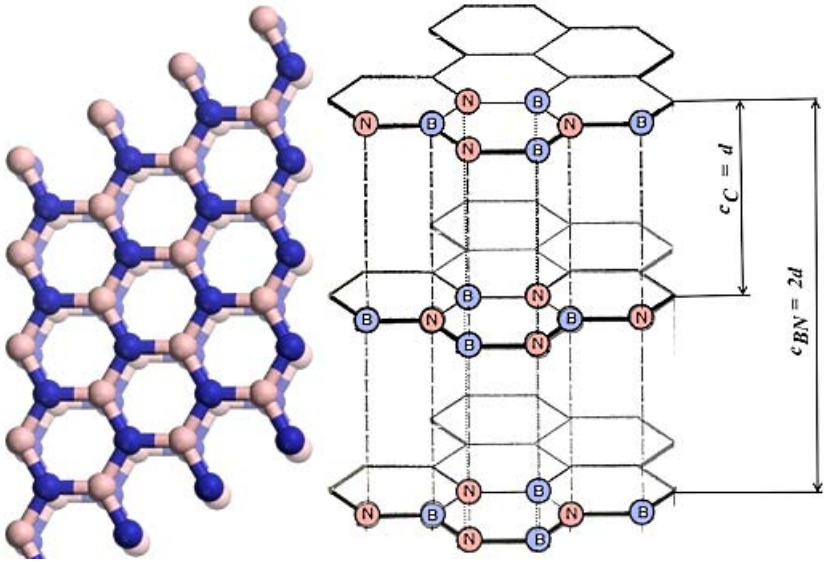

Fig. 22: Erroneous, but originally included in the letters, and still redrawn by many, including Wikipedia, and graphenologami, the basic model of the crystal lattice of the hexagonal phase C & BN (with the replacement of equivalent balls for graphite).

In terms of promoting understanding of the meaning of true rather than idealized allowed atomic orbitals, many results of structural and IR spectral studies were obtained in the growth of pyroxymes of graphite and boron nitride, which, in many ways, supplemented each other [7 - 12]. The closeness in energy of the upper p-orbital of carbon ($2p^2$) to the average value of the energies of the upper half-filled p-orbitals of boron ($2p$) and nitrogen ($2p^3$) indicates the similarity of external orbitals of boron nitride to carbon orbitals.

Those. the flow of an electron from nitrogen to boron leads, as it were, to the formation of two carbon atoms, only one little (as seen from the spectra of the lattice reflection BN) is positively charged and the other negatively. The polarity of the boron nitride molecule made it possible to analyze the interatomic bonds in the crystal lattice, which is practically identical to the graphite lattice in all phases, including the one depicted in Fig. 5, which demonstrates the discrepancy between the Powling orbital and not only the hexagons in the layer, but also the observed translation periods across the layers C & BN. The model of the crystal structure of the hexagonal phase, drawn by the Pulling method, gives a transmission period that does not exist in hexagonal graphite and is equal to one interplanar distance (in the experiment it is at least doubled in 3D graphite), and in hexagonal boron nitride there is such a period, and the atoms of adjacent layers are not located as in Fig. 22.

In general, the above-mentioned cycle of complex studies allows us to state that the true atomic orbitals of C & BN are inscribed, in strict accordance with symmetry, in the tetrahedron depicted in Fig. 6 (and, as studies have shown, in strict accordance with the four are involved in molecular bonds in C & BN electrons).

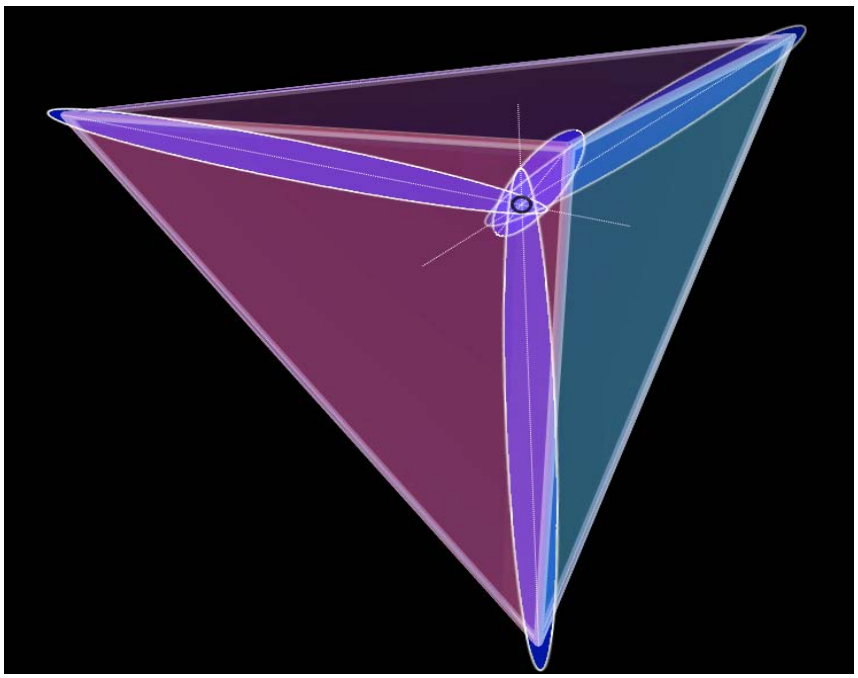

Fig. 23: The orientation of the true hybridized atomic orbitals C & BN.

The deformation of the atomic orbitals shown in Fig. 23 requires additional energy, which is released during the chemical reaction. However, a large deformation of atomic orbitals requires a large expenditure of energy. Therefore, the formation of chemical orbitals is more probable with a slight change in the orientation of the atomic orbitals.

Therefore, the correct, and not artificial, type of Pauling's constructions is essential, their representation is in first approximation (rather than making numerous corrections to the ideal model, or drawing them not on the basis of the principles of physics, but based on empirical data).

The atomic orbitals shown in Fig. 6 correspond directly to the crystalline orbitals of the cubic C & BN phase and only slightly deform in their other phases.

The analysis shows that it is the model of the carbon atom that should be used as the base for many chemical elements, and also for the correct description of organic life.

VI. The Real Crystal Structure Of C & BN

The complex research carried out by C & BN touched on a number of the most general issues of the formation of atomic-molecular bonds. And a direct confirmation that the results of the analysis are true and useful are the obtaining of perfect pyrocrystals and the construction of the rhombohedral C & BN structure (Fig. 24) on the basis of the orbitals depicted in Fig. 23 and the identification of the order-disorder transition upon its transition to the hexagonal phase.

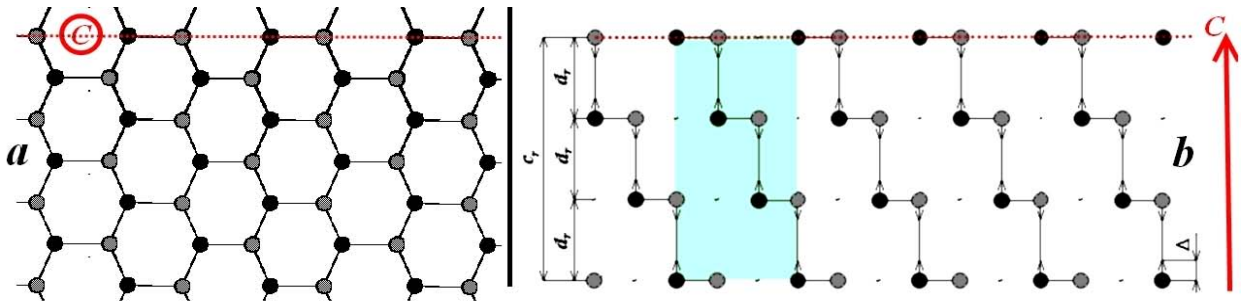

Fig. 24: The simplest, but taking into account the displacements of the atoms Δ from the plane perpendicular to the C axis (shown in the figure to the right by small arrows) is the lattice model of the rhombohedral C &BN : a - in the plane perpendicular to the C axis, b - in the plane of the section parallel to the C-axis (indicated in both figures by a dotted red line).

Three of the four orbitals depicted in Fig. 23, overlapping with the orbitals of neighboring atoms form very rigid bonds and form the grid of hexagons depicted in Fig. 24a. The fourth atomic orbital of one monoatomic

layer "can find" an analogous orbital from the adjacent layer, but their overlap will be somewhat less because of partial rectification in the plane of the three orbitals involved in the grid of hexagons.

Figure 24b shows the cross-section of the lattice by a plane parallel to the C axis and passing along the sides of a part of hexagons. The interlayer bonds shown in Fig. 24b, which are about one and a half times less rigid than the intralayer ones, can satisfy spatial translation and form a regular lattice from the two-dimensional net of hexagons by the only method depicted in Fig. 7b, which leads to the formation of the rhombohedral phase.. These interlayer bonds provide up to about 1000 ° C the existence of a regular rhombohedral phase [6]. But since their stiffness (and, accordingly, the Debye temperature along the C axis) is about one and a half times lower than the stiffness inside the layer bonds, then at higher temperatures, while maintaining ordering in the planes, the interlayer bonds are destroyed.This leads to a one-dimensional solid-state order-disorder transition in the hexagonal phase [11, 12]. So the hexagonal phase existing at room temperatures is metastable (hardened like the same diamond) and has ordering of interlayer bonds of the soliton type, which leads to the formation of small-diameter crystallites. In fact, it is the interlayer bonds that form the fullerenes, and the destruction of their regularity leads, with the integrity of hexagons, to the formation of a small concentration of defects (Fig. 3) in the rhombohedral phase of the C and BN pyrocrystals.

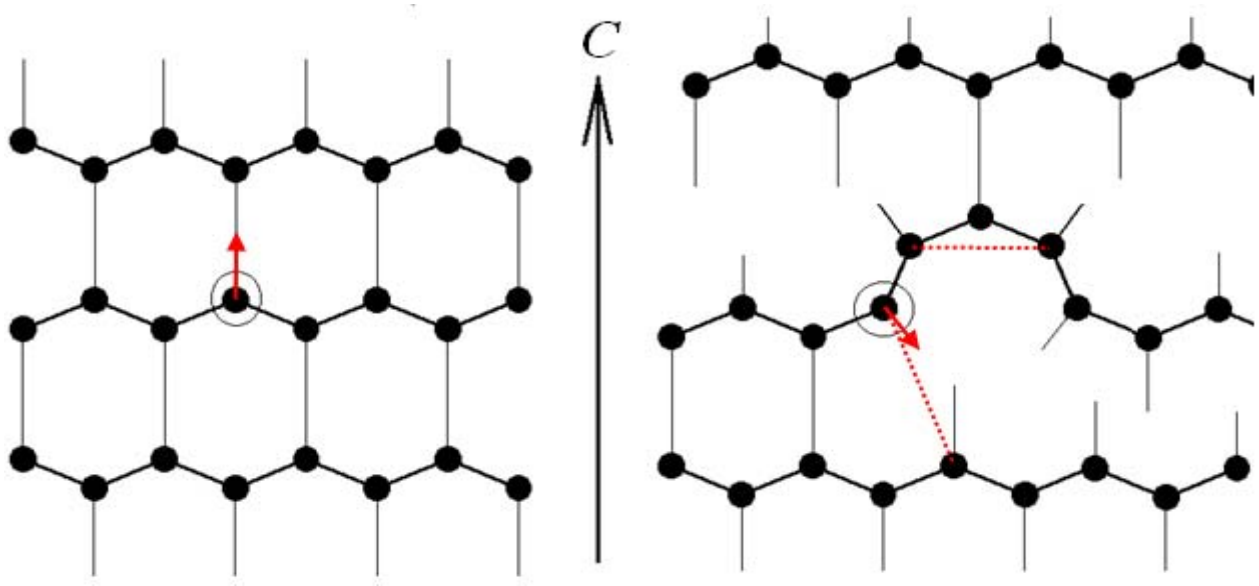

Fig. 25: The model for the formation of the interlayer defect in C & BN.

On the left, there is a schematic representation of a 3-dimensional ordered lattice, to the right of a defect, a violation of the alternation of the direction of one interlayer bond (isolated), leading to local distortion of the monatomic layer and destruction of the spatial correlation of monolayers (the red dotted line shows the probable "erroneous interlayer bond and the unlikely" erroneous " layer bond).

The section shown in Fig. 25 demonstrates how, in principle, the interlayer bonds of the same layer can be closed to each other when one of them is passed. This is how the fullerenes are formed from which crystallization centers are formed, a large number of which lead to the formation of poorly ordered pyrocrystals from sprouting growth cones (Fig. 2).

And most of the published data refer to the type shown in Fig. 2, C & BN samples, in which many properties are determined by large intercrystalline scattering. Whereas our conclusions are based on the results of the measurement of the most perfect samples (Fig. 5a).

Measurements of lattice vibrations in rhombohedral nitride of boron and measurement of plasma oscillations in rhombohedral graphite have unambiguously confirmed the asymptotic behavior of the dependences of the numerous C & BN parameters on the degree of their ordering-there is an ion-covalent bond between monoatomic layers.

The maximum of the anisotropy of C & BN is achieved on highly ordered polycrystalline hexagonal samples (Fig. 5c) and decreases, first, as the dimensions of the hexagonal crystallites increase (Fig. 5b), and then on going to the rhombohedral single crystal (pc.5a)

VII. The Beginning Of The Quasinuclear Model

a) Inert gases are quasinuclearof periods

An atom with a quasinuclear "has" a charge equal to the number of external electrons, and the size

of the quasinuclear is determined by the orbits of the inner electron shells. But screening of the core reduces its effective charge, which can be calculated using formula 1

$$E_n = -\frac{hcRZ^2}{n^2} \Leftrightarrow -\frac{hcRZ^{*2}}{n^2} = E_n^{Exp} \quad (2)$$

Thus, putting the screening factor of the hydrogen nucleus equal to unity, we obtain the screening coefficient for the helium nucleus and subsequent elements of the second period

$$k_{He}^{Z} = \frac{Z^*}{Z} = \sqrt{\frac{E_n^*}{E_n}} = \sqrt{\frac{1{,}8081}{4}} = 0{,}6723 \quad (3)$$

Thus, the quasinuclear potential is modified for the second period, which determines the allowed energy levels of the external electrons and, in accordance with the experiment, raises them above the corresponding levels obtained from the hydrogen-like model.

At the end of the second period, we obtain, similarly (see Fig. 17), the screening coefficient for the nucleus of neon

$$k_{Ne}^{Z} = \sqrt{\frac{1{,}5862}{25}} = 0{,}2519 \quad (4)$$

And in accordance with the algorithm used to construct the dependence of the energy of the upper filled level in Fig. 1, we can calculate the screening coefficient for the argon nucleus

$$k_{Ar}^{Z} = \sqrt{\frac{1{,}1592}{36}} = 0{,}1794 \quad (5)$$

and all subsequent shielding ratios of inert gases.

The increase in the size of quasinuclear should also be taken into account when constructing true orbitals. As well as the features noted above, leading to a nonmonotonic dependence of the first ionization potential within the periods. But this paragraph is not accidentally called "beginning", tk. the obtained estimates of the screening coefficient of the nuclei only modify the model of the hydrogen-like atom - they adjust the basic parameter in the first approximation to the experiment. So, for the time being this is just a compilation done to examine the key moments of the proper quasinuclear model, to which, strictly speaking, the s-p-d-f-classification of electron shells is not applicable. The obtained estimates show that it is required to find true quasinuclear "originally hybridized" orbitals of the atom, like, 4 external electrons C & BN.

VIII. Biological Aspects Of The Analysis Of Atomic-Molecular Bonds

I believe that it is not a secret that some important moments fall out of modern medical science. And only individual physicians-personalities such as Professor Shabalov (like Einstein in physics), maximally owning and modern medicine, and taking into account SOMETHING, are able to find elementary solutions when an ordinary doctor says: Modern medicine is powerless!

Another example, not for anyone, it's not a secret that not all medications prescribed by doctors lead automatically to a person's recovery. Moreover, many medications help a person purely psychologically, at the placebo level. And when creating active drugs, the principle of Hippocrates: DO NOT HAVE, as you know, is not always observed, say, in chemotherapy. So in pharmacology, we often have only attempts to follow this principle, and for a positive active intervention, both the doctor and the patient have to use a purely empirical method of trial and error.

So, medicine needs to be raised to a new level, but this requires understanding: What are the "bricks" used by it from the conjugated sciences to clarify? Of course, it also affects the fact that the organization of modern science and medicine in general is imperfect in particular, especially in modern Russia. But it is also obvious that modern science does not take into account any fundamental points. A change in the medical "brick" will not only manifest itself on the treatment of an individual directly, but due to a dynamic fractal connection, the medical "tree" itself will change.

And to "see" this "brick" we must remember that life on Earth is organic and its main brick is carbon. So the formation of "molecules of life" - cells is determined primarily by carbon. And not by chance, tk. it is the carbon fullerenes that are part of a chemical chain reaction that disrupts normal statistics, preserving information about the past, and thereby accelerating the development of the processes, makes the probability of the occurrence of life nonzero. Carbon fullerenes are cosmic sperm that has taken root in the "womb" of the Earth. Therefore, it is necessary to take into account the properties of carbon in the first place, whereas modern pharmacology deals primarily with catalysts - other chemical elements and their compounds.

Physical concepts of the electronic structure of carbon, were laid by the chemist Pauling to explain the anisotropy of graphite [1]. Practically in their original form they are still preserved, both in physics itself, in chemistry, and in their special directions, in particular in pharmaceuticals. Although Pauling himself tried to eliminate the contradictions in his model by introducing "curved chemical bonds," but the further development of science followed the original track he laid [2]. So that to curtail from this gauge it is required taking into account

modern knowledge to consider more thoroughly both the chemical bonds of carbon, and chemical bonds in general, tk. at their construction in an implicit kind were repelled from representations from chemical communications of carbon.

The fact that carbon has become in implicit form the basis for general ideas about chemical bonds, as will be shown in the article not by chance. Therefore, the refinement of its electronic structure is important not only for a correct analysis of the structure and properties of organic matter, but also for the electronic structure of most chemical elements and for the properties of materials [3], including those used in medicine.

IX. Conclusion

Any model, in principle, has limits of applicability. The widely used model of a hydrogen-like atom, as shown in this paper, is qualitatively broken already in the second period, and for the following periods gives a catastrophic discrepancy with the experimental data.

The complex study of C & BN pyrocrystals not only clarified their crystal structure and properties, made it possible to obtain perfect pyrocrystals and, on their "elementary" basis, to make a qualitatively new "brick" for the construction of atoms, namely their electronic orbitals.

Thus, it has been shown that even in the simplest chemical compounds, even in the "elementary" carbon atom, it is required to refine the concepts of the strength and form of atomic-molecular bonds. At the same time, it is possible and necessary to build models of atomic-molecular bonds of many chemical compounds on the basis of an "elementary", but more complex than a hydrogen atom, a carbon atom.

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Mind Fields Consciousness and Biocognitive Morphogenetic Fields as Described by the Great Cosmic Sea and Dark Matter Fractal Field Theory

By Timothy Fulton Johns DDS

Abstract- The most obscure and mysterious, yet personal, reality we all share is our conscious identity. The “me” of my world, and the questions that many of us ponder at some existential point in our life related to this awareness. Questions such as: What is all of this here for? How did I get here with it? Why are we here and to do what? And, a more recent question post-Galileo: Are we alone in this vast universe, are there other planets with life, or is it just us on this third rock from our Sun? The attempts of humanity through religion, philosophy and science to comprehend, understand and explain the answers to such questions are widespread and deeply rooted in our history.

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I. Introduction

What I am bringing to the discussion is a new model to use to explore our growing database of scientific knowledge to help provide some clarity to such concerns. A new paradigm to frame a different worldview to be used as we engage and compare what we think we know about our universe against the foundations of a new theory. It is possible that by using a new more inclusive world view to probe deeper into the working nature of the neglected life force we can begin to make inroads to better answer questions science still ponders. It is important that science investigate all plausible theories so that we may better understand how the life force relates and interacts with the other known forces of our cosmos. This new theory could be essential as we look for possible answers that might give insight into the growing discovery of new exoplanets and the life that is likely to exist there and elsewhere in our ever growing probing efforts to explore our galaxy and the deep space beyond.

Man's intellect is indeed another type of probe that can be used, as it has in our past. Another type of lens, through which the" minds' eye" may view our world. This method requires an accurate working model to focus the intellectual probe of our efforts in the most effective way that will direct our methods toward future discovery. We are sentient conscious beings for a reason; it is prudent to use our best intellect employing the most accurate model to understand the mysterious zones of our reality. The Cosmic Dark Matter Fractal Field Theory has predictive implications about consciousness and how it might be a projection of a specialized morphic fields thought to be resonant with and therefore receptive to a reservoir of information that the psychiatrist Dr. Carl Jung called the collective unconscious. Dr. Jung believed the collective unconscious to be responsible for instinctual behavior manifested in many life forms in the biosphere as well as mankind.

These fields are thought to be utilized for evolutionary progression of the biospheres, preserved in this collective unconscious and even recycled through reverse entropy dynamics by morphogenetic fields that occur across the baryonic matter/cosmic dark matter fractal field/interface (BM/CDMFF/I) at the Planck scale. It seems conceivable that this occurs through specialized fields "mind fields" as well which are recycled through process I call Biocognitive Transradiation.

See YouTube lecture (https://www.youtube.com/watch?v=R-DLHuiGgy8)

II. The Mind And The Universe

How does our conscious, as well as, our unconscious mind operate within and as a part of the collective unconscious of our species and the entirety of this cosmic reality? How do we explain the intuitive nature and sometimes precognitive insight of our intellect? What model of our reality can properly explain something so obscure but widely known to exist through personal experience and scientific experimentation? There are so many questions we have about this well-known but poorly understood subject. However, If reverse entropy is indeed possible as the cosmic dark matter fractal field theory (CDMFFT) predicts then information is being conserved, enhanced and recycled in the black hole/wormhole/white hole model of the Planck BM/CDMFF/I described in the foundational elements of the CDMFFT. A true theory of everything (TOE) should explain at least in part how all matter, animate and inanimate, organic and inorganic forms, function's and coexists in harmonic resonance with our universe and its biospheres. I believe this new theory as described in the book "The Great Cosmic Sea of Reality" is quickly moving in that direction.

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III. What Is Reality?

"The field is the only reality" Albert Einstein:

Our reality is indeed illusory when taken into full context as a part of an expanse that sits almost exactly in the middle of a scalar continuum from the Planck scale to the vast visible universe and the super-massive objects known to exist there. Even more illusory when we consider that all of the matter that we can perceive through scientific inspection and even our individual sensory perceptions make up only 4% of our entire cosmos. The presence of dark matter and dark energy accounting for the other 96% leaves quite a void in our pretense to understand the cosmos. However, there are significant clues that lead to clarity when the body of scientific research is considered across multiple disciplines. That is what I have done for most of my professional years as a perpetual student of the sciences and have discovered a common thread that encompasses all forces of nature including the neglected life force. So, it is not as an authority on any one subject that I bring this theory forward for your consideration but as a student who has uncovered a concept that keeps answering questions I have pondered for decades.

Perceived reality is an important concept to understand as a part of this inquiry that literally varies from person to person because our brain is the interpreter of that reality and conclusions about it. Therefore, perceptions of reality can vary greatly based on the input of several factors. These input factors are complex they are both direct and indirect, local and non-local. All of this data input is being sent to the brain directly by neuronal cells as well as indirectly by fields of different types to what we call the central nervous system that gives us an interpretation for a reasoned response or an instinctive reflex reaction to perception of "our" reality.

Information is received into our central data processor by way of both direct neuronal nerve connections and indirect influence of different electromagnetic fields (EMS) as well as fractal morphogenetic fields (MF). The human brain is seemingly the center of that data processing, the most complex object known in our cosmos. However, we may be mistaken in that assumption and there is evidence that the storage as well as processing of this input and certain memory storage is not exclusively located in the brain. Science has recently discovered new understanding that will, when combined with the CDMFFT, open new doors of insight about the structure, processing and function of this amazing organ of human functional perception and self-awareness. The brain consist of tens of billions of individual specialized cells called neurons with trillions of wire-like connections that transfer information signals across the entire organ not only locally but globally through its own fields across the entire central nervous system and the body it controls as well as non-locally at a distance resulting in hundreds of trillions of bits of information transfers per second. This complex neural network of connections and fields is giving you a read out, a conclusion, about your world moment by moment keeping you alert even now as you sit reading this paper; you remain conscious, upright, maintaining your balance pumping blood to everyone of your fifty trillion cells in your highly complex body sending oxygen and nourishment with every involuntary breath you take. So, is this a choice we make to be here or is it bigger than that; could it be a part of a process, a bigger paradigm that is out of our control when all is said and done?

Everything we recognize as our reality, our beliefs and hopes, our dreams indeed our entire construct of who we are in the context of our being; seemingly resides here and evolves within this three pound jelly-like organ of consciousness. However, we now know of a silent contributor out of our awareness called "the second brain" located in the gut. This new understanding has been uncovered through the Human Microbiome Project (https://commonfund.nih.gov/hmp/). This research project has revealed a whole universe of microorganisms that not only live in the gut but on our skin, in the mouth, nasal cavities and in a cloud like zone suspended in the air around our body all acting in unison as a type of fractal information network. This universe of microbes attempts to live in a symbiotic partnership with our complex body systems actively participating in the health and successful function of our body. Our human cells are literally outnumber 9 to 1 in cell population and genetic makeup by this micro-universe now known to be crucial for good balanced health.

This microbiome universe now referred to as the holobiome by many is thought to communicate with the central nervous system by way of your second brain in your gut through direct neuronal connection in the tenth cranial nerve, called the Vegas nerve, as well as indirectly through electromagnetic signals that these microbes generate for communications and possibly through biomorphic and biocognitive fields. This is a very complex and growing area of medical physiology research but the evidence is strong and the symbiotic fractal nature of your own biology and microbiology starts to unfold as you grasp this theory a bit more.

This dual cognitive complex with its multiple sources of input is the interpreter of your reality; the perception of your reality has less to do with what is outside you and more to do with what is inside as a part of your total fractal processing system. The miraculous job of your brain is to sift through all of this information and somehow keep you vertical, alert, intelligible and effective as you go about your day working and taking care of yourself and maybe a family. This rather oversimplified explanation of what is running in the

background under the hood so to speak may give you a small insight into what science calls the unconscious mind which has been estimated to account for 95% of your daily mental activity, which I think you will now agree is out of your awareness…therefore, unconscious.

IV. The Collective Unconscious

The acknowledgement and study of the mind eventually led to a concept that explained the mind as a collective experience not only locally but non-locally at many levels. However, without a model to understand how that might occur as mankind evolved the prospect of this concept as a part of our reality became less likely to influence this concept. That model now exist in the CDMFF theory and provides a possible explanation for the collective unconscious. The work of Dr. Carl Jung in the early twentieth century was one of the first to speak of the collective unconscious and he believed that it was a part of specific instinctual aspects of behavior across the animal kingdom. The quotes below are from one of the translations of his book "The Portable Jung"

> "I define the unconscious as the totality of all psychic phenomena that lack the quality of consciousness. These psychic contents might fittingly be called subliminal on the assumption that every psychic content must possess a certain energy value in order to become conscious at all. The lower the value of a conscious content falls the more easily it disappears below the threshold. From this it follows that the unconscious is the receptacle of all lost memories and of all contents that are still too weak to become conscious.
>
> The collective unconscious contains the whole spiritual heritage of mankind's evolution born anew in the brain structure of every individual. His conscious mind is an ephemeral phenomena that accomplishes all provisional adaptations and orientations for which reason one can best compare its function to orientation in space. The unconscious is on the other hand the source of the instinctual forces of the psyche and of the forms and categories that regulate them, namely the archetypes. All of the most powerful ideas in history go back to archetypes. I must emphasize yet again that the concept of the collective unconscious is neither a speculative nor a philosophical but an empirical matter. The question is simply this: are there or are there not unconscious, universal forms of this kind? If they exist, then there is a region of the psyche which one can call the collective unconscious."

V. Success Is Survival

This reservoir of eternal forms of "species specific information" (archetypes) explains what was observed as instinctual behavior by all animals including man according to Dr. Jung's theory. This theory was very good as far as it went, however, it is the prediction of the CDMFF theory that both biocognitiveas well as biomorphic transradition is occurring giving a more complete explanation as to how these well-known observations might actually work. There is another possibility to consider here and that is of a reservoir of Jungian archetypes which exists as a combined collection of life force archetypes expressed across perhaps millions of planetary biospheres throughout the entire universe. This entire library of archetypes resides in the DM/DE zone of our cosmos as a resource which may contain biomorphic information for environmental change and variation to unfold over time.(See Figure 1) This vast resource could cause certain new resonance to emerge in response to the environmental challenge presented and that stimulation is resulting in the activation of an archetype in that library of possibilities which has been successful in that situation as experienced across other exoplanets of similar environments. This could then generate an appropriate CDMMF response to induce biomorphic transradiation that carries the new modified morphic field across the BM/CDMFF/I to stimulate adaptive morphogenetic change increasing survival of environmentally stressed species. This DM/DE derived information results in new causative formation in our baryonic world in a favorable epigenetic response in hopes of increasing the chance of biologic change that can modify form and function that can possibly improve survival of any threatened species on any planet of similar environment.

All of this input from many sources has all come together over our lifetime and according to Jung many eons of lifetimes of the collective species of our planet and in my view many others to produce what is called a personal internal model of the world, a personal archetype of sorts. This perception should over time be modified and updated as new information is introduced into our input sources gathered by experience, adaptation, or experiment which are perceived by our senses then interpreted by our binary brain filtered by our personal internal model. This model may or may not be updated correctly based on a number of biological as well as psychological factors but always in compliance with individual beliefs. Only in the last fifteen years, after the mapping of the human genome by thousands of scientists working in harmony on the Human Genome Project, has it been well established that your genes don't control you; rather, you have the ability to control their expression in your body for better or worse. While much of your environment is out of your control and of course also has influence on your genetic expression, there is also much that is in your control through your personal environment, by the way you think and the choices you make that can control what your

more than 50 trillion cells are exposed to. The wrong beliefs can misdirect not only your actions but your conclusions even your destiny as an individual but also possibly a species. It has been shown that your beliefs also have epigenetic effects on your overall health and survival. This is why it is always crucial that your beliefs are based on definable tested empirical results and not dogma.

VI. Entropy And Information

The Cosmic Dark Matter Fractal Field Theory clearly brings into question our current understanding of the second law of thermodynamics as it was understood in late 1900's through the work of Ludwig Boltzmann who looked at this entropic conundrum from a different perspective. This Italian scientist and mathematician along with a few others began to look at these thermodynamic realities at much smaller scales. Viewed at these microcosmic atomic scales the actions involved with heat became a bit easier to begin to understand and explain.

However, at this period of time the existence of atoms was only a theory but it could provide an acceptable explanation for much of the behavior of heat and its transfer dynamics. Ludwig Boltzmann's work with the mathematics of this atomic scale of reality began to provide answers that were providing a foundation for experimental proofs that followed. Using this model of the atom theory Boltzmann could begin to explain what others could not and of course these dedicated scientist had no concept of quantum dynamics or dark matter and because of that I am now explaining what they could not.

The CDMFF theory reveals that their conclusions about entropy were incomplete. There is undeniable proof that there are many aspects of the laws of thermodynamics that work well under certain conditions, however, like Newton's laws of gravity they are scale dependent, but unlike Newton's laws, the laws of thermodynamics are based on a static paradigm which our highly dynamic cosmos definitely is not. The conclusion that the CDMFF theory of our universe points to is that our reality is much more like a perpetual self-regenerating cosmic being not a dying machine losing power.

In that regard it is also important to reexamine what we think of as information. The way science has come to define it is quite different than most people understand it. This statement for example: "Information is about distinction, preservations of information is that distinctions exist and persist" to quote Leonard Susskind, theoretical physicist of Stanford University. The most efficient way to retain defined distinctions as information is by way of some type of reservoir or repository of that energy/information. That is quite possibly what is happening at the Planck scale by way of morphic fields as they traverse the BM/CDMFF/I. Not only recording and preserving the information in some way but building upon that information with other information like it, archetypes, thereby enhancing the epigenetic process of modifying the readout of genetic patterns that favor environmental adaptation.

What contains the information that distinguishes us and does it persist?

The Greeks believed that everything about human life that was messy or bad, base desires and bad behavior came from the body, the material part of our essence. Everything that was good, like love, kindness and enlightenment resided in the soul which survives and transcended the body at death. The Greeks believed in reincarnation in which this transcendent soul was in fact given another body recycled as it were and characteristics of that soul were retained such as consciousness. This view of the subject changed as Christianity spread throughout Europe and elsewhere as the Roman Empire spread its influence across the west and northwest toward Gaul, Britannia, and Germania along with the emerging theocratic Roman Catholic Church. The burning question of self-identity, who and what I am and where and what is the destiny of my soul was and is, as always, ever present among sentient beings. The model of the CDMFF theory provides support for the Greek view of reincarnation and even provides an explanation of the common description of what dying is like in near death experiences (NDE) survivors that have been widely reported for centuries. One of the most common descriptions by these people which have been pronounced dead and then miraculously returned to life is experiencing the sensation of flying through a tunnel and seeing a bright light that they seemed to be travelling toward. This common script describes a reasonable depiction of what would be possible to view within the black hole/ wormhole/white hole interface pathway predicted to exist at the Planck scale; which is also predicted to be responsible for entropic recycling of morphic fields, as well as, baryonic matter which provides a model for understanding these NDE reports as well as reincarnation. (See link to" Entropy is not a one way street" paper end of the conclusions)

This view reinforces that consciousness is a field different and separate from the physical brain yet intimately immersed and connected with it much the same way the images on your television are displayed; if you busted up your TV we all know you would not find Dr. Phil or anyone else residing within. These images are not literally present in the material component parts of the TV. They are however, necessary for the images and the information displayed on the screen by way of the reception of a resonant electromagnetic signal to be received, processed, viewed and assimilated by our conscious mind. According to a recent 2007 Pugh pole

81% of the population believe in the existence of a soul 45% believe in ghost. So this view is the most widely held but until now there has been on theory or model to use to explain or support this majority consensus opinion.

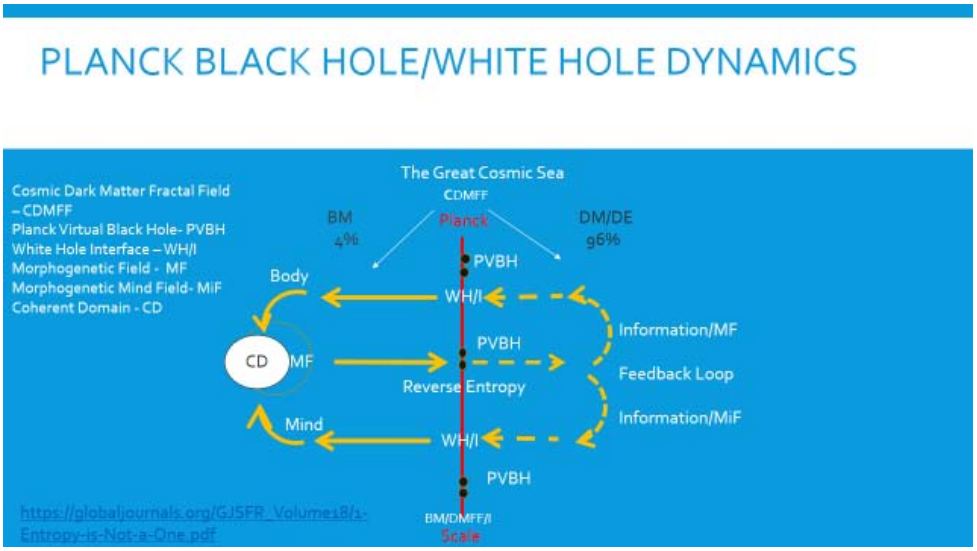

Figure 1

VII. Reverse Entropy, The Soul And Reincarnation

The studies of Reincarnation and Past Life Memories http://www.ljfrank.com/archives/1449

What follows is a portion of an interview with Larry Frank of NP Journal and Walter Semkiw, MD, MPH, IISIS Reincarnation Research President, Reincarnation Expert from the above link.

Dr. Semkiw

"It is possible that individuals in communities that are not part of the developed world have greater access to clairvoyant abilities, which allow access to past life memories. Still, such experiences are subjective, which do not promote universal understanding of the fundamentals of reincarnation. The major breakthrough occurring at this time is that evidence of reincarnation is not considered a subjective phenomenon. Rather, the truth of reincarnation is now considered objective. The primary source of evidence involves the work of the late Ian Stevenson, MD of the University of Virginia. For a period of 40 years, Dr. Stevenson traveled around the world studying young children who had spontaneous past life memories that could be objectively validated. These children would give enough detailed information regarding their past life identities, parents and relatives, as well as the geographic location of their past life homes, that past life families could be located. When the child was reunited with the past life family, family members would validate the child's past life memories. Dr. Stevenson compiled approximately 1200 of such validated reincarnation cases. To learn more about Dr. Stevenson's work, go to: *Reincarnation Research of Ian Stevenson.* At the University of Virginia Division of Perceptual studies Jim Tucker MD is the head of the division which is continuing the work of Ian Stevenson forward. Of the over 2500 case studies developed by Dr. Stevenson's team he has developed a case reliability scale; the case below is one of those that scored near perfect on Dr. Tuckers scale and is the case study of James Leinninger. I encourage you to read it in total but I have quoted some excerpts from it below. A very compelling study of a child, James Leinninger, who seemed to be a reincarnation of a WWII pilot killed in the battle of Iwo Jima or possibly a past life memory transfer study, you decide.

https://www.facts-are-facts.com/news/the-past-life-memories-of-james-leininger-#.Wz5lvdJKg2w or Google this report if this link fails.

"Every detail of James' dreams have been verified to the Leiningers' (parents) satisfaction, whether through eyewitness accounts, personal interviews or military records. Bruce and Andrea Leininger say they are absolutely convinced that Huston's spirit has touched James. They just can't figure out why or how exactly.

After reading about a counselor by the name of Carol Bowman from Pennsylvania, Ms. Scoggin explained how Ms. Bowman was an expert on a child phenomenon that was similar to what James was experiencing. Ms. Bowman had also authored a book, Children's Past Lives: How Past Life Memories Affect Your Child, her own son had similar problems with nightmares and strange recollections.

'If a soul reincarnates with 'unfinished business, or dies a traumatic death, these memories are more likely to carry over into another life,' says Ms. Bowman,

the author and expert on such metaphysical phenomena. 'In James case the WWII pilot, he died a traumatic death as a young man. There was still much emotion and energy that may have propelled these memories forward. … As I see it, a part of James Huston's consciousness survived death and is a part of James Leininger's (the child) soul consciousness. The present incarnation is not a carbon copy of the last, but contains aspects of James Huston's personality and experience"

It is a prediction of the CDMFF theory that the information source of past life memory (PLM) , as well as, near death experience (NDE)is contained in a great reservoir, Dr. Jung's collective unconscious, which lies within the DM/DE zone on the opposite side of the BM/CDMFF/I.(See Figure 1) The transfer of this information occurs through the process of "biocognitive trans radiation", unseen fields of information transfer , as well as, morphogenetic fields which traverse this interface moment by moment and become populated with baryonic matter and integrate with the biosphere in a fractal recursive format in scalar coherent domains. It is the dark matter that makes up the morphogenetic fields, the "strange attractor", which carries the primary source of information used in causative formation of our world. (See Chapter 3 of "The Great Cosmic Sea of Reality")

VIII. Conclusions

To say that the topics in this paper are controversial is an understatement but so have many now well accepted concepts of our reality upon first introduction for example the silly absurd notion that man could fly! However, this subject matter is being discussed now within the framework of a theory that has scientific studies and concepts that back its premise and have been accepted at least in some stations of theoretical physics, biophysics and cosmology. The findings of the science directed toward the power of the life force as seen in the neurophysiology, cognitive function and dysfunction have obvious links to the explanation of these dynamics described by the CDMFF theory with clear implications for research directed toward mental health issues still poorly understood and treated with little success.

I highly recommend reading the book "The Great Cosmic Sea of Reality" that explains this theory as well as the four other double-blind peer reviewed research papers that have now been generated from the Cosmic Dark Matter Fractal Field Theory. This theory points to several possible misconceptions of what are now well accepted conclusions of current science that should be revisited with this new insight. I welcome input, comments and questions as we together explore where this insight might lead.

https://globaljournals.org/GJSFR_Volume18/1-Entropy-is-Not-a-One.pdf

https://globaljournals.org/GJSFR_Volume17/1-Possible-Origins-of-Virtual.pdf

https://globaljournals.org/GJSFR_Volume18/1-Dark-Matter-May-be-a-Possible.pdf

The citation for the passage "The field is the only reality" page2.

"We may therefore regard matter as being constituted by the regions of space in which the field is extremely intense. ...There is no place in this new kind of physics both for the field and matter, for the field is the only reality."

is as follows:

Einstein, Albert. Quoted in Capek, M. The Philosophical Impact of Contemporary Physics. (Princeton, N.J.: D. Van Nostrand, 1961). p. 319.

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Kinetic Capacity

By F. F. Mende

Abstract- If the vector of magnetic moment does not coincide with the direction of the magnetic field, then this moment accomplishes precessional motion. This motion does not have a inertia. since. it instantly ceases at the moment of removing the magnetic field. At the same time to us it is known that the atom, which possesses the magnetic moment, placed into the magnetic field, and which accomplishes in it precessional motion, has potential energy of. Therefore potential energy can be accumulated not only in the electric fields, but also in the precessional motion of magnetic moments, which does not possess inertia.

Keywords: *magnetic moment, potential energy, precession, kinetic capacity.*

GJSFR-A Classification: *FOR Code: 030703*

KINETICCAPACITY

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Kinetic Capacity

F. F. Mende

Abstract- If the vector of magnetic moment does not coincide with the direction of the magnetic field, then this moment accomplishes precessional motion. This motion does not have a inertia. since. it instantly ceases at the moment of removing the magnetic field. At the same time to us it is known that the atom, which possesses the magnetic moment, placed into the magnetic field, and which accomplishes in it precessional motion, has potential energy of. Therefore potential energy can be accumulated not only in the electric fields, but also in the precessional motion of magnetic moments, which does not possess inertia.

Keywords: magnetic moment, potential energy, precession, kinetic capacity.

I. Introduction

If in the existing scientific literature occurs only of the irregular reference about the fact that such is the kinetic inductance of charge carriers [1-4], that there was no work known about the kinetic [5] capacity before the appearance.

If we consider all components of current density in the conductor, then the second equation of Maxwell can be written down:

$$rot\vec{H} = \sigma_E \vec{E} + \varepsilon_0 \frac{\partial \vec{E}}{\partial t} + \frac{1}{L_k}\int \vec{E}dt\,, \qquad (1)$$

where σ_E - the conductivity is metal, ε_0 - the dielectric constant of vacuum, L_k - the kinetic inductance of charge carriers.

At the same time, the first equation of Maxwell can be written down as follows:

$$rot\vec{E} = -\mu \frac{\partial \vec{H}}{\partial t}, \qquad (2)$$

where μ - magnetic permeability of medium. It is evident that equations (1) and (2) are asymmetrical.

To somewhat improve the symmetry of these equations are possible, introducing into equation (2) term linear for the magnetic field, that considers heat losses in the magnetic materials in the variable fields:

$$rot\vec{E} = -\sigma_H \vec{H} - \mu \frac{\partial \vec{H}}{\partial t}, \qquad (3)$$

where σ_H - conductivity of magnetic currents. But here there is no integral of such type, which is located in the right side of equation (1), in this equation. At the same time to us it is known that the atom, which possesses the magnetic moment $\vec{m}$, placed into the magnetic field, and which accomplishes in it precessional motion, has potential energy $U_m = -\mu\vec{m}\vec{H}$. Therefore potential energy can be accumulated not only in the electric fields, but also in the precessional motion of magnetic moments, which does not possess inertia. Similar case is located also in the mechanics, when the gyroscope, which precesses in the field of external gravitational forces, accumulates potential energy. Regarding mechanical precessional motion is also noninertial and immediately ceases after the removal of external forces. For example, if we from under the precessing gyroscope, which revolves in the field of the earth's gravity, rapidly remove support, thus it will begin to fall, preserving in the space the direction of its axis, which was at the moment, when support was removed. The same situation occurs also for the case of the precessing magnetic moment. Its precession is noninertial and ceases at the moment of removing the magnetic field.

Therefore it is possible to expect that with the description of the precessional motion of magnetic moment in the external magnetic field in the right side of relationship (3) can appear a term of the same type as in relationship (1). It will only stand L_k, i.e. instead of C_k the kinetic capacity, which characterizes that potential energy, which has the precessing magnetic moment in the magnetic field:

$$rot\vec{E} = -\sigma_H \vec{H} - \mu_0 \frac{\partial \vec{H}}{\partial t} - \frac{1}{C_k}\int \vec{H}dt\,. \qquad (4)$$

For the first time this idea of the first equation of Maxwell taking into account kinetic capacity was given in the work [3].

II. Kinetic Capacity Of The Magnetic Moments

Let us explain, can realize this case in practice, and that such in this case kinetic capacity. Resonance processes in the plasma and the dielectrics are characterized by the fact that in the process of fluctuations occurs the alternating conversion of electrostatic energy into the kinetic kinetic energy of charges and vice versa. This process can be named electrokinetic and all devices: lasers, masers, filters, etc, which use this process, can be named electrokinetic. At the same time there is another type of resonance -

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magnetic. If we use ourselves the existing ideas about the dependence of magnetic permeability on the frequency, then it is not difficult to show that this dependence is connected with the presence of magnetic resonance. In order to show this, let us examine the concrete example of ferromagnetic resonance. If we magnetize ferrite, after applying the stationary field of in parallel to the axis of, the like to relation to the external variable field medium will come out as anisotropic magnetic material with the complex permeability in the form of tensor [7]

$$\mu=\begin{pmatrix} \mu_T^*(\omega) & -i\,\alpha & 0 \\ i\,\alpha & \mu_T^*(\omega) & 0 \\ 0 & 0 & \mu_L \end{pmatrix},$$

where

$$\mu_T^*(\omega)=1-\frac{\Omega\ |\gamma|\ M_0}{\mu_0(\omega^2-\Omega^2)},\qquad \alpha=\frac{\omega\ |\gamma|\ M_0}{\mu_0(\omega^2-\Omega^2)},\qquad \mu_L=1,$$

moreover

$$\Omega=|\gamma| H_0 \tag{5}$$

is natural frequency of precession, and

$$M_0=\mu_0(\mu-1)H_0 \tag{6}$$

is a magnetization of medium. Taking into account (4) and (5) for, it is possible to write down

$$\mu_T^*(\omega)=1-\frac{\Omega^2(\mu-1)}{\omega^2-\Omega^2} \tag{7}$$

That magnetic permeability of magnetic material depends on frequency, and can arise suspicions, that, as in the case with the plasma, here is some misunderstanding.

If we consider that the electromagnetic wave is propagated along the axis X and there are components pour on H_y and H_z, then in this case the first Maxwell equation will be written down:

$$rot\ \vec{E}=\frac{\partial \vec{E}_Z}{\partial x}=\mu_0\mu_T\frac{\partial \vec{H}_y}{\partial t}.$$

Taking into account (7), we will obtain

$$rot\ \vec{E}=\mu_0\left[1-\frac{\Omega^2(\mu-1)}{\omega^2-\Omega^2}\right]\frac{\partial \vec{H}_y}{\partial t}.$$

for the case ω>>Ω we have

$$rot\ \vec{E}=\mu_0\left[1-\frac{\Omega^2(\mu-1)}{\omega^2}\right]\frac{\partial \vec{H}_y}{\partial t}, \tag{8}$$

assuming $H_y=H_{y0}\sin\omega t$ and taking into account that in this case

$$\frac{\partial \vec{H}_y}{\partial t}=-\omega^2\int \vec{H}_y\ d\ t,$$

we will obtain from (8)

$$rot\ \vec{E}=\mu_0\frac{\partial \vec{H}_y}{\partial t}+\mu_0\ \Omega^2(\mu-1)\int \vec{H}_y\ d\ t,$$

or

$$rot\ \vec{E}=\mu_0\frac{\partial \vec{H}_y}{\partial t}+\frac{1}{C_k}\int \vec{H}_y\ d\ t. \tag{9}$$

Value

$$C_k=\frac{1}{\mu_0\ \Omega^2(\mu-1)}$$

which is introduced in relationship (8), let us name kinetic capacity.

For the case ω<<Ω we find

$$rot\ \vec{E}=\mu_0\mu\frac{\partial \vec{H}_y}{\partial t}$$

we have the first equation of Maxwell.

With which is connected existence of kinetic capacity, and its which physical sense? If the direction of magnetic moment does not coincide with the direction of external magnetic field, then the vector of this moment begins to precess around the vector of magnetic field with the frequency Ω. The magnetic moment $\vec{m}$ possesses in this case potential energy $U_m=-\vec{m}\cdot\vec{B}$. This energy similar to energy of the charged capacitor is potential, because precessional motion, although is mechanical, however, it not inertia and instantly it does cease during the removal of magnetic field. However, with the presence of magnetic

field precessional motion continues until the accumulated potential energy is spent, and the vector of magnetic moment will not become parallel to the vector of magnetic field.

The equivalent diagram of the case examined is given in Figure 1. At point $\omega=\Omega$ occurs magnetic resonance, in this case $\mu_T^*(\omega)=-\infty$. The resonance frequency of macroscopic magnetic resonator, as can easily be seen of the equivalent diagram, also does not depend on the dimensions of line and is equal Ω. Thus, the parameter

$$\mu_H{}^*(\omega)=\mu_0\left[1-\frac{\Omega^2(\mu-1)}{\omega^2-\Omega^2}\right]$$

is not the frequency dependent magnetic permeability, but it is the combined parameter, including μ, μ_0 and C_k, which are included on in accordance with the equivalent diagram, depicted in Figure 1.

Is not difficult to show that in this case there are three waves: electrical, magnetic and the wave, which carries potential energy, which is connected with the precession of magnetic moments around the vector H_0

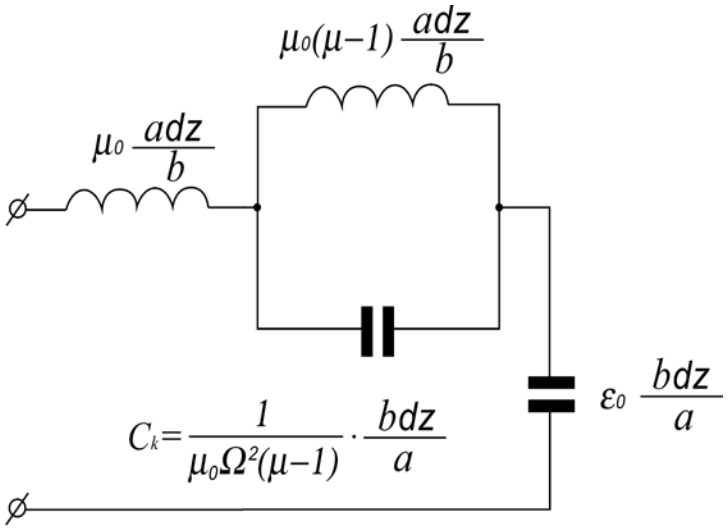

Figure 1: The equivalent the schematic of the two-wire circuit of that filled with the magnetic material, to which is superimposed magnetostatic field.

III. Conclusion

Before the appearance of a work [5] in the electrodynamics this concept, as kinetic capacity it was not used, although this the real parameter has very intelligible physical interpretation. if the vector of magnetic moment does not coincide with the direction of the magnetic field, then this moment accomplishes precessional motion. This motion does not have a inertia. since. it instantly ceases at the moment of removing the magnetic field. At the same time to us it is known that the atom, which possesses the magnetic moment, placed into the magnetic field, and which accomplishes in it precessional motion, has potential energy of. Therefore potential energy can be accumulated not only in the electric fields, but also in the precessional motion of magnetic moments, which does not possess inertia.

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- Lectures

- Printed material
- Graphic representations
- Computer programs
- Electronic material
- Any other original work

Authorship Policies

Global Journals follows the definition of authorship set up by the Open Association of Research Society, USA. According to its guidelines, authorship criteria must be based on:

1. Substantial contributions to the conception and acquisition of data, analysis, and interpretation of findings.
2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

Changes in Authorship

The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

Copyright

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Appealing Decisions

Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

Declaration of funding sources

Global Journals is in partnership with various universities, laboratories, and other institutions worldwide in the research domain. Authors are requested to disclose their source of funding during every stage of their research, such as making analysis, performing laboratory operations, computing data, and using institutional resources, from writing an article to its submission. This will also help authors to get reimbursements by requesting an open access publication letter from Global Journals and submitting to the respective funding source.

Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for Writing a Good Quality Science Frontier Research Paper

Techniques for writing a good quality Science Frontier Research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of science frontier then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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or email us at helpdesk@globaljournals.org

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