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The Schottky Effect and Cosmos

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0. Ordin S.V., “UNSCEBABLE TRUTH”, 11.04.2019. 2 pp., http://www.rusnor.org/pubs/articles/15867.htm

I. Schottky Barrier

In my popular articles, I have repeatedly noted that there are still unsolved problems even in elementary electrostatics [1, 2]. Showed, solutions to some of them. It showed that I had to think out and quickly correct for more than 40 years of research at the Academy of Sciences, when the models traditionally used to interpret the experimental data gave “black holes”. But remaining within the framework of purely Coulomb ideas, which, as will be shown in this work, are only qualitative, we ourselves, faced with large quantitative discrepancies, create imaginary problems and invent “new effects”.

If the system does not have many-particle interactions, i.e. collective effects, then, according to the principle of superposition, the total energy of interaction of all particles in the system is simply the sum of the energies of pairwise interactions between all possible pairs of particles. At the same time, we learned long ago to take into account the “infinite” number of positive and negative elementary charges not only in vacuum, but also in a solid body, not only in the form of macroscopic forces acting on macro-objects, but also in the form of forces acting on an elementary (minimum) charge.

Thus, in a linear approximation, in a solid body we obtain measurable ≡ finite values of parameters by simple summation of infinite, but convergent series. The condition of the convergence of the series gives us the fact that at short distances between particles the forces act short-range, giving the dependence of the potential on the reciprocal of the distance with a degree z above three, whereas at large distances the Coulomb law works with the dependence of the potential on the reciprocal of the distance with a degree z a unit.

Based on the above, a number of crude assumptions were made. First, a separation of “fundamental” forces was made and canonized, which are only members of the adiabatic expansion in the order of smallness. Secondly, only macroscopic long-range Coulomb forces connected with the three-dimensionality of our geometrical space, and even then at not very large distances, leaving a “loophole” to other dimensions for short-range forces, and for “Einstein” forces at large distances.

But all this will still be shown with a joint account of the Coulomb and gravitational forces (in the framework of the Coulomb Newton Laws). In the meantime, let us take into account what has already been obtained with reference only to the "infinite" number of elementary charges - the emergence of the Schottky barrier on the boundary of a solid body. This potential barrier to the exit of electrons from a solid, in the case of lightly doped semiconductors, corresponds to the energy gap between the bottom of the conduction band inside the semiconductor and the vacuum level outside the semiconductor. And taking into account the scale factors, model constructions in solids are applicable to cosmology. Moreover, they allow her to return to reality.

The number of atoms in one cubic centimeter is more than the number of astronomical objects observed now in the "infinite" universe. But this large number of atoms does not give grounds for us to build “alternative” cubic centimeters, as it is now accepted in cosmology.

But initially it was necessary (when analyzing the experiments) to eliminate the error of Schottky himself [3, 4], the two in the calculations of the barrier height, which in the calculations of microelectronics [5] were compensated by the erroneous semiconductor nonideality coefficient, and to clarify the shape of the barrier, which they tried to correct with macroscopic formulas of Richardson-Demscher, introducing a “hanging in the air” volume charge [6]. Formally, this contradiction was eliminated by the introduction of the Bardeen layer [7], which was a 100% amendment and in itself contained a great deal of uncertainty associated with surface states [8].

But it was possible to more accurately describe the current-voltage characteristics if we set the barrier in the form of a rectangular step [9]. This microscopic

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description, simply ignoring the macroscopic calculations of the Schottky barrier, allowed us to remove from the "anomalies" discharge the Prigogine local thermodynamic effects — the giant Thermo-EMF observed in semiconductor structures [10, 11,12, 13, 14] .

To strictly determine the parameters of the potential barrier near the boundary of the object, and in its volume, we carry out model calculations based on the principle of superposition of the potentials of atomic cores in the crystal lattice.

If initially we use the Coulomb potential. then, setting all constants equal to one, we obtain its reduced dependence on the coordinate

$$\varphi = \frac{1}{Abs[x]} \qquad (1)$$

If we set the distance between the nearest sources of potential (step) equal to one for the one-dimensional case, we obtain the distribution of the potential shown in Fig.1.As can be seen from Fig. 1, with an increase in the number of lattice sites, the minimum height of the inter-node barrier decreases, which limits the free motion of a particle in energy and, accordingly, the height of the boundary barrier of the crystal, which limits the free motion of a particle along the coordinate, increases.In this case, naturally, the potential barrier that prevents the electron from leaving the crystal also grows.

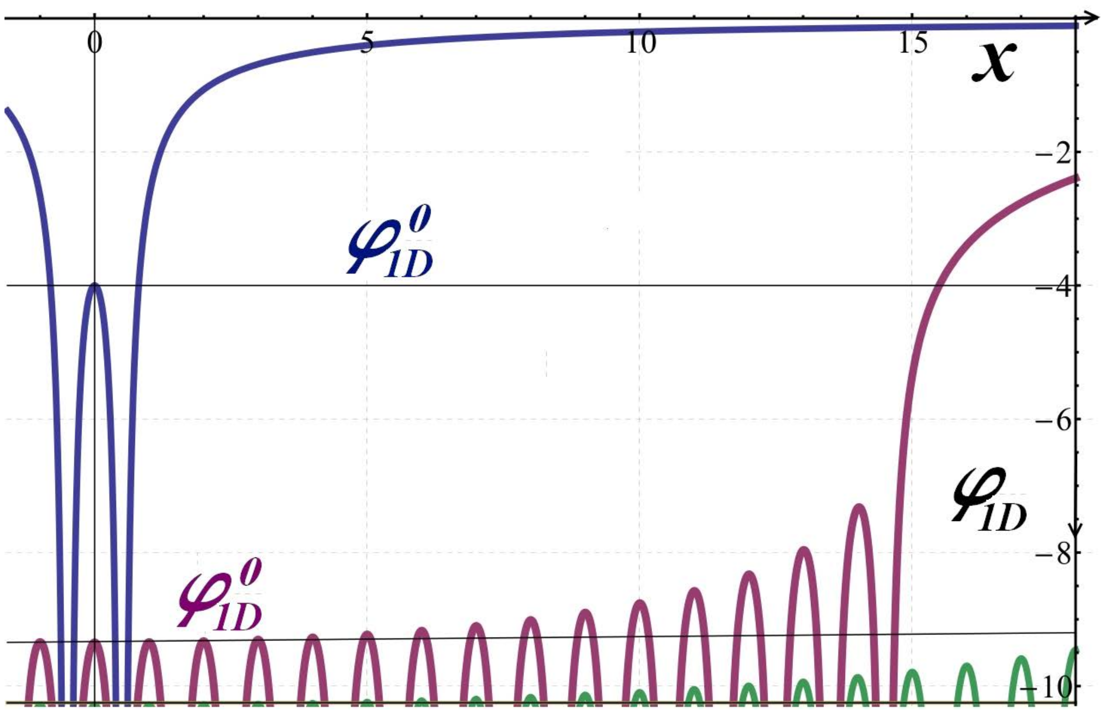

Fig. 1: Dependence of the spatial distribution of the Coulomb potential in the one-dimensional case and the bottom of the conduction band on the number of steps / periods.

But when using the long-range Coulomb potential, even in the one-dimensional case, as the number of attraction nodes tends to infinity, the contribution from all nodes to the height of the barrier in the center tends to infinity

$$\varphi^0_{1D} = \sum_{n=-\infty}^{\infty} \frac{1}{Abs[0.5+n]} \to \infty \qquad (2)$$

Those.as applied to an electron, the bottom of the conduction band goes down infinitely deep. The increase in the dimension of the object due to the additional attraction of the surrounding nodes is a tendency to infinity, it only naturally intensifies, which directly contradicts all the experimental data, in particular the final value of the Schottky barrier at the boundary of the lattice by vacuum. Therefore, at short distances, short-range forces were introduced with a higher steppe. For the three-dimensional case, with a not very strict reference to symmetry, the degree was chosen more than three (usually 4 or 5). But using the modified formula 1, we obtain the dependence of the potentials for all three dimensions of objects:

$$\varphi_{1D}^{0}=\sum_{n=0}^{\infty}2\left(\frac{1}{Abs[0.5+n]}\right)^{Z}=1\cdot\sum_{n=-\infty}^{\infty}\left(\frac{1}{Abs[0.5+n]}\right)^{Z}$$

$$\varphi_{2D}^{0}=\sum_{n=0}^{\infty}2\pi\left(Abs\left[n+0.5\right]\right)\left(\frac{1}{Abs[0.5+n]}\right)^{Z}=\pi\sum_{n=-\infty}^{\infty}\left(\frac{1}{Abs[0.5+n]}\right)^{Z-1} \quad (3)$$

$$\varphi_{3D}^{0}=\sum_{n=0}^{\infty}4\pi\left(Abs\left[n+0.5\right]\right)^{2}\left(\frac{1}{Abs[0.5+n]}\right)^{Z}=2\pi\sum_{n=-\infty}^{\infty}\left(\frac{1}{Abs[0.5+n]}\right)^{Z-2}$$

which (as will be seen later) differ from the one-dimensional case only by a factor, equal, with a sufficient distance from the center, to the volume of the surface of the object of unit thickness. Expressed via Zeta functionspresented in Figure 2.

$$\varphi_{1D}^{0}=2.\left(-1.+2^{z}\right)Zeta\left[z\right]$$

$$\varphi_{2D}^{0}=2\pi\left(-1.+2.^{-1.+z}\right)Zeta\left[-1.+z\right] \quad (4)$$

$$\varphi_{3D}^{0}=4\pi\left(-1.+2.^{-2.+z}\right)Zeta\left[-2.+z\right]$$

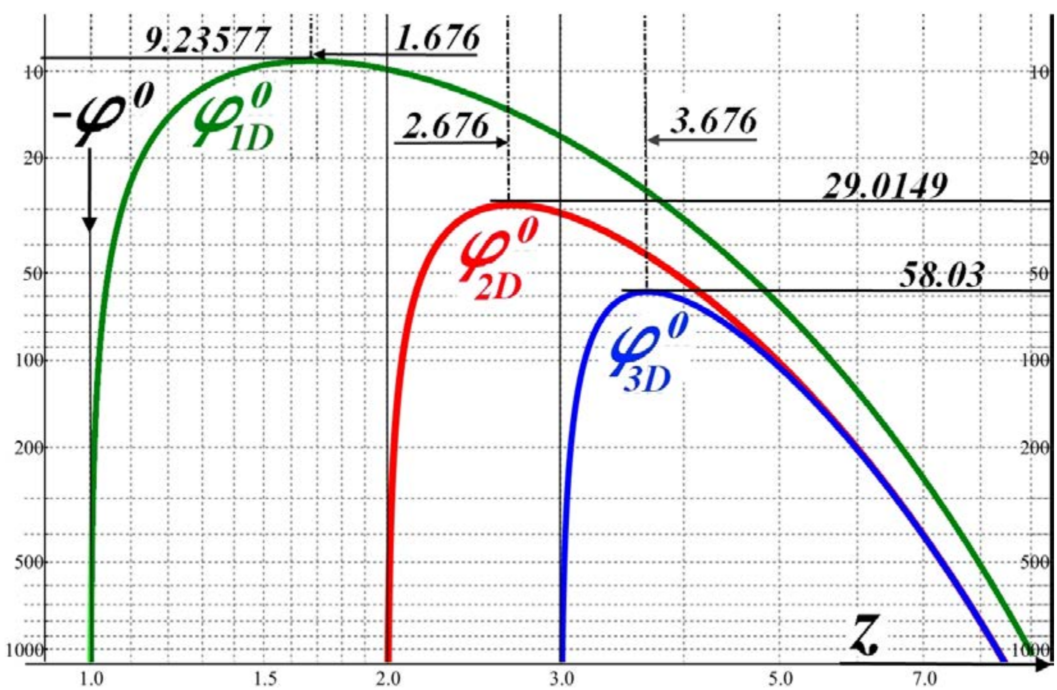

Fig. 2: The dependence of the height between the nodal barriers on the degree for different dimensions of objects.

Formulas 4, as it followed from f.3, differ from each other only by a factor determined by the dimension of the object and the displacement in the z degree by one for the two-dimensional case and by two for the three-dimensional case. All three dependences on z have similarly displaced extremes, with deviations from which there is a catastrophic (exponential) tendency of the height of the potential barrier, as shown in Fig. 1, and f.2, to infinity minus (the depth of the bottom of the conduction band tends to infinity) .

Whereas all experiments on any materials point to specific hospital beds, CHARACTERISTIC heights of the Schottky barriers at the border. This gives grounds to assume that the REAL dependence of the potential on the distance corresponds not to the Coulomb unit, but to the degree of extremum.

$$\varphi = \left(\frac{1}{Abs[x]}\right)^{1.676} \tag{5}$$

And the rapid convergence of the series on the basis of such a power dependence corresponding to the extremum makes it possible to calculate the Real course of the potential of an object of any dimension and any size

$$\varphi^0_{1D} = 1\sum_{n=-k}^{k}\left(\frac{1}{Abs[0.5+n+x]}\right)^{1.676}, \varphi^0_{2D} = \pi\sum_{n=-k}^{k}\left(\frac{1}{Abs[0.5+n+x]}\right)^{1.676} \tag{6}$$

$$\varphi^0_{3D} = 2\pi\sum_{n=-k}^{k}\left(\frac{1}{Abs[0.5+n+x]}\right)^{1.676}$$

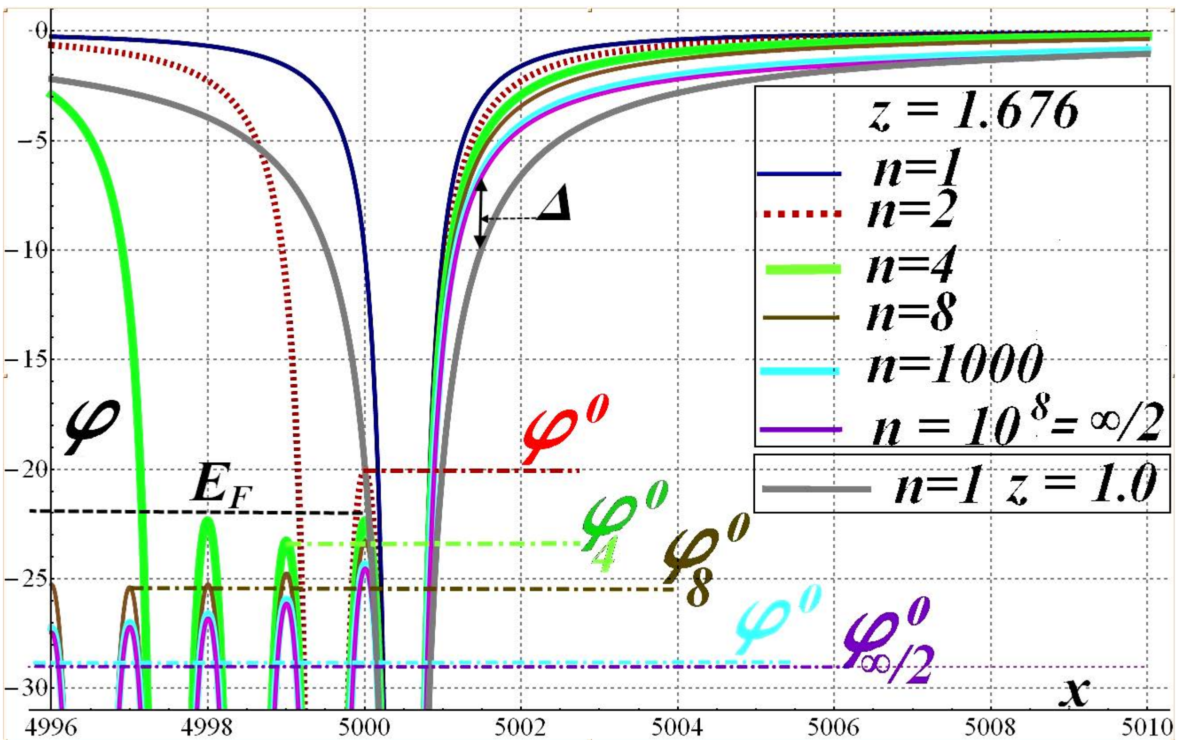

Fig. 3: True potential distribution near the flat boundary of a three-dimensional crystal for different number of steps n (monatomic flat layers) and the imposition (in gray) on the Coulomb potential (z= 1) of the monatomic plane with charge multiplied by π

The rapid convergence of the series on the basis of such a power dependence corresponding to the extremum makes it possible to calculate the Real potential variation near the boundary of a three-dimensional object of any thickness (any number of steps n), including semi-infinite. in the form of a sum of potentials in the center, equidistantly located disks of infinite radius (Fig. 3).

The potential distribution presented in Fig. 3 naturally removes the question of the infinite depths of the bottom of the conduction band φ^0. At the same time, such a linear mapping of the true potential distribution provides a visual representation of the dependence of the true depth of the conduction band on the thickness of nano-objects and the effective concentration of current carriers in the subsurface layer (the difference between the E_F and the interstitial barrier near the border).

But the fundamental point of the difference between the true potential of the Coulomb potential at the boundary is that the degree z of a semi-infinite crystal depends on the distance beyond the crystal boundary — it runs through the values from the maximum 1.676 directly at the boundary to zero at infinity.

The physical nature of this "zero" will be discussed in the analysis of gravity. Now we only note an important consequence — the difference in Δ of the height of the local near-surface true potential from the Coulomb potential, which is attributed to the "volume charge" in emission models. In fact, as can be seen from Fig. 3, a large Δ value does not correspond to some additional barrier above the vacuum level, but is simply an excess of the true course of the potential above the Coulomb one at small distances from the border. Therefore, in the microscopic models, the steeper than the Coulomb form of the Schottky barrier is often replaced with just a rectangular potential step.

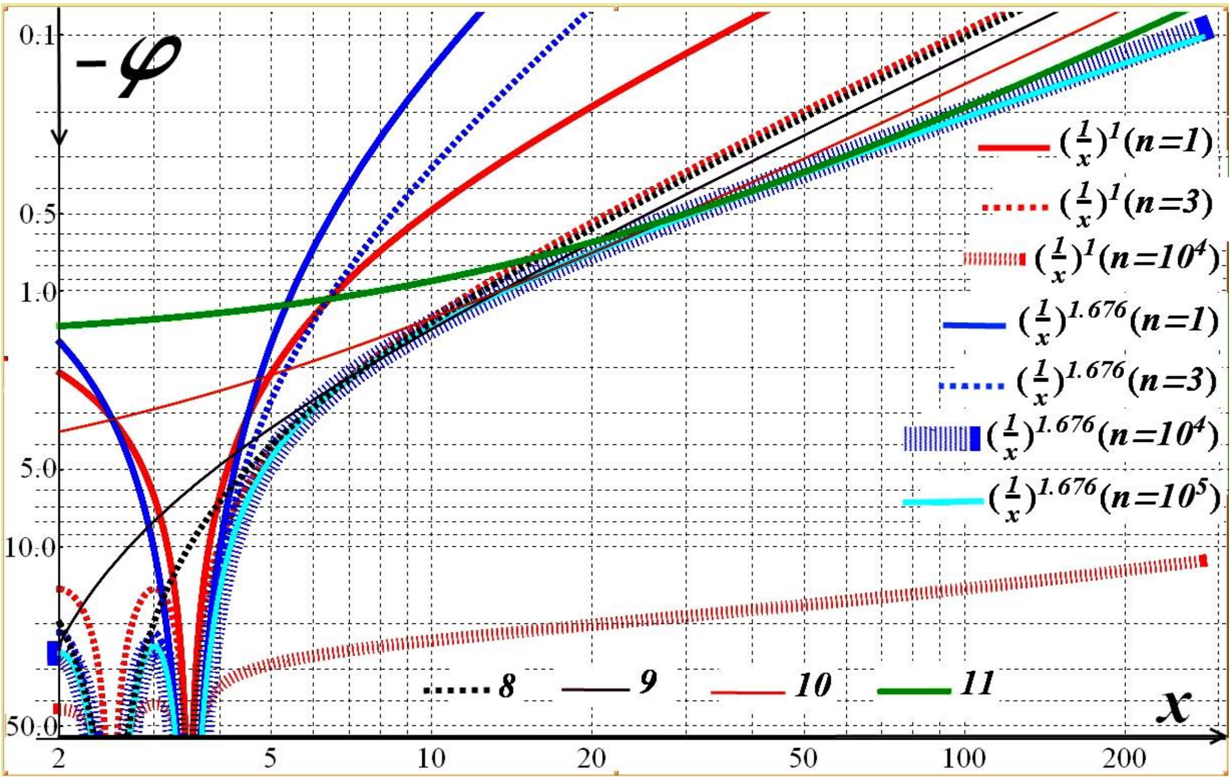

Fig. 4: The spatial distribution of the Coulomb and true potential on a flat boundary for different numbers of steps — monatomic flat layers in a crystal and Coulomb approximations of the true Schottky barrier of a semi-infinite crystal (curves 8 ÷ 11).

On the linear scale of Fig. 3, the course of the true potential (z = 1.676) and the Coulomb potential (z = 1) at large distances seem to almost coincide. But the strict correspondence of the course of the true potential to the course of the Coulomb charged plate is possible only at one point. In a large range of changes in the coordinates, this is demonstrated in a double logarithmic scale in Fig.4.

Used in Fig.4.the scale emphasizes how catastrophically both the depth of the conduction band bottom φ^0 would decrease and the near-surface potential, if their formation were determined by a purely Coulomb potential — compare the curves $(1/x)^1(n=10^4)$ and $(1/x)^{1.676}(n=10^5)$. But at the same time, the finiteness of these actually measured values indicates that the real potential determines the total energy of the crystal as a whole! And the fundamental question arises about the conventionality of division in general into short-range and long-range forces, since An additive contribution to the full potential of only long-range Coulomb forces would be enough to compress the crystal to a point.

Therefore, the INFINITE corrections for the pendant in the form of shielding are required, with the finite values of the parameters being obtained at an infinity ratio.

The Coulomb (and, running ahead - gravitational) field cannot provide a stable (albeit stationary) state of the system of field sources in a 3-dimensional space.

But initially, we finish an elementary analysis that shows not only the reason for introducing the "semiconductor nonideality coefficient" to describe the current-voltage characteristics of pn junctions using Coulomb calculations with the "correction" on the volume charge, but also the cause of macroscopic "experimental confirmations" of Coulomb calculations.

As noted above, the spatial distribution of the true surface potential outside the crystal (corresponding to a stable state of the crystal as a whole, without collapse), is described by a power dependence of the reciprocal of the distance to the boundary with a variable degree z = 1.676 ÷ 0. And therefore, strict coincidence, taking into account the first derivatives of the true potential with the Coulomb potential, is possible only at one point. And then, with the introduction of amendments to the amount of charge. But nonstrict Coulomb approximations (curves 8 ÷ 11 in Fig. 4) describe areas of $L_1 \div L_2$ of the true surface potential, which are different from the border, with good accuracy, but when the starting point of the report shifts into the crystal Δx^* and the effective charge Q^* increases.

Curve 8 - $\Delta x^* = -1$, $Q^* = 10/\pi L_1 \div L_2 \sim 6 \div 9$

Curve 9 - $\Delta x^* = -2$, $Q^* = 12/\pi L_1 \div L_2 \sim 8 \div 11$

Curve 10 - $\Delta x^* = -5$, $Q^* = 16/\pi L_1 \div L_2 \sim 12 \div 26$

Curve 11 - $\Delta x^* = -16.5$, $Q^* = 22/\pi L_1 \div L_2 \sim 30 \div 55$

And so, the analysis of the true potential, which is basic for galvanic phenomena, is naturally useful for designing elements of micro and nanoelectronics. But, initially, it requires "combing" their design, and adjusting many of their dynamic parameters - starting with clarifying the true capacitance of capacitors, to clarifying the characteristics of the p – n junctions. In addition, it requires combining the theory of radiation, which is determined, as is known, by derivatives of the charge potential.

But it should be noted once again that relative units were used everywhere. At the same time, the obtained digital values can vary and sometimes nonlinearly. So presented in Fig.2 and 3, the limit heights of the barriers depend on the relative concentration of the centers of attraction:

$$\varphi^0 = \pi \sum_{n=-\infty}^{\infty} \left(\frac{1}{Abs\left[0.5 + k \cdot n\right]} \right)^{1.676} \qquad (7)$$

With a multiple increase in the step between nodes by a factor of k (corresponding to a decrease in the relative concentration of centers), as shown in Fig. 5, the Schottky barrier decreases at the boundary of a semi-infinite three-dimensional crystal.

The presented potential distributions in a crystal ignore the fact that only a relatively small number of atoms are ionized in lightly doped semiconductors, i.e. the fact that in calculations that were originally built on simplified, valid, as noted, at sufficiently large formulas, the locality of the potential of the ionized nucleus is also not taken into account.

In addition, the analysis is qualitative, because It does not take into account a significant factor - local screening of the potentials of the lattice nuclei, which changes the depth of the bottom of the conduction band. But even from the fraction of the total number of atoms, the infinite lattice must have stability, and for a stable existence, the fraction of the nuclear charge must have a true power dependence, not Coulomb.

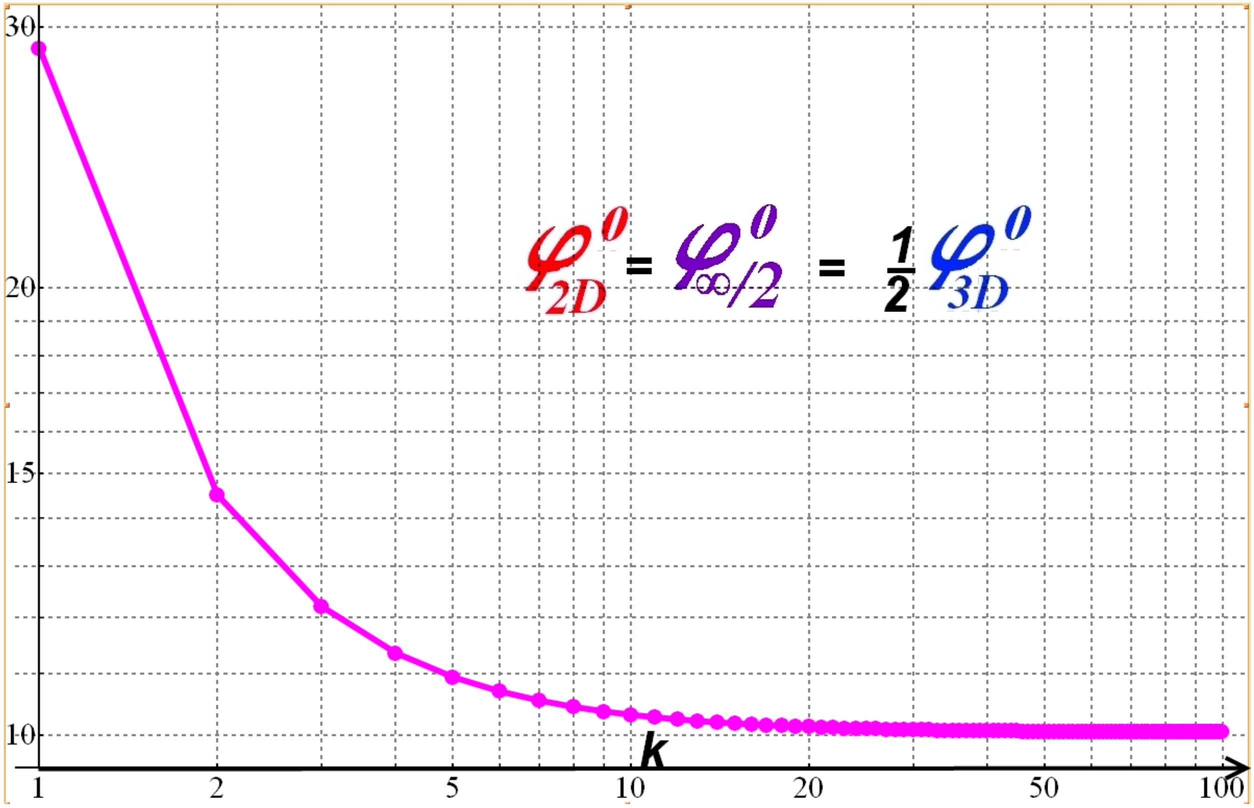

Fig. 5: Dependence of the Schottky barrier on the fold increase in the lattice spacing (decrease in the relative concentration of the centers of attraction).

So we have, as it were, the imposition of two initially abstracted phenomena: a limitation of the distribution of the potential of nuclei obtained independently of anything and the rise of the allowed state of an electron obtained for the potential distribution of an isolated atom. This is in principle a standard model for the formation of a conduction band, only for potential relief, and for calculating the allowed state of an electron in an isolated atom, it is necessary to take into account the true degree 1.676.

II. Gravitational Potentials in the Universe

Most of the modern problems of cosmology are artificial, far-fetched, since it evades the solution of the Main Problem: the finiteness of measured local quantities for an infinite Universe. Hiding the Main Problem, cosmologists even “measured” and weighed the infinite! The whole universe. But the values obtained by them characterize not the boundaries of the infinite Universe, but the boundaries of their sphere of knowledge about the power of infinite sets. Their experimental borders of "infinity" are less than the number of electrons in one cubic centimeter. And the theoretical boundaries of their sphere of knowledge, in fact, they set themselves arbitrariness in choosing the absolute value of energy. And when discussing about the far Cosmos, especially about the infinite Universe, it is simply impossible to do without using potential energy. In principle, the calculation of the true potential described above allows eliminating this uncertainty for the gravitational potential.

They are accustomed to counting electric energy. Every quantum is considered. Therefore, they use mainly potential diagrams. We will return to them when considering gravitational effects. But first, a little about the forces that are used in the near space and in electrical measurements. Despite the gigantic, by 40 orders of magnitude difference between the Coulomb force and the gravitational force [10, 11], a functional similarity of these two potential forces is observed. Therefore, we can compare the distribution of forces - derivatives of the previously obtained true potential Fi near the object boundary with the reduced Coulomb-Newton force FC-N near the same boundary. If we use the distribution of the true potential near the border shown in Fig. 3 for a semi-infinite crystal and its Coulomb approximation presented there, we obtain the distribution of these forces, shown in Fig. 6.

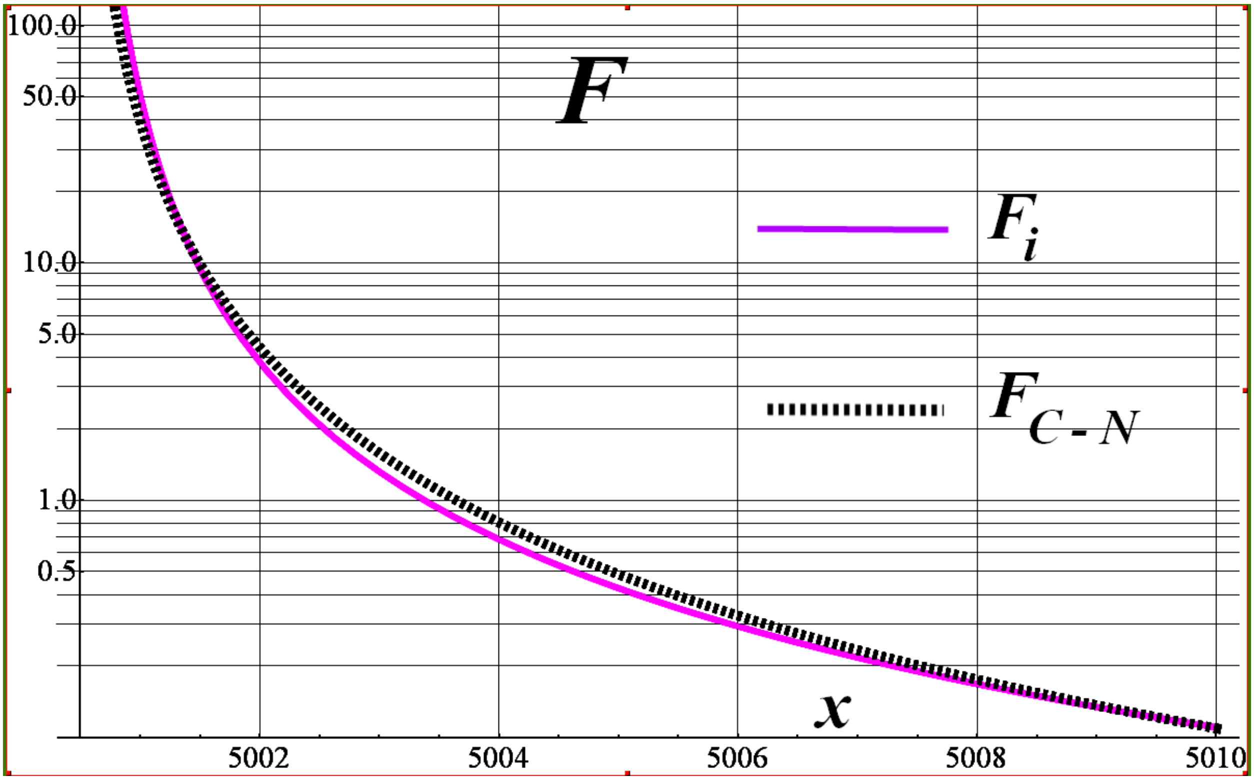

Fig. 6: The spatial distribution of the true force of attraction F_i on the boundary of the object and the Coulomb – Newtonian force F_{C-N}.

As can be seen from the figure, a substantial excess of the true force F_i corresponding to the Schottky effect over the F_{C-N} force begins immediately near the object boundary. The fact that these true forces are manifested in the form of the Van der Waals, when approaching a small distance of ideal flat boundaries, we have already mentioned above. The apparent contradiction with the macroscopic measurements of gravity near the surface of the Earth is due to the fact that the mass density of the Earth is unevenly distributed - it rises sharply to the center due to compression / pressure. But the principles of accounting for these "details" will be shown below. For now, returning to Fig. 6, we only note that for near space, the true potential gives only corrections to the Earth's space velocities. But the amendments are needed. People need to believe in something (at least in the resurrection of Christ, which they themselves crucified), but in science, to replace the "nonideality coefficient" of the theory with the "nonideality coefficient" of semiconductors, as in calculations of the current-voltage characteristics of p-n junction, is not good . So it is in gravity. As he told my friend Neil Am strong, returning to Earth from the Moon in automatic mode, they almost missed the Earth and hardly got to the Earth in manual mode.

But we will concentrate the main attention on the Basic Problem, which is rooted in the representation of the potential that actually controls all the electronics, something unreal to gravity. Although in the electrostatics itself in the above-mentioned works, problems were noted that can be fully attributed to gravitostatics [15]. Here we will not touch upon the problem [2] of the incorrect, contradicting the observable both micro and macro effects, application of the Ostrogradsky-Gauss theorem, which allegedly leads to a decrease in the electric field near the internal non-planar surface. Here we will touch on the problem of true potential raised in the previous paragraph, which is different from the zero Newton and Coulomb Law. It is his vibrations that give both electromagnetic and gravitational waves [15]. But we will not consider the dynamics with acceleration yet either, but we will use the mathematical expressions for the true potential already obtained in the previous section and the ideas about the work function and the conduction band, borrowed from Solid Physics Physics.

Already in the previous section, these ideas were implicitly corrected / refined by the charge-mass analogy [9]. Thus, the free motion of electrons above the potential barriers of atoms above the bottom of the conduction band is similar to the movement of asteroids "above the potential barriers" of planets and stars. If the asteroids do not fall exactly into an astronomical object, they will fly past it with energy conservation. Just as they approach, their potential energy will decrease with an equivalent increase in kinetic energy, and then their kinetic energy will decrease with potential energy reaching the previous level.

Already this ELEMENTARY example shows us that, both for charges and for the masses, the use of arbitrariness in choosing a constant for a potential is, to put it mildly, counterproductive. And if the ZERO potential at infinity is chosen, then the position of the DND of the conduction band, both for the charges and for the masses, is strictly defined - as shown in the previous figures.

But gravity also revealed issues that were thrown out of consideration in electrostatics (with an arbitrary potential constant) and were only noted in the previous paragraph. This is the question of Infinity (in particular, the Universe). Above was noted simply as a curious fact that the potential of the bottom of the conduction band (relative to vacuum at infinity) of a semi-infinite three-dimensional crystal is strictly equal to half the potential of the bottom of the conduction band of the infinite crystal. In fact, this potential is influenced by the power of an infinite set and putting together in the zero plane two semi-infinite crystals, it is quite natural (for border nodes and not quite familiar for nodes at infinity) that the height of the interstitial barrier is lowered exactly twice. So, the boundary cyclic Kronig-Penny conditions used for a long time in electrons for electrons (and not only) are correctly replaced by "contact" plus and minus infinity in calculations by "infinity". Specifically, in the calculations, they replace with sufficiently large numbers sufficient to reach the asymptotics of the calculated parameters. But, at the same time there is a new BUT! NO SURFACE BARRIER along the dimension in question! For the conventionally depicted one-dimensional case (Fig. 7), the ZERO at infinity can be taken for another orthogonal measurement- dimension. Showed in Fig.7.the distribution scheme of potential barriers of lattice sites works well in one-dimensional wires, both in terms of calculating kinetic parameters and in terms of matching the magnitude of the work function to another measurement of the depth of the conduction band along the wire (the experimental differences of the "work output" are quite understandable by different experimental conditions).

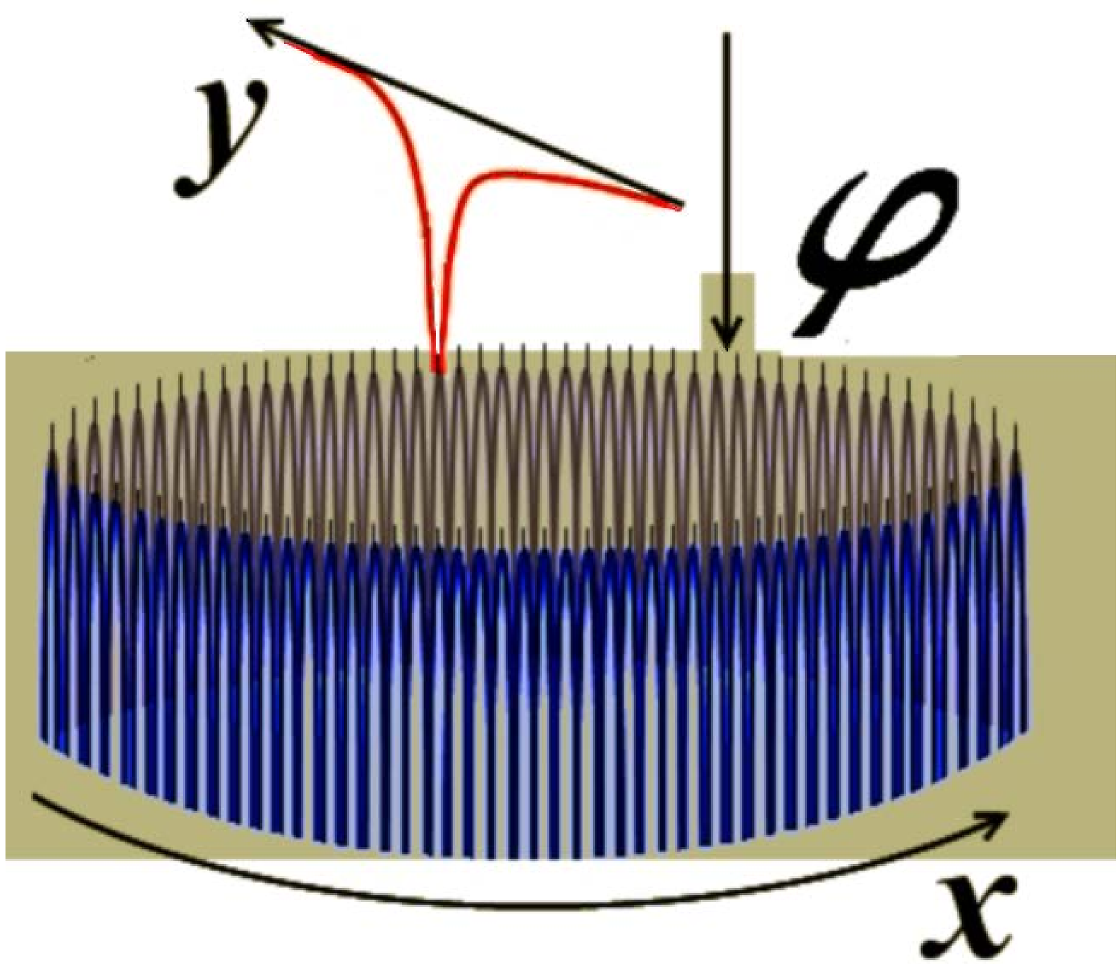

Fig. 7: Schematic representation of one-dimensional potential interstitial barriers for movement along x (blue curves below) under cyclic Kronig-Penney boundary conditions and the course of the surface potential in the direction orthogonal to the movement along y (red curve above)/

It is not difficult to construct a similar potential scheme for the two-dimensional case. And the orthogonal third dimension also confirms the operability of the Kronig-Penney conditions for two-dimensional films. The performance of these conditions has been repeatedly tested and used in Solid State Physics and in the three-dimensional case.

But in the Solid Body of “infinity” of one cubic centimeter there are real borders in all three dimensions, which allow checking the calculated values of the work function in experimental measurements (though, before specifying the Schottky barrier given in the previous paragraph, there were clever men who received “anisotropy” of work output, i. e., the orientation of the crystal changed ZERO in different directions at infinity!). And if we use the resulting true potential, then the false “anisotropy” of infinity for the charges goes away, and there are no fundamental contradictions in using the three-dimensional looping of the boundary conditions and for the three-dimensional truly infinite Universe. But, having no fourth geometric measurement, the only experimental verification is either the exit from three-dimensional space at energies greater than the Schottky barrier, or the exit to the asymptotic limit of the possible kinetic energies of a “particle” in the Universe.

This ideological question arises from the charge-mass similarity of potentials when considering gravity, but it also applies to the charge field in full. And his decision was hampered by arbitrariness in the choice of a potential constant, even electric, which led to errors / confusion. Whereas the finiteness of the measured values of the macroscopic characteristics is determined by the finite depth of the potential barrier relative to infinity - that is, the output at infinity to the zero derivative of the potential is zero Force!

As was shown in [16], for charge and mass, not only the zero, Newton-Coulomb static laws, but also the dynamic laws are similar. This allowed to look at the problem of the stability of the Universe from the other side. If once the planetary model helped to understand the structure of the atom, now many well-advanced theoretical models of a solid body solve the problems of the Universe that are “unsolvable” by the most modern mathematical methods. Both static and dynamic. In particular, the properties of an electron in an "infinite" crystal are well described (taking into account what was stated in the previous paragraph) by the final parameters due to the Carnot cyclic conditions. This allows you to remove the full arbitrariness in the choice of the potential of the constant not only, as was done above, for the charge (and bring it in line with the experimental data in the crystals), but also for the infinite Universe.

The fields we measure and the dynamics of material bodies are determined by a combination of an infinite number of sources of fields in the Universe. I mean, we measure the effective fields and masses / charges. And the fundamental difference of measurements in the “infinite crystal” and the infinite Universe in that, in the crystal, we “look”, say, on an electron, through the border - we apply and take into account external fields, whereas, being in the Universe, measuring the properties at a distance from the source fields (local) we must take into account the internal field.

So the similarity of the Law of the World and Coulomb's Law, given the huge difference in the absolute value of their forces, is associated with geometrically different scales - instead of Angstroms, the Parsecs. And the correction in these Laws of degree - instead of the constant unit variable from 1.676 to zero, allows this similarity to be used to determine the finite values of environmental parameters in an infinite Universe.

To conclude this article, let's talk a little bit about the “details”.

The chaotic distribution of stars in space does not match the ideal lattice. But to qualitatively show the absence of “bad” infinities, to show what the “resolved” potential in the “empty” place of the Infinite Universe is, allows the lattice of gravitational masses that are far apart in space. As shown in Fig.5. and this gas gives not zeros and bad infinities, but a qualitative conclusion about the finite value of the depth of the zone, even with an abstract tendency to discharge to infinity. Those absolute emptiness is also unattainable as absolute temperature zero.

As an example, we consider the distribution of the true potential for a finite package of fairly long 200 objects (Fig. 8)

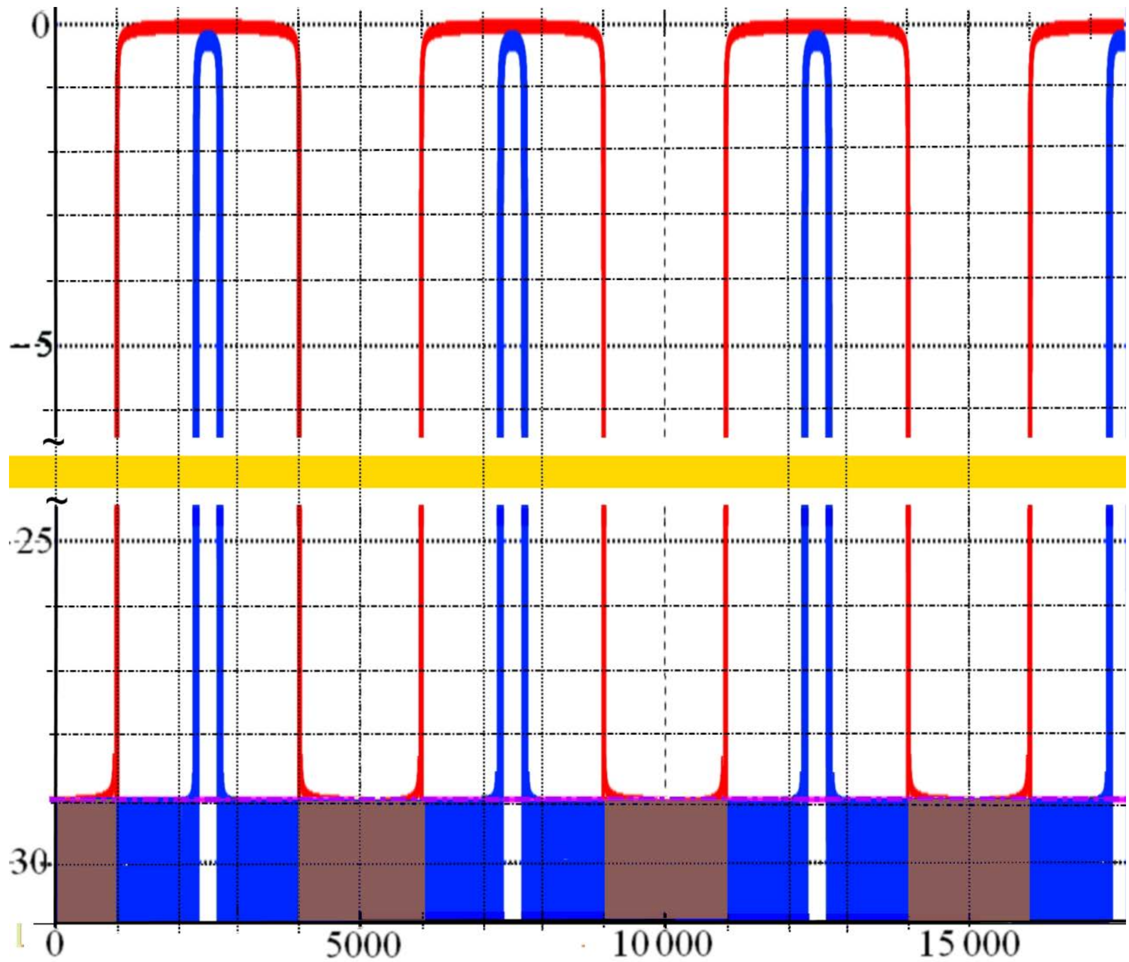

Fig. 8: The spatial distribution of the potential for central packages having a thickness less than (2000 layers) and more (4600 layers) half the distance between the packages (5000)

The potential distribution shown in Fig. 8 is described by the expression:

$$-\pi \sum_{k=-100}^{100}\left(\sum_{n=5000k-1000}^{5000k+1000}\left(\frac{1}{Abs\left[x-(n+0.5)\right]}\right)^{1.676}\right),$$
$$-\pi \sum_{k=-100}^{100}\left(\sum_{n=5000k-2300}^{5000k+2300}\left(\frac{1}{Abs\left[x-(n+0.5)\right]}\right)^{1.676}\right) \tag{8}$$

The dependences shown in Fig. 8 allow us to determine the final depth of the bottom of the CONDUCTIVITY ZONE for crystals (when using / taking into account charges), and! for SPACE (when using / accounting for masses of bodies).

III. Conclusion

For any potential forces, although electrostatic, even gravitational, it is necessary by law to reduce their potentials in inverse proportion to the distance from the object: charge or mass. However, in a large dynamic range, this LAW was not experimentally verified, but was limited to using them as an approximation of measurement results and for qualitative assessments.

The reason for this was that the LAW was allegedly "clearly confirmed" by a decrease in the "power flux density" through a given surface covering an object in inverse proportion to the surface area. However, this “visibility” did not rely in any way on the actually observed “Particles of Flowing Force”, which infinite time “flowed out of the object, but did not end at all (and did not return).

So this law was simply postulated, purely phenomenologically. But at the same time, a new LAW of short-range forces between charges was introduced purely empirically for small distances, in which, with reference to symmetry, it was assumed that the potential decreases with a distance of third or fourth degree. Such a rough fit with the help of "fundamental forces" has long been learned how to obtain final parameters in an "infinite crystal, associating them with the Schottky barrier and the work function and using them for a long time in practice when designing devices. But in cosmology, similar calculations were not carried out, and the gravitational potential was addressed “freely” up to a constant, even infinite. It was not necessary to design the cosmos, but with the flight of rockets into space, the “difficulties” of calculating the trajectory were corrected with the help of numerous adjustments of the flight trajectory.

The obtained phenomenological LAW 1.676 and the used method of calculating the total potentials made it possible to translate both electrical and gravitational "anomalies" into the discharge of normal counted effects. And the analysis of the LAW 1.676 itself allows us to obtain a quantitative ratio between the gravitational and inertial mass (charge), the equivalence of which was qualitatively postulated by Einstein.

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