**How the discovery of the physical meaning of Planck's constant made it possible to clarify the connections between classical and quantum mechanics and corpuscular-wave mechanics**

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In its physical meaning, Planck's constant turned out to be one of the corpuscular-wave quantities (CWQ) of microparticles. In turn, the newly discovered CWQ turned out to be quantities of corpuscular-wave mechanics (CWM), just as corpuscular quantities are quantities of the Newton's corpuscular classical mechanics (CCM). At the same time, Schrödinger's wave quantum mechanics (WQM) turned out to be in fact an incomplete part of the CWM of a non-relativistic electron (NE), and Newton's CCM itself turned out to be derived from the CWM of a macroscopic body (MB). Thus, to our great surprise, the CWM of a NE turned out to be a more general form of Schrödinger's WQM, and the CWM of a MB turned out to be a more general form of Newton's CCM. In this regard, just as Abel discovered the multiplicity of algebras, and Lobachevsky discovered the multiplicity of geometries, similar to them, we encountered the multiplicity of the mechanics of physics.

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## 1. About the physical meaning of Planck's constant, which made in possible to discover the photon's own CWQ.

The era of quantum concepts began with discovery by M. Planck [1] of the photon as a quantum of light a new constant called Planck's constant:

$$\hbar = 1{,}054 \cdot 10^{-54}\text{дж•с} \tag{1.2}$$

Based of 1.1) Planck and Einstein [2] discovered the following formulas for the momentum and energy of the photon:

$$\boldsymbol{P} = \hbar \boldsymbol{k} \tag{1.2}$$

$$E = mc^2 \tag{1.3}$$

$$E = \hbar w \tag{1.4}$$

here, $\boldsymbol{k}$ – wave vector, $m$ – relativistic mass, $\boldsymbol{c}$ – speed, $w$ – photon cyclic frequency.

At the same time, Einstein himself equated the corpuscular energy of the photon (1.3) with the wave energy of the photon (1.4):

$$(\mathbf{P} \cdot \mathbf{c}) = \hbar\omega \tag{1.5}$$

was interpreted as a formula for the corpuscular-wave duality (CWD) the photon.

As we continued our research, we came across fact according to which the formulas for the CWD of the photon are actually the formulas for the photon's own CWQ.

To detect the intrinsic CWQ of a photon, let us turn to the experimentally known property photon's. According to experimental data, if the long-wave (ultraviolet), then its relativistic mass will be small and vice versa, if the photon is short-wave (infrared), then its relativistic mass will be large. This experimental property, of a photon indicates that the photon has its own value $\boldsymbol{m^*}$**,** the factors of which are the corpuscular value of the photon-relativistic mass $m$ and its wave value-linear wavelength -$i$ $\boldsymbol{r}$ :

$$\mathbf{m}^* = mi\mathbf{r} = \frac{\hbar}{\mathbf{c}} \tag{1.6}$$

here, $c$ – the photon speed, like Planck's constant (1.1), is a fundamental constant.

As we see, the experimental properties of photons observed experimentally indicate that the photon has its own CWQ (1.6), and the photon itself, from the moment of its birth appears in the form of a corpuscular-wave object of a Nature. Accordingly, based on (1.6) the proper CWQ of the photon have the form:

$$\mathbf{m}^* = mi\mathbf{r} \tag{1.7}$$

$$P^* \equiv \hbar = (\mathbf{m}^*\mathbf{c}) \tag{1.8}$$

$$\mathbf{E}^* = \mathbf{m}^* c^2 \tag{1.9}$$

If we take into account the analogue of the photon's own CWQ (1.7)…(1.9) with the corpuscular quantities of Newton's corpuscular classical mechanics (CCM) [3], then (1.7) can be called corpuscular-wave mass, CWQ (1.8) corpuscular-wave momentum, and CWQ (1.9) corpuscular-wave energy. Here, it turned out that the stability of the photon is explained by fact that its own CWQ (1.7)...(1.9) are fundamental constants.

Due to the fact that the proper CWQ of the photon (1.7) appeared as a formula for the CWD of the photon, and therefore, the question arises, what is wrong with the formula for the CWD of the photon (1.5) proposed by Einstein? It turns out that the formula for CWD of the photon (1.5) proposed by Einstein is in fact not a corpuscular-wave formula, but a corpuscular-freguengy formula.

Taking into account the above-mentioned inaccuracy of the Einstein formula (1.5), there is no doubt that the proper CWQ of the photon (1.7) is the formula for the CWD of the photon.

Now, to establish connections between the proper CWQ of the photon (1.7)…(1.9) with the Planck and Einstein formulas (1.2)…(1.5), we first transform the proper CWQ of the photon (1.7)…(1.9) using the differential operator (transformation) used by Schrödinger in WQM [4]:

$$\mathbf{k} \equiv -i\nabla \tag{1.10}$$

In this case, the proper CWQ of the photon (1.7)…(1.9) are transformed in the form:

$$-i\mathbf{m}^{*}\nabla = m(i\mathbf{r}(-i\nabla)) = m \tag{1.11}$$

$$-iP^{*}\nabla = -i\hbar\nabla = (m\mathbf{c})_{1.2.3} - (m\mathbf{r}\omega)_{4} \tag{1.12}$$

$$-i\mathbf{E}^{*}\nabla = \left(mc^{2}\right)_{1,2,3} - (m(\mathbf{r}\omega\mathbf{c}))_{4} - (\hbar\omega)_{0} \tag{1.13}$$

here, the subscripts 1,2,3,4,0 correspond to the five dimensions of the five-dimensional Klein-Gordon space:

$$R^{2} = (x^{2}+y^{2}+z^{2})_{1,2,3} - (ct)_{4}^{2} - \left(\frac{\hbar}{mc}\right)_{0} \tag{1.14}$$

Here, it is easy not that the three-dimensional energy that appears on the right of the transformations (1.13) is the corpuscular energy of the photon discovered by Einstein (1.3), and the energy corresponding to the fifth dimension is the wave energy, or more precisely, the frequency energy of the photon (1.4), discovered by Planck. Accordingly, the three-dimensional momentum that appears on the right side of transformation (1.12) is the corpuscular momentum of the photon (1.2) discovered by Einstein. As we see, the corpuscular momentum of the photon (1.2) and the corpuscular of the energy of the photon(1.3), discovered by Einstein, as well as the frequency energy of the photon (1.4) discovered by Planck, arise when the proper CWQ of the photon (1.7)...(19) are presented within the framework of the five-dimensional Klein-Gordon space(1.14). This very important circumstance indicates that a photon endowed with its own CWQ (1.7)…(1.9) within the framework of our five-dimensional Klein-Gordon (1.14) on the basis of transformation (1.12) in impulse form manifests itself in the form of a four-dimensional object of Nature, and based on transformation (1.13) in energy from it manifests itself in the form of a five-dimensional object of Nature. Moreover, due to the fact that the fifth dimension of our five-dimensional Klein-Gordon space (1.14) is assumed to be closed and cyclic (frequency), and therefore the photon energy (1.4) corresponding to the fifth dimension is frequency, although now it is generally accepted to consider it wave energy (1.4).

The reason that left unnoticed the set of CWQ of the photon (1.7)…(1.9) was due to the fact that one of them, namely the corpuscular-wave impulse (1.8) was discovered first as the Planck constant (1.1). Due to the fact that the photon's CWQ (1.7)…(1.9) were related to each other using the photon's speed, and therefore, the value (1.7) began to be expressed as the ratio of Plank's constant to the photon's speed and the value (1.9) began to be expressed as the product of Plank's constant and the photon speed. In turn, Planck and Einstein's timely failure to discover the photon's own CWQ (1.7)…(1.9) and their transformations (1.11)…(1.13) played a fatal role when de Broglie [5] and Schrödinger generalized the Planck and Einstein formulas (1.2)...(1.5) for the case of a NE.

## 2. How the failure of Planck and Einstein discover the photon's own CWQ led to the incompleteness of the de Broglie and Schrödinger formulas for the case of a NE.

Following Einstein, de Broglie proposed hypothesis about the inherent nature of CWD not only to the photon, but also to other microparticles. In particular, de Broglie generalized the formulas of Planck and Einstein (1.2)…(1.5) for the case of NE in the form:

$$\boldsymbol{P} = \hbar \boldsymbol{k} \tag{2.1}$$

$$E = \hbar w \tag{2.2}$$

here: $\boldsymbol{k}$– wave vector, $m$ -mass, $\boldsymbol{v}$ - speed, $w$ – cyclic frequency NE.

And the formula for CWD of the photon (1.5) for the case of a NE took the form:

$$(\mathbf{P} \cdot \mathbf{v}) = \hbar\omega \tag{2.3}$$

In turn, Schrödinger, having expressed de Broglie formulas (2.1), (2.2) using the spatial differential operator (1.10), obtained the initial relations of WQM in the form:

$$\hat{P} = i\hbar\nabla \tag{2.4}$$

$$\grave{E}_k = \frac{\hbar^2}{2m}\Delta \tag{2.5}$$

$$\hat{U} = i\hbar\frac{\partial}{\partial t} \tag{2.6}$$

here: $\hat{P}$ È, $\hat{U}$— operators of momentum and energy of a NE.

Due to the fact that the formulas of de Broglie and Schrödinger (2.1)…(2.6) were a generalisation of the formulas of Planck and Einstein (1.2)…(1.5) for the case of a NE, and therefore, following thier example generalize the proper CWQ of the photon (1.7)…(1.9) and transformations (1.11)…(1.13) to the case NE. To do this, we first note the corpuscular quantities of the NE, which are established using the beginning of all physics- the corpuscular principles of Newton's CCM in the form:

Mass: $m$ (2.7)

Impulse: $\boldsymbol{P} = m \cdot \boldsymbol{v}$ (2.8)

Kinetic energy: $E \quad = \frac{mv^2}{2}$ (2.9)

Potential energy: $U = m \cdot v^2$ (2.10)

And the wave magnitude of the NE will be the linear wavelength of the NE:

$$\boldsymbol{ir} = ir(1,2,3,4,0) \tag{2.11}$$

here: 1,2,3,4,0 are symbols of the five dimensions of the five-dimensional Klein-Gordon space (1.14).

By combining the corpuscular quantities of the NE (2.7)…(2.10) with the wave magnitude of the NE, namely with the linear wavelength of the NE (2.11), we obtain the proper CWQ of the NE similar to the proper CWQ of the photon (1.7)…(1.9):

$$\boldsymbol{m}^* = mi\boldsymbol{r} \tag{2.12}$$

$$P^* = \hbar = (\boldsymbol{m}^*\boldsymbol{v}) = m(\boldsymbol{irv}) \tag{2.13}$$

$$\boldsymbol{E}* = (\boldsymbol{m}^* v^2)/2 \tag{2.14}$$

$$\boldsymbol{U}^* = \boldsymbol{m}^* v^2 \tag{2.15}$$

In turn, transform the proper CWQ of the NE (2.12)…(2.15) using the differential operator (1.10) similar to transformations (1.11)…(1.13):

$$\boldsymbol{m}^* k \to (\boldsymbol{m}^*(-i\nabla)) = m(i\boldsymbol{r}(-i\nabla)) = m \tag{2.16}$$

$$\hbar k \to i\hbar\nabla = (m\boldsymbol{v})_{1,2,3} - (mi\boldsymbol{r}(-iw)_4 = \boldsymbol{P}_{1.2.3} - \boldsymbol{P}_4 \tag{2.17}$$

$$(\boldsymbol{E}_k^* k) \to \quad (\boldsymbol{E}_k^*(-i\nabla) = E_{1,2,3} - (\frac{m*(-iwv)}{2})_4 - (hw/2)_0$$
(2.18)

$$(\boldsymbol{U}^* k) \to (\boldsymbol{U} * (-i\nabla)) = U_{1.2.3} - (\boldsymbol{m}^*(-iw)\boldsymbol{v})_4 - (-i\hbar w)_0 \tag{2.19}$$

где:

$$(i\boldsymbol{r}(-i\nabla)) = 1 \tag{2.20}$$

$$(\boldsymbol{v}(-i\nabla)) = -iw \tag{2.21}$$

Now, it is to to notice that the formulas (2.1), (2.2), obtained by de Broglie, as well as the initial relations of WQM (2.4)…(2.6) obtained by Schrödinger, are nothing more than simplified form of transformations (2.16)…(2.19) presented in relation to the corpuscular quantities of a NE (2.7)…(2.10):

$$m = (\boldsymbol{m}^* k) \ \to \ \hat{m} = -i\boldsymbol{m}^*\nabla \tag{2.22}$$

$$\boldsymbol{P} = \hbar\boldsymbol{k} \ \rightarrow \quad \hat{P} = -i\hbar\nabla \tag{2.23}$$

$$E_k = (\boldsymbol{E}_k^* k) \rightarrow \quad \widehat{E_k} = -i\boldsymbol{E}^*\nabla \tag{2.24}$$

$$U \quad = (\boldsymbol{U}^* k) \ \rightarrow \quad \widehat{U} = -i\boldsymbol{U}^*\nabla \tag{2.25}$$

As we see, de Broglie and Schrödinger obtained only special case of relations (2.22)…(2.25). At the same time, right up to the present day, it was clear that the left-hand sides of the Broglie (2.1), (2.2) and Schrödinger (2.4)...(2.6) contained the corpuscular quantities of the NE, and what was on the right-hand sides of their relations did not make any sense. Now, thanks to relations (2.22)…(2.25), it has become clear that the right-hand sides of the de Broglie relations (2.1), (2.2) and Schrödinger (2.4)...(2.6) contain the CWQ of the NE (2.7)…(2.10) an the differential operator (1.10) acting on them.

Here we note how the Heisenberg uncertainty principle [6] confirms the fact of the existence in Nature of the intrinsic CWQ of a NE (2.12)…(2.15). In the virgo part of the Heisenberg uncertainty relation:

$$\Delta P \Delta x \geq \hbar \tag{2.26}$$

we are talking about experimentally measured values of the momentum and spatial coordinates of a NE, which are defined within the framework of the five-dimensional Klein-Gordon space (1.14). On the right side of the Heisenberg uncertainty relation (2.26), according to the corpuscular-wave momentum formula (2.13), under the symbol Planck's constant (1.1) there are own dimensional values of the NE. In this regard, it becomes obvious that the Heisenberg uncertainty relation (2.26) shows the fact that the experimentally measured momentum and spatial coordinate have meaning up to the manifestation of the intrinsic CWQ on the NE (2.12)...(2.15). As we see, according to the Heisenberg uncertainty relation (2.26), to the intrinsic CWQ of the NE (2.12)...(2.15) act as lover boundaries up to which the experimentally determined momentum and spatial coordinate are applicable.

Here we must clarify the speed that appears in de Broglie's formulas (2.1)…(2.3), since it is generally accepted that they involve a relative variable speed, defined in Newton's CCM. But, in fact, the speed of a NE in de Broglie formulas (2.1)…(2.3) is not a variable value, because in this case the left and right parts of de Broglie formulas (2.1)…(2.3) will not be equally relativistic invariant and when moving from one reference system to another they change. Therefore, we note that, like the photon speed the first paragraph, the speed in de Broglie formulas (2.1)...(2.3) is a fundamental constant. To prove this circumstance, we will take into account the fact that the photon speed:

$$c = 2{,}99792458 \cdot 10^8 \quad \text{м/с} \tag{2.27}$$

and fine structure constant:

$$\alpha = 7{,}297352 \cdot 10^{-3} \tag{2.28}$$

are fundamental constants, and therefore, a value equal to their product will also be a fundamental constant:

$$v_B = 2{,}187691 \cdot 10^6 \ \text{м/с} \tag{2.29}$$

At the same time, as the speed of a NE (2.29), a speed appeared that is generally known in the form of the first Bohr speed [6], that is, like the photon speed (2.27) and the fine structure constant (2.28), the first Bohr speed (2.29), also turned out to be a fundamental constant. Accordingly, in all the above formulas of this section, including de Broglie formulas (2.1)…(2.3), the fundamental constant appears as the speed, which is generally known in the form of the first Bohr speed (2.29). This feature of the first Bohr velocity (2.29) indicates that the hydrogen atom does not spontaneously decay into an electron and a proton without external influence. Thus, we have obtained proof that the intrinsic CWQ of a NE (2.12)…(2.15) like the intrinsic CWQ of a photon (1.7)…(1.9) are fundamental constants. Let us note passing that the constanty of the first Bohr velocity (2.29) suggests the appropriateness of the relation (2.29):

$$m_e i r_e = m_p i r_p = \frac{\hbar}{\mathbf{v}_B} \tag{2.30}$$

here, quantities with subscripts *e* are quantities of the NE, and quantities subscripts *p* are quantities of the proton.

According to relation (2.30) like a NE for a proton, analogues of the proper CWQ of a NE (2.12)…(2.15) and transformations (2.13)…(2.16) are also appropriate.

According to the above information in this paragraph, like the photon, the NE considered by de Broglie and Schrödinger, as well as the proton, are due to the fact that their own CWQ are fundamental constants. Thus, up to the present day, the fundamental constant-electric charge was known as the intrinsic value of charged microparticles, and now it has become clear that the fundamental constants (1.7)…(1.9), (2.12)…(2.15), are also the intrinsic CWQ of microparticles.

At the end of this section, we note that if, along with the linear wavelength of the NE (2.11), we take into account its perpendicular radius vector $r\perp$, then between the values (2.12) and (2.13) the intrinsic moment of the NE will occur:

$$\boldsymbol{m}_{\perp}^{*} = [\boldsymbol{m}^{*} \times \boldsymbol{r}_{\perp}] = m[i\boldsymbol{r} \times \boldsymbol{r}_{\perp}] \tag{2.31}$$

We will consider one feature of quantity (2.31) in the following paragraphs, since it assumes the possibility of a spontaneous transition between translational rotational angular momentum.

Now, in the next paragraph we will show how the intrinsic CWQ of a NE (2.13)…(16) allow us to find out that Schrödinger's WQM is actually the CWM of a NE.

## 3. Schrödinr"s WQM, as an incomplete part of CWM of a NE.

One of the features of Newton's CCM is that it contains both corpuscular quantities similar to the corpuscular quantities of a NE (2.7)…(2.10), and its equation of motion:

$$\mathbf{F} = \frac{d\mathbf{P}}{dt} \tag{3.1}$$

Unlike Newton's CCM, Schrödinger's WQM has only its equation of motion:

$$E\psi = i\hbar\frac{\partial\psi}{\partial t} \tag{3.2}$$

And the quantities associated with the equation of motion of Schrödinger's WQM (3.2), historically, have not been discovered.

To discover the quantities associated with the equation of motion Schrödinger's WQM (3.2), let us turn to the proper CWQ of the NE (2.12)…(2.15) and consider how in a sufficiently short time:

$$-i\frac{\partial}{\partial t} \tag{3.3}$$

their evolutionary formulas look like:

$$-i\mathbf{m}^*\frac{\partial}{\partial t} = -im\frac{\partial(i\mathbf{r})}{\partial t} = m\mathbf{v} = \mathbf{P} \tag{3.4}$$

$$-i\hbar\frac{\partial}{\partial t} = (\mathbf{Pv}) - (m^*\mathbf{a}) = E - F^* \tag{3.5}$$

$$\frac{-i\hbar v}{2}\frac{\partial}{\partial t} = \frac{\mathbf{P}v^2}{2} - \frac{((\mathbf{m}^*\mathbf{a})\mathbf{v})}{2} - \frac{\hbar\mathbf{a}}{2} \tag{3.6}$$

$$-i\hbar\frac{\partial}{\partial t} = \mathbf{P}v^2 - ((m^*\mathbf{a})\mathbf{v}) - \hbar\mathbf{a} \tag{3.7}$$

Now, if we express the evolutionary formula (3.5) with respect to the energy *E*:

$$E = -i\hbar\frac{\partial}{\partial t} + F^* \tag{3.8}$$

If in (3.8) we do not take into account the last component, then the equation of motion of Schrödinger’s WQM (3.2) without the wave function symbol arises:

$$E = -i\hbar\frac{\partial}{\partial t} \tag{3.9}$$

As we see, the proper CWQ of a NE (2.12)…(2.15) turned out to be precisely those quantities with which the equation of motion of Schrödinger’s WQM (3.2) is related, just as the equation of motion Newton’s CCM (3.1) is associated with corpuscular quantities.

Thus, what was called WQM for a hundred years actually turned out to be an incomplete part the CWM of the NE. And the incompleteness of WQM, which Einstein assumed, turned out to be the absence in it of its own CWQ of a NE (2.12)…(2.15), transformations (2.16)...(2.19 and evolutionary formulas (3.4)…(3.7).

Now, due to the fact that the transitions of Schrodinger’s WQM into Newton’s CCM is assumed on a macroscopic scale, we will therefore these two mechanics actually relate. As noted above, Schrodinger’s WQM is an incomplete part of the CWM of a NE, and therefore, the own CWQ of a NE (2.13)…(2.16), transformations (2.16)…(2.19), as well as evolutionary formulas (3.4)…(3.7) that we discovered are still unknown to this day parts of Schrodinger's WQM. In contrast to Schrodinger's WQM, corpuscular quantities Newton's CCM (2.7)...(2.10) arise as a result transformations (2.16)…(2.19) as internal spatial three-dimensional quantities. Therefore, Newton's CCM itself, in its status, is purely internal spatial corpuscular mechanics. In turn, due to the fact that the evolutionary formula (3.4) that we discovered is the mathematical formula of Newton's first law, and therefore, the impulse that appears of the right side of the transformation (3.4) is the impulse that appears in both Newton's first law and Newton's second law or, in other words, in the equation of motion of Newton's CCM (3.1). As we see, our fundamental mechanics-CCM of Newton, being internally spatial mechanic, is unable to cover the more general WQM of Schrödinger, which, a strict approach, is CWM.

The equation of motion of Schrödinger's WQM (3.2),being a first-order differential equation, according to the evolutionary formula (3.5) is not similar to the equation of motion of Newton's CCM (3.1), which is a second-order differential equation. On the contrary, the equation of motion of Schrödinger WQM (3.9) is similar to transformations (2.16)…(2.19) is a transformation (display) in time *t* and expresses how the CWQ (2.13) is manifested (displayed) under the influence of time *t*. In this regard, to fix changes in time to the Schrödinger equation of motion of WQM (3.2) another function is required, which is called the wave function, and it is this wave function that expresses the change in time of transformed form of the CWQ (2.13). In contrast to the equation of motion of Schrödinger's WQM (3.2), in the case of the equation of motion of Newton's CCM (3.1), being a second-order differential equation, the equation of motion of Newton's CCM (3.1) itself fixes change in momentum ***P*** over time *t*.

Now, at the end of this section, let us turn to the CWQ (2.31) and indicate its evolutionary formula:

$$[\mathbf{m}^* \times \mathbf{r}_\perp]\left(-i\frac{\partial}{\partial t}\right) = [\mathbf{P} \times \mathbf{r}_\perp] = [\mathbf{m}^* \times (-i\mathbf{v}_\perp)] \tag{3.13}$$

here, we are dealing with two types of intrinsic angular momentum:

$$L = [\mathbf{P} \times \mathbf{r}_\perp] \tag{3.14}$$

$$L_{\perp} = [\mathbf{m}^{*} \times (-i\mathbf{v}_{\perp})] \tag{3.15}$$

In this case, quantity (3.14) in the translational intrinsic angular momentum, and quantity (3.15) is the rotational intrinsic angular momentum. But the emergence of both translational and rotational intrinsic angular momentum from the same evolutionary formula (3.13) suggests that there may be a spontaneous transition between these two varieties of intrinsic angular momentum. If in reality such a spontaneous transition turns out to be realized in Nature, then it will have to be taken into account when studying the properties of free object of Nature.

## 4. About the CWQ of the CWM of a MB and their connection with the corpuscular quantities of Newton's CCM.

By analogy with the CWQ of a NE (2.12)…(2.15) for the CWM of a MB, the macroscopic CWQ will have the form:

$$\mathbf{m}^{*} = m\mathbf{r} \tag{4.1}$$

$$P^{*} = (\mathbf{m}^{*}\mathbf{v}) \tag{4.2}$$

$$\mathbf{E}_{k}^{*} = \frac{\mathbf{m}^{*}v^{2}}{2} \tag{4.3}$$

$$\mathbf{U}^{*} = \mathbf{m}^{*}v^{2} \tag{4.4}$$

here, **r** – radius-vector of a MB co-directed with its speed ***v***.

An analogue of the differential operator (1.10) will be the operation of differentiation:

$$\mathbf{k} = \frac{d}{d\mathbf{r}} \tag{4.5}$$

Transforming the CWQ of the CWM of a MB (4.1)…(4.4) using the differentiation operation (4.5), we obtain analogues of transformations (2.16)…(2.19) in the form:

$$\frac{d\mathbf{m}^{*}}{d\mathbf{r}} = m\frac{d\mathbf{r}}{d\mathbf{r}} = m \tag{4.6}$$

$$\frac{d\mathbf{P}}{d\mathbf{r}} = (m\mathbf{v})_{1,2,3} - (m\mathbf{r}w) = \mathbf{P}_{1,2,3} - \mathbf{P}_4 \tag{4.7}$$

$$\frac{d\mathbf{E}_k^*}{d\mathbf{r}} = \left(\frac{mv^2}{2}\right)_{1,2,3} - \left(\frac{(\mathbf{m}^*w\mathbf{v})}{2}\right)_4 - \left(\frac{P^*\omega}{2}\right)_0 \tag{4.8}$$

$$\frac{d\mathbf{U}^*}{d\mathbf{r}} = \left(mv^2\right)_{1,2,3} - (\mathbf{m}^*w\mathbf{v})_4 - (P^*w)_0 \tag{4.9}$$

here, the subscripts 1,2,3,4,0 correspond to the five dimensions of the five-dimensional Klein-Gordon space (1.14).

The quantities with subscripts 1,2,3 that appear on the right-hand sides of transformations (4.6)…(4.9) correspond to the three-dimensional dimension of the five-dimensional Klein-Gordon space (1.14) and are corpuscular quantities of Newton’s CCM:

Mass: m (4.10)

Impulse: $\mathbf{P} = m\mathbf{v}$ (4.11)

Kinetic energy: $E_k = \dfrac{mv^2}{2}$ (4.12)

Potential energy: $U = mv^2$ (4.13)

Accordingly, if we consider changes in the CWQ of the CWM of a MB (4.1)...(4.4) in a fairly short time *t* :

$$\frac{d}{dt} \tag{4.14}$$

Then we obtain the evolutionary formulas for the CWQ of the CWM of a MB in the form analogues of the evolutionary formulas (3.4)…(3.7):

$$\frac{d\mathbf{m}^*}{dt} = m\frac{d\mathbf{r}}{dt} = m\mathbf{v} = \mathbf{P} \tag{4.15}$$

$$\frac{dP^*}{dt} = m\frac{d(\mathbf{r}\mathbf{v})}{dt} = (\mathbf{P}\mathbf{v}) - (m^*\mathbf{a}) = U - F^* \tag{4.16}$$

$$\frac{d\mathbf{E}_k^*}{dt} = \frac{m}{2}\frac{d(\mathbf{r}v^2)}{dt} = \frac{\mathbf{P}v^2}{2} - \frac{F^*\mathbf{v}}{2} - \frac{P^*\mathbf{a}}{2} \tag{4.17}$$

$$\frac{d\mathbf{U}^*}{dt} = m\frac{d(\mathbf{r}v^2)}{dt} = \mathbf{P}v^2 - F^*\mathbf{v} - P^*\mathbf{a} \tag{4.18}$$

In this case, the evolutionary formula (4.16) will be the equation of motion of the CWM of a MB by analogy with the analogue evolutionary formula (3.5). At the same time, the evolutionary formula (4.15) is a mathematical formula of Newton’s first law and the impulse that arises on its right side is the impulse that appears in both Newton’s first law and Newton’s second law.

Thus, according to the above results, behind the CCM of Newton there is the CWM of a MB, unknown to this day. Accordingly, the corpuscular quantities of Newton’s CCM (4.10)...(4.13) arise from the CWQ of the CWM of a MB (4.1)...(4.4) after transformations (4.6)...(4.9). Thus, Newton’s CCM based on corpuscular quantities (4.10)...(4.13) begins with the right-hand sides of transformations (4.6)...(4.9), and Newton's first law based on momentum begins with the right-hand sides of evolutionary formula (4.15). As we see, the corpuscular quantities of Newton’s CCM (4.10)…(4.13) known from the time of Newton up to the present day as the beginning of physics, turned out to be derived from the CWQ of the CWM of a MB (4.1)...(4.4). In this regard, we can say that the beginnings of physics with the corpuscular quantities of Newton’s CCM (4.10)...(4.13) moved away and the CWQ of the CWM of a MB (4.1)...(4.4) became known as the beginning of physics. Of course, this circumstance will not be easy to perceive, but as Einstein himself said, physics begins and ends with experience. Therefore, it is necessary to experimentally verify the provisions of the CWM of a MB. For example, evolutionary formula (4.15) is located in the place where Newton’s first law is now located and according to it, real objects of Nature cannot be at rest if there is a time parameter *t*. While, according to Newton’s first law, the object of Nature under study may be at rest. This difference makes it possible to establish experimentally whether the provisions of CWM of a MB are realized in Nature or not.

Here, we especially note the fact that the differential operator (1.10) and the differentiation operation (4.5) appeared in the form на of an influencing space parameter on the object under study, and operations (3.3) and (4.14) appeared in the form of an influencing time parameter on the object under study. This property of space and time in the form of dynamic categories of physics is in perfect agreement with Einstein's two theories of reality [8], in which space and time also appear an the form of dynamic categories of physics. But while in Newton's CCM and in Einstein's two theories of relativity only internal spatial corpuscular quantities appeared, here, in CWM, extra-spatial CWQ appeared, that is, in fact, physics went beyond the space-time continuum. Our physics has reached extra-spatial CWQ, but they turned out to be so unusual that they will require incredible intellectual abilities from us, from internal spatial beings, to perceive them.

In the end, we note that the macroscopic analogue of (2.31) will be the quantity:

$$[\mathbf{m}^* \times r_\perp] \tag{4.19}$$

And the macroscopic analogue of the evolutionary formula (3.13) will be the evolutionary formula:

$$\frac{d[\mathbf{m}^* \times r_\perp]}{dt} = [\mathbf{P} \times \mathbf{r}_\perp] = [\mathbf{m}^* \times \mathbf{v}_\perp] \tag{4.20}$$

According to the evolutionary formula (4.20), a spontaneous transition can take place between the translational and rotational angular momentum. If this spontaneous transition turns out to be realized in Nature, then on its basis it is possible to create first rotating and then vertically taking off saucer-shaped aircraft.

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