Schrödinger's wave quantum mechanics is actually the corpuscular-wave mechanics of a non-relativistic electron.

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Three hundred and fifty years ago, I.Newton, in his corpuscular classical mechanics (CCM), introduced mass as an initial quantity and, on its basis, defined other corpuscular quantities of CCM. And a hundred years ago, the corpuscular-wave properties of microparticles testified to the inherent corpuscular-wave quantities (CWQ), which as the initial value had the product of mass and wavelength. Accordingly, just as Newton's CCM was based on corpuscular quantities, corpuscular-wave mechanics (CWM) should have been based on CWQ in the same way. But a hundred years ago, Plank's and Einstein, to describe the corpuscular-wave properties of the photon, used hybrid of corpuscular quantities Newton's CCM and wave quantities of wave optics, which a priori, by their definition, were insufficient to describe the CWQ of the photon. Subsequently, de Broglie and Schrodinger applied the method of Planck and Einstein to the case of a non-relativistic electron (NE), and obtained wave quantum mechanics (WQM). But the WQM he obtained turned out to be a real puzzle, and now, a hundred years later, l was able to discover that in reality WQM is an incomplete version of the CWM NE. The campaign managed to find out that Newton's CCM arises in the form of a special case of the CWM macroscopic body. In this regard, now, l seem to be a Tajikistan physicist who discovered CWQ and CWM physics.

1. On the insufficiency of the Planck and Einstein formulas for describing corpuscular-wave properties of the photon.

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

$$\hbar = 1{,}054 \cdot 10^{-54} \text{дж•с} \qquad (1.1)$$

Based on (1.1), Planck and Einstein [2] discovered the following formulas for the impulse and energy of a photon:

$$P = \hbar k \qquad (1.2)$$

$$E = mc^2 \qquad (1.3)$$

$$E = \hbar w \qquad (1.4)$$

Where, k – wave vector, m – relativistic mass, c – speed, w – cyclic frequency of the photon.

At the same time, Einstein himself interpreted the equality of the corpuscular energy of the photon (1.3) with its wave energy (1.4) as a formula for the corpuscular-wave duality (CWD) of the photon:

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

The peculiarity of formulas (1.2)…(1.5) is that in them Planck and Einstein used the previously known corpuscular quantities of Newton's CCM [3] and the wave quantities of wave optics [4] combining them with Planck's constant (1.1). At the same time, due to the fact that the quantities of Newton's CCM and wave optics were not intended to describe the corpuscular-wave object of Nature, which was the photon, and there fore the question arises, is the hybrid of the quantities of Newton's CCM and wave optics sufficient to describe corpuscular-wave property of the photon or not?

In order to get an answer to the above question, let is turn to the experimentally known property of the photon. Experimentally, the longer the wavelength of a photon, the smaller its relativistic mass [5] and vice versa, the shorter its wavelength, the larger its relativistic mass. And this circumstance indicates that there is a certain constant $\boldsymbol{m}^*$, the factors of which are the corpuscular quantities of the photon-the relativistic mass m and its wave quantities-the linear wavelength-$i\,\boldsymbol{r}$:

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

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

According to the CWQ (1.6), the photon a priori, by its birth, a corpuscular-wave object of Nature and it has its own CWQ:

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

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

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

These proper CWQ (1.7)...(1.9) cannot be expressed using corpuscular quantities of Newton's CCM and wave quantities of wave optics. To make this circumstance obvious, let us show how the proper CWQ of the photon (1.7)...(1.9) are actually related to the Planck and Einstein formulas (1.2)…(1.5). To do this, we first transform the proper CWQ of the photon (1.7)...

(1.9) using the differential operator (transformation) used by Schrödinger [6] in WQM:

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

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

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

$$-iP^*\nabla = -i\hbar\nabla = (m\mathbf{c})_{1,2,3} - (m\mathbf{r}\omega)_4 \tag{1.12}$$

$$-i\mathbf{E}^*\nabla = \left(mc^2\right)_{1,2,3} - (m(\mathbf{r}\omega\mathbf{c}))_4 - (\hbar\omega)_0 \tag{1.13}$$

where, 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 to notice that the three-dimensional impulse that arose on the right side of the transformation (1.12) was discovered by Einstein in the of a corpuscular photon impulse (1.2). The three-dimensional energy from the right side, of the transformation (1.13) was discovered by Einstein in the form of the corpuscular energy of the photon (1.3), and the energy from the right side of the transformation (1.13) corresponding to the fifth dimension was discovered by Planck of the form of the wave energy of the photon (1.4).

As we can see, the corpuscular and wave quantities of the photon (1.2)...(1.5) predicted by Planck and Einstein turned out to be quantities that arise from the photon’s own CWQ (1.7)...(1.9) after transformations (1.11)…(1.13), that is, we have advanced further than Planck and Einstein in understanding the quantities of the photon. At the same time, it became clear that the corpuscular and wave quantities of the photon (1.2)...(1.5) discovered by Planck and Einstein turned out to be internal spatial quantities in relation to the five-dimensional Klein-Gordon space (1.14), and the own CWQ discovered by us photon quantities (1.7)...(1.9) turned out to be external quantities with respect to the five-dimensional Klein-Gordon (1.14). Therefore, if, following Planck and Einstein, to describe the properties of a photon we use the internal spatial quantities of Newton’s CCM and wave optics, then the extra-spatial proper CWQ of the photon (1.7)…(1.9) and their transformations (1.11)…(1.13) will remain unknown in physics, as has been the case from the beginning of the twentieth century intil the present day.

Thus, the fact became clear that a photon endowed with its own CWQ (1.7)…(1.9) is a corpuscular-wave object of Nature, and these own CWQ of the photon (1.7)…(1.9) in within the five-dimensional Klein-Gordon (1.14) manifests itself in the form of corpuscular, mixed and wave quantities. At the same time, it became obvious that the CCM created by I.Newton is purely three-dimensional spatial mechanics, and therefore, if we use it inside three-dimensional spatial corpuscular quantities together with wave quantities of wave optics, even then it is impossible to fully characterize the intrinsic CWQ of the photon (1.7)…(1.9), which, within the framework of the five-dimensional Klein-Gordon space (1.14), manifest themselves as five-dimensional quantities. This is due to more general nature of the intrinsic CWQ of the photon (1.7)…(1.9) compared with the corpuscular quantities of Newton's CCM and the wave quantities of wave optics.

For a visual comparison, we note that in Newton's CCM it was assumed that a hypothetical material point moves with mass m. But the real object of Nature, the photon, turned out to be moving with a magnitude equal to the product of mass and wavelength $\boldsymbol{m^*}$, that is, the real object Nature, the photon, turned out to be not like a hypothetical material point. Therefore, the CWQ of a photon can be called corpuscular-wave mass $\boldsymbol{m^*}$ (1.7)**,** corpuscular-wave impulse P^* (1.8) and corpuscular-wave energy $\boldsymbol{E^*}$ (1.9).

2. On the insufficiency of the de Broglie and Schrödinger formulas for describing the corpuscular-wave properties of a NE .

Following Einstein, L. de Broglie [7] subsequently proposed a hypothesis about the inherent nature of CWD not only to the photon, but also to other microparticles, thereby generalising Einstein's idea to the case of other microparticles. In particular, for the case of a NE, the formulas Planck and Einstein (1.2)...(1.5) were generalized by de Broglie in the form:

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

$$E_k = \frac{m v^2}{2} \tag{2.2}$$

$$E = \hbar w \tag{2.3}$$

where: k– wave vector, m -mass, v – speed , w – cyclic frequency of the NE .

And the formula CWD (1.5) took the form:

$$(\mathbf{P} \cdot \mathbf{v}) = \hbar\omega \tag{2.4}$$

In turn, E. Schrödinger, having expressed de Broglie formulas (2.1)...(2.3) using the differential operator (1.10), obtained the initial relations of WQM in the form:

$$\hat{P} = i\hbar\nabla \tag{2.5}$$

$$\grave{E}_k = \frac{\hbar^2}{2m}\Delta \tag{2.6}$$

$$\hat{U} = i\hbar\frac{\partial}{\partial t} \tag{2.7}$$

where: $\hat{P}$ $\grave{E}, \hat{U}$— operators impulse and energy NE.

Due to the fact that the formulas of de Broglie and Schrödinger (2.1)...(2.7) were a generalisation of the formulas of Planck and Einstein (1.2)...(1.5) to the case of a NE, and therefore, following example, we generalize the formulas of proper CWQ of the photon (1.7)...(1.9) and transformations (1.11)...(1.13) in 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 quantities of Newton’s CCM in the form:

Mass: m (2.8)

Impulse: $P = m \cdot v$ (2.9)

Kinetic energy: $E_{\square} = \frac{m v^2}{2}$ (2.10)

Potential energy: $U = m \cdot v^2$ (2.11)

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

$ir = ir(1,2,3,4,0)$ (2.12)

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

By combining the corpuscular quantities of the NE (2.8)...(2.11) with the wave quantity of the NE, namely, with its linear wavelength (1.12), we obtain the intrinsic CWQ of the NE similar to the intrinsic CWQ of the photon (1.7)...(1.9):

$$m^* = mir \tag{2.13}$$

$$P^* = \hbar = (m^* v) = m(irv) \tag{2.14}$$

$$E^* = (m^* v^2)/2 \tag{2.15}$$

$$U^* = m^* v^2 \tag{2.16}$$

In turn, the proper CWQ of a NE (2.13)...(2.16) using the differential operator (1.10) similar to transformations (1.11)…(1.13):

$$m^* k \to (m^*(-i\nabla)) = m(ir(-i\nabla)) = m \tag{2.17}$$

$$\hbar k \to i\hbar\nabla = (mv)_{1,2,3} - (mir(-iw)_4 = P_{1.2.3} - P_4 \tag{2.18}$$

$$(E^*_k k) \to (E^*_k(-i\nabla) = E_{1,2,3} - (\tfrac{m^*(-iwv)}{2})_4 - (\tfrac{\hbar v}{2})_0 \tag{2.19}$$

$$(U^* k) \to (U^*(-i\nabla)) = U_{1.2.3} - (m^*(-iw)v)_4 - (-i\hbar w)_0 \tag{2.20}$$

where:

$$(ir(-i\nabla)) = 1 \tag{2.21}$$

$$(v(-i\nabla)) = -iw \tag{2.22}$$

Not, it is easy to notice that both the formulas (2.1)...(2.4) proposed by de Broglie and the initial relations of WQM (2.5)...(2.7) proposed by Schrödinger are formulas in which simplified form of transformations (2.17)...(2.20) are presented in relation to the corpuscular quantities of a NE (2.8)…(2.11):

$$m = (m^* k) \to \hat{m} = -im^*\nabla \tag{2.23}$$

$$P = \hbar k \rightarrow \ \hat{P} = -i\hbar\nabla \tag{2.24}$$

$$E_k = (E_k^* k) \rightarrow \ \hat{E}_k = -iE^*\nabla \tag{2.25}$$

$$U = (U^* k) \rightarrow \ \hat{U} = -iU^*\nabla \tag{2.26}$$

As we see, formulas (2.1)...(2.7) obtained by de Broglie and Schrödinger, corresponding to formulas (2.23)...(2.26), are thereby insufficient to express the proper CWQ of a NE (2.13)...(2.16) and transformations (2.17)...(2.20), just like the formulas of Planck and Einstein (1.2)...(1.5) turned out to be insufficient to express the proper CWQ of the photon (1.7)...(1.9) and transformations (1.11)…(1.13). The insufficiency of the de Broglie and Schrödinger formulas (2.1)...(2.7) resulted in the fact that instead of the necessary CWM of a NE, its incomplete version was obtained in the form of WQM, and we will verify this in the third paragraph of this work.

Now, let us note how the Heisenberg uncertainty principle [8] confirms the fact of the existence in Nature of the CWQ of a NE (2.13)…(2.16). On the left side the Heisenberg uncertainty relation we are talking about the experimentally measured values of impulse and spatial coordinates, which are established and obtained by the researcher:

$$\Delta P \Delta x \geq \hbar \tag{2.27}$$

According to the CWQ (2.14), on the right side of the Heisenberg uncertainty relation (2.27) under the symbol of Plank's constant (1.1) the own dimensional quantities of the NE are hidden. In this regard, in became obvious that as soon as the experimentally measured magnitudes of the impulse and spatial coordinate become equal to the intrinsic dimensional CWQ of a NE, that any change in the wave quantities of a NE (2.12) is accompanied by a change in its corpuscular quantities (2.8)...(2.11) and vice versa, any change in the corpuscular quantities of a NE (2.8)...(2.11) in accompanied by a change in its wave quantities (2.12). Accordingly, as soon as the left part (2.27) becomes smaller than the right part, then the intrinsic dimensions of the NE (2.13)...(2.16) become undetectable quantities. As we can see, the Heisenberg uncertainty is one of the many uncertainties that occur due to the fact that the corpuscular and wave quantities of a photon are quantized using constants (1.7)...(1.9), and the corpuscular and wave quantities of a NE are quantized using constants (2.13)...(2.16).

Here we should especially emphasize the fact that the constanty of the intrinsic CWQ of the photon (1.7)...(1.9) is beyond doubt, but the constanty of the intrinsic CWQ of a NE (2.13)...(2.16) must be specified. In this regard we will take into account the fact that the speed of the photon:

$$c = 2{,}99792458 \cdot 10^{8} \quad \text{м/с} \tag{2.28}$$

and the fine structure constant:

$$\alpha = 7{,}297352 \cdot 10^{-3} \tag{2.29}$$

they are fundamental constants, and therefore, their products are also a fundamental constant:

$$v_B = 2{,}187691 \cdot 10^{6} \ \text{м/с} \tag{2.30}$$

As we can see, the first Bohr velocity [9], like Planck's constant and the speed of light, is a fundamental constant, and therefore, the intrinsic CWQ of a NE (2.13)...(2.16) similar to the intrinsic CWQ of the photon(1.7)...(1.9) are also fundamental constant. Accordingly, the constanty of the first Bohr velocity (2.30) implies the relevance of the relation:

$$m_e ir_e = m_p ir_p = \frac{\hbar}{\mathbf{v}_B} \tag{2.31}$$

Here, the values with lower *e* indices are the values of the NE, and the values with lower *p* indices are the values of the photon.

Thus, the CWQ of the photon (1.7)...(1.9) and the intrinsic CWQ of a NE (2.13)...(2.16), and also, protons are quantized due to the fact that they are fundamental constants. Historically, when great physicists limited themselves to just one of them, Plank's constant (1.1), then, along with constants (1.7)...(1.9), (2.13)...(2.16) the intrinsic CWQ of the photon and the NE went unnoticed, and along with them, the CWM of physics went unnoticed.

At the end of this section, we note that if, along with the linear wavelengty of a NE (2.12), we take into account its perpendicular radius vector $r\perp$, then between the CWQ (2.13) and (2.14) there will be another CWQ:

$$m_{\perp}^{¿}=[m_{\square}^{¿}\times r_{\perp}]=m[ir\times r_{\perp}] \tag{2.32}$$

We will consider one important feature of relation (2.32) in the following paragraphs, since it assumes the possibility of a spontaneous transition between translational and rotational motions.

Now, in the next paragraph, we will show how the CWQ of a NE (2.13)...(2.16) make it possible to find out that Schrodinger's WQM is actually an incomplete version of the CWM of a NE. And we will make sure that this circumstance was not noticed for a hundred years.

3. Schrodinger's WQM, as an incomplete version of the CWM of the NE.

One of the features of Newton's CCM is that it contains both corpuscular quantities similar to corpuscular quantities (2.8)...(2.11) and the equation of motion:

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

Unlike Newton's CCM, Schrodinger'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 its equation of motion (3.2), historically, were not discovered.

To discover the quantities associated with the equation of motion of WQM (3.2), let us turn to the intrinsic, CWQ of a NE (2.13)...(2.16) and consider their changes in a fairly short time:

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

thier 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 write evolutionary formula (3.5) with respect to energy E:

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

And we do not take into account the last component, then we obtain the equation of motion of WQM (3.2) with out the function symbol:

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

As we see, the proper CWQ of a NE (2.13)...(2.16) turned out to be exactly the quantities with which the equation of motion of WQM (3.2) is associated, similar to how the equation of motion of Newton's CCM is associated with corpuscular quantities (3.1).

Thus, it became obvious that what was perceived for a hundred years as WQM actually turned out to be an incomplete version of the CWM of a NE, the incompleteness of WQM, which Einstein assumed, was generated by the absence in it of its own CWQ of the NE (2.13)...(2.16), transformations (2.17)...(2.20) and evolutionary formulas (3.4)…(3.7).

Now, due to the fact that is a generally accepted opinion about the transition of Schrodinger's WQM on a macroscopic scale to Newton's CCM, we will therefore indicate how Schrodinger's WQM is actually interconnected with Newton's CCM. As noted above, Schrodinger's WQM is an incomplete form of the CWM of a NE, and therefore, it es enough to find out how the CWM of a NE is interrelated with the CCM of Newton. First of all, let us pay attention to the fact that according to the information in the previous paragraph, the corpuscular quantities of Newton's CCM (2.8)...(2.11) arise from the CWQ of the NE (2.13)...(2.16) after transformations (2.17)...(2.20), that is, it became obvious that the CWQ of the NE (2.13)...(2.16) are more general compared to corpuscular quantities of the Newton's CCM (2.8)...(2.11). Accordingly, we will take into account the fact that all evolutionary formulas (3.4)...(3.7) are related to the CWM of a NE, and of these, only the evolutionary formula (3.4) is also related to Newton's CCM. The connectedness of the evolutionary formula (3.4) is explained by the fact that the evolutionary formula (3.4) itself is located where Newton's first law is now located, that is, the evolutionary formula (3.4) is the formula of Newton's first law. Therefore, the impulse $\boldsymbol{P}$, that arose on the right side of the evolutionary formula (3.4) is the impulse that appears both in Newton's first law an in Newton's second law or, in other words, in the equation of motion of Newton's CCM (3.1). Thus, the corpuscular quantities of Newton's CCM (2.8)...(2.11) arise from the CWQ of the NE (2.13)...(2.16) after transformations (2.17)...(2.20) in the from of internal spatial three-dimensional quantities, and Newton's first and second laws are related to the evolutionary formula (3.4). As we see, Schrödinger's WQM, being a more general mechanics, does not fit into the framework within the spatial three-dimensional CCM of Newton.

Here we note te fundamental difference between the equation of motion of Schrödinger's WQM (3.2) and the equation of motion of Newton's CCM (3.1). The equation of motion of Schrödinger's WQM (3.2), being a first-order differential equation, is not similar to the equation of motion of Newton's CCM (3.1), since the equation of motion of Newton's CCM is a second-order differential equation. On the contrary, the equation of motion of WQM (3.2) like transformations (2.17)...(2.20) is an equation of transformation (display) in time t and expresses how the CWQ of a NE (2.14) is transformed (displayed) under the influence of time t. Therefore, to the equation of motion WQM (3.2) it will be necessary to add one more function, which is called the wave function, and it is this wave function that fixes the change in time of the transformed version of the CWQ of a NE (2.14). In contrast, the equation of motion Newton's CCM (3.1), being a second-order differential equation, itself fixes the change in impulse $\boldsymbol{P}$ over time t.

Thus, according to the above results, what was called Schrödinger's WQM for a hundred years actually turned out to be an incomplete version of the CWM of a NE, which as its quantities has its own CWQ of a NE (2.13)…(2.16), and what for a hundred years was called Schrödinger's equation of motion of WQM (3.2) actually turned out to be the equation of motion of CWM of a NE (3.9). In contrast to the CWM of a NE, Newton's CCM has corpuscular quantities (2.8)...(2.11) as its quantities, and has the equation of motion (3.1) as its equation of motion. In this case, the corpuscular quantities of Newton's CCM (2.8)...(2.11) arise from the CWQ of the NE (2.13)...(2.16) after transformations (2.17)...(2.20) in the form of quantities corresponding to three-dimensional dimension of the five-dimensional Klein-Gordon space (1.14). Accordingly, Newton's first and second laws follow from evolutionary formula (3.4), and the equation of motion of CWM of a NE follows from evolutionary formula (3.5). Thus, we have clearly outlined the differences between the new CWM of a NE and the previously known CCM of Newton.

Now, at the end of this section, let us turn to the corpuscular-wave formula (2.32) and obtain its evolutionary formula:

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

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

$$L = [\mathbf{P} \times \mathbf{r}_\perp] \qquad (3.14)$$

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

In this case, in (3.14) we are dealing with translational intrinsic angular momentum and in (3.15) with rotational intrinsic angular momentum. But the appearance of two varieties of proper angular momentum (3.14) and (3.15) from one CWQ (2.32) indicates the possibility of a spontaneous transition between them. If in reality such a spontaneous transition between two varieties of proper angular momentum takes place, then it must be taken into account when studying the properties of real object's of Nature.

4.One the approximate form of CWM for a macroscopic body.

By analogy with the CWQ of a NE (2.13)…(2.16) for the CWM of a macroscopic body (MB), the proper CWQ will the form:

$$\mathbf{m}^* = m\mathbf{r} \qquad (4.1)$$

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

$$\mathbf{E}_k^* = \frac{\mathbf{m}^* v^2}{2} \qquad (4.3)$$

$$\mathbf{U}^* = \mathbf{m}^* v^2 \qquad (4.4)$$

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

An analogue of the operation 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 (4.1)…(4.4) of the CWM of a MB using the differentiation operation (4.5), we obtain analogies of transformations (2.17)…(2.20):

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

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

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

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

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

On the right-hand sides of transformations (4.6)...(4.9) the quantities with subscripts 1,2,3, correspond to the three-dimensional dimension of the five-dimensional Klein-Gordon (1.14) and represent 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)

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

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

Then we obtain evolutionary formulas for CWQ of CWM of a MB (4.1)... (4.4) in the form of analogies of evolutionary formulas (3.4)…(3.7):

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

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

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

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

In this case, the evolutionary formula (3.16) will be the equation of motion of the CWM of a MB by analogy with the evolutionary formula (3.5). Accordingly, the evolutionary formula (4.15) will be the formula of Newton’s first law, and is the impulse that appears in Newton’s second law or, in other words, in the equation of motion of Newton’s CCM (3.1).

In turn, the macroscopic analogue of the CWQ (2.32) will be the i888macroscopic CWQ:

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

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

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

In the CWQ (4.1)...(4.4) are realized in Nature, then they will be inherent in free MB, and if the CWQ (4.1)...(4.4) are not realized in Nature, then, based on Newton’s first law, corpuscular quantities (4.10)…(4.13) will be inherent in free MB. To experimentally check whether macroscopic CWQ (4.1)...(4.4) are realized in Nature or not, we think, we can find out by experiments in conditions of weightlessness. For example, according to the evolutionary formula (4.15), any loose element, in particular, the astronauts themselves, must be in a state of motion, since the evolutionary formula (4.15) refutes the first provision of Newton's first law about bodies being at rest in the absence of external influence. Exactly, also, according to the evolutionary formula (3.4), a free microparticles will always have impulse and cannot be at rest, contrary to the first provision of Newton's first law.

Thus, if the CWQ and CWM discovered by us turn out to be realized in Nature, then the first provision of Newton's first law will not be realizable for real object Nature.

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