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The Quantum Mechanics as Also a Case of the Ether Elasticity Theory

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Abstract

The Schrödinger equation ensues from the following axiom: in Cartesian coordinates and in absence of gravitation, to the component p_μ, ($\mu = 1,2,3,4$), of the momentum tensor is associated the operator $-i\hbar\partial_\mu$. We show here this equation is a particular case of the equation that governs, even in presence of gravitation, the oscillatory displacements ξ of the points of the ether shown to be a specific elastic medium. That is to say that the Schrödinger equation of which the solutions are the scalar state functions Θ is a particular case of the equation of the vectorial waves ξ propagated in the ether. As shown in previous publications, a mobile particle is a superposition $\hat{\xi}$ of these waves ξ that form a globule moving like this particle; here we show, in particular that, in a bound state, it is the interferences of these waves ξ that creates the so called "quantum states". The ether elasticity theory therefore do not only generalizes the quantum mechanics, but also gives the physical signification of the quantum phenomena.

Keywords: ether elasticity theory, quantum mechanics, physical signification of the quantum effects

1. Introduction

We use the following notations. The Greek indexes take the values 1,2,3,4, they are associated to spatial-time quantities. The Latin indexes take the values 1,2,3, they are associated to spatial quantities. The index 4 is associated to time quantities. We denote by p_μ the covariant components of the momentum tensor, by x^μ the contra-variant coordinates, by $\dot{x}^\mu$ the time derivative of x^μ, i.e., $\dot{x}^\mu \equiv dx^\mu/dt$, and by ∂_μ the partial derivatives $\partial/\partial x^\mu$.

The Schrödinger equation is based on the axioms inspired from the Broglie plane wave, postulating that "in Cartesian coordinates and in absence of gravitation, to the component p_μ of the momentum tensor is associated, the operator $-i\hbar\partial_\mu$ applied on the wave function ". Therefore, even though it yields very important results, the Schrödinger's equation is arbitrary since it is founded on these arbitrary axioms. Zareski (2011) shown that the quantum mechanics may be extended to the case where there is present a gravitational field, by replacing the operator $-i\hbar\partial_\mu$, by the covariant operator $-i\hbar D_\mu$, but even this last axiom is arbitrary.

Therefore one may think that since it reposes on axioms, the quantum mechanics theory may be generalized by a theory based on time, space, forces, movements and general relativity. In that context, we show here that the quantum mechanics is a particular case of the "ether elasticity theory (Zareski, 2001, 2012, 2013)", compatible with the general relativity. One reminds that Maxwell and Einstein presumed its existence, indeed Maxwell wrote in Art. 866 of Maxwell (1954):

"*Hence all these theories lead to the conception of a medium in which the propagation takes place, and if we admit this medium as an hypothesis, I think it ought to occupy a prominent place in our investigations*.".

and Einstein, in Einstein (1920):

"Recapitulating, we may say that according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether. According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense.".

As shown in Zareski (2001, 2012, 2013), the "ether elasticity equation" that governs the displacements ξ of the points of the ether ensues from the Navier-Stokes-Durand equation of elasticity, that takes also into account the densities of couples applied to the elastic medium. Theses densities of couples were introduced by E. Durand, Cf. pp. 229-239 of Durand (1953), they complete the Navier-Stokes equation of elasticity.

In this paper one consider the particular case where the ether elasticity equation is defined by Equations (30)-(32) of Zareski (2013) and where the field of forces that act the particle is static, i.e., where as we show, the displacements ξ of the points of the ether are waves of constant frequency. As shown here below, in this case the ether elasticity theory generalizes the quantum mechanics since it yields in particular the Schrodinger equation, but not only the Schrodinger equation of which the solutions are scalar state functions Θ, but yields an equation of which the solution are vectorial waves ξ called "particle waves" . This new equation which ensues from the Navier-Stokes-Durand equation is valid even in the presence of a gravitational field.

These waves ξ are called "particle waves" because they are associated to the $\mathrm{Par}(m,e)$s, (i.e., particles of mass m and electric charge e), as following: an adequate superposition $\hat{\xi}$ of waves ξ forms a globule that moves like a $\mathrm{Par}(m,e)$, therefore a $\mathrm{Par}(m,e)$ can be considered as such a globule, in particular a $\mathrm{Par}(0,0)$ is a photon and the waves ξ associated it are electromagnetic; reciprocally, as we show here below, an adequate sum of such globules $\hat{\xi}$ forms a wave ξ, Cf. (Zareski, 2013). Mathematically, these sums are Fourier transforms and their inverses.

In a bound state of a $\mathrm{Par}(m,e)$ submitted to a Schwarzschild field and to a Coulomb one due to a $\mathrm{Par}(m_0,q_0)$ immobile at the origin, the waves ξ that compose $\hat{\xi}$ interfere with themselves. In this interference, only remain certain waves ξ that do not destruct themselves in this interference, but on the contrary, are amplified, i.e., resonate. This resonance happens when a close trajectory of $\mathrm{Par}(m,e)$ contains an integer number "n" of wave lengths I_w, and these resonant waves are the equivalents of the so called "quantum state" of the quantum mechanics.

2. Recalls on the Equation that Governs the Elastic Ether and of Its Solution ξ

One considers that the fields to which is submitted a $\mathrm{Par}(m,e)$ are static. In this case, Cf. Sec. V (ibid), the particle waves ξ associated to such a $\mathrm{Par}(m,e)$ is the solution of the following "ether elasticity wave equation"

$$\mathbf{curl}\left(V_P{}^2\mathbf{curl}\,\xi\right)=\omega^2\xi\,, \tag{1}$$

where V_P denotes the phase velocity of ξ, and ω, a constant pulsation. As shown, (ibid), a solution ξ of Equation (1) is of the form

$$\xi=\xi_0\exp(i\phi)\,. \tag{2}$$

where the phase ϕ is related to the Lagrange-Einstein function L_G of a $\mathrm{Par}(m,me)$ submitted to a gravitational and or a electromagnetic field by the relation

$$d\phi\equiv L_G dt/\hbar\,, \tag{2a}$$

and where, Cf. Sec. II, (ibid),

$$L_G=-mc\dot{s}+eA_\mu\dot{x}^\mu/c\,. \tag{2b}$$

In this expression, A_μ denotes the electromagnetic potential tensor and $\dot{s}\equiv ds/dt$, where ds denotes the Einstein infinitesimal element. Furthermore, in (2), ξ_0 denotes a vector depending upon only the spatial coordinates x^j of $\mathrm{Par}(m,e)$. We give now the explicit expression for phase the ϕ. Since the expression for the momentum tensor p_μ, defined by $p_\mu\equiv\partial L_G/\partial\dot{x}^\mu$, is,

$$p_\mu=-mc\,dx_\mu/ds+eA_\mu/c\,, \tag{2c}$$

it follows that

$$L_G dt=p_\mu dx^\mu\equiv p_4dx^4+p_jdx^j\equiv\left(-E_Tdt+p_jdx^j\right)/\hbar\,. \tag{2d}$$

Now V_P is defined by the fact that $\phi=0$, i.e., by

$$V_P=d\ell/p_jdx^j\,, \tag{2e}$$

where $d\ell$ denotes the infinitesimal length of its trajectory of the $\mathrm{Par}(m,e)$. It follows that for a $\mathrm{Par}(m,me)$ submitted to static fields, one has,

$$\phi\equiv\omega\left(-t+\int d\ell/V_P\right), \tag{3}$$

where the spatial curvilinear integral is taken along a trajectory defined in (Zareski, 2013), and where V_P, for which the expression is given here below for the cases that interest us, is the phase velocity of the wave ξ, and ω denotes the pulsation defined by

$$\omega \equiv E_T/\hbar . \tag{4}$$

In Equation (4), E_T denotes the total energy of the $\mathrm{Par}(m,e)$, this energy is constant since the fields to which it is submitted are static, furthermore E_T can be written in the form

$$E_T \equiv mc^2 + h\nu , \tag{5}$$

where ν is a constant frequency. As shown (ibid), for a $\mathrm{Par}(m,e)$ such an electron or a proton, ξ_0 is perpendicular to the trajectory. Now the velocity V of $\mathrm{Par}(m,e)$ is related to V_P by the relation

$$\frac{\partial}{\partial E_T}\left(\frac{E_T}{V_P}\right) = \frac{1}{V} . \tag{5a}$$

Therefore, if one defines ϕ' by

$$\phi' \equiv \hbar \, \partial\phi/\partial E_T , \tag{5b}$$

then, on account of Equation (3) and of (5a), one has

$$\phi' = -t + \int d\ell/V . \tag{5c}$$

3. The Schrodinger Equation as a Particular Form of the Ether Elasticity Equation

When a $\mathrm{Par}(m,e)$ is submitted to a Schwarzschild field and to a Coulomb field created by the $\mathrm{Par}(m_0,q_0)$, i.e., a particle of mass m_0 and electric charge q_0, immobile at the origin **O**, the expression for V_P, is, (ibid),

$$V_P{}^2 = \frac{c^2 E_T{}^2 \gamma^2}{\gamma_a{}^2\left[(E_T + eA_4)^2 - \gamma^2 (mc^2)^2\right]} , \tag{6}$$

where,

$$\gamma^2 \equiv 1 - \alpha/r , \quad \alpha \equiv 2m_0 k/c^2 , \quad \gamma_a{}^2 \equiv 1 + \alpha(\cos^2 a)/(r\gamma^2), \quad eA_4 \equiv -|eq_0|/(4\pi\varepsilon_0 r) , \tag{7}$$

"a" being the angle made by the radius vector **r** and the trajectory element of the $\mathrm{Par}(m,e)$. From the identity

$$(E_T + eA_4)^2 - \gamma^2 (mc^2)^2 \equiv (2mc^2 + h\nu + eA_4)(h\nu + eA_4) + (mc^2)^2 \alpha/r , \tag{8}$$

it appears that, in the "non-relativistic approximation", i.e., when α/r is neglected in front of 1, and $h\nu + eA_4$ in front of mc^2, but where $(mc^2)^2 \alpha/r$ is <u>not neglected</u>, Equation (8) becomes

$$(E_T + eA_4)^2 - \gamma^2 (mc^2)^2 \cong 2mc^2 [h\nu + \hat{a}/r], \tag{9}$$

where $\hat{a}$ is defined by

$$\hat{a} \equiv |eq_0|/(4\pi\varepsilon) + mm_0 k , \tag{10}$$

and the expression for the phase velocity (6) becomes then

$$V_P{}^2 \cong \frac{E_T{}^2}{2m(h\nu + \hat{a}/r)} . \tag{11}$$

Now, denoting by $\boldsymbol{\psi}_0$ the vector defined by

$$\boldsymbol{\psi}_0 \equiv \xi_0 \exp\left(i\omega \int d\ell/V_P\right), \tag{12}$$

Equation (2) can be written

$$\xi = \boldsymbol{\psi}_0 \exp(-i\omega t), \tag{13}$$

inserting (13) in (1), one obtains

$$\mathbf{curl}\left(V_P{}^2 \mathbf{curl}\, \boldsymbol{\psi}_0\right) = \omega^2 \boldsymbol{\psi}_0 . \tag{14}$$

By using the following two identities

$$\mathbf{curl}(b\mathbf{B}) \equiv b\,\mathbf{curl}\mathbf{B} + \mathbf{grad} b \wedge \mathbf{B} , \quad \text{and} \quad \mathbf{curl}(\mathbf{curl}\mathbf{B}) \equiv -\nabla^2 \mathbf{B} + \mathbf{grad}(\mathrm{div}\mathbf{B}), \tag{15}$$

where "b" is any scalar and **B**, any vector, Equation (14) takes the form

$$-\nabla^2 \boldsymbol{\psi}_0 + \boldsymbol{\Xi} = \frac{\omega^2}{V_P{}^2}\boldsymbol{\psi}_0, \tag{16}$$

where, $\boldsymbol{\Xi}$ is defined by

$$\boldsymbol{\Xi} \equiv \left[\mathbf{grad}.\left(\log V_P{}^2\right)\right] \wedge \mathbf{curl}\,\boldsymbol{\psi}_0. \tag{17}$$

For the $\mathrm{Par(m,e)}$ submitted the field created by this $\mathrm{Par(m_0,q_0)}$, then, on account of (6), Equation (16) becomes

$$-\nabla^2 \boldsymbol{\psi}_0 + \boldsymbol{\Xi} = \left(\frac{\gamma_a}{c\gamma\hbar}\right)^2 \left[\left(E_T + eA_4\right)^2 - \gamma^2\left(mc^2\right)^2\right]\boldsymbol{\psi}_0, \tag{18}$$

where, in $\boldsymbol{\Xi}$ and in $\boldsymbol{\psi}_0$, V_P is given by (6). Yet, in the non-relativistic approximation, then, on account of (11), this Equation (18) becomes,

$$-\nabla^2 \boldsymbol{\psi}_0 + \boldsymbol{\Xi} \cong \frac{2m}{\hbar^2}\left(h\nu + \hat{a}/r\right)\boldsymbol{\psi}_0, \tag{19}$$

where now, in the expressions for $\boldsymbol{\Xi}$ and $\boldsymbol{\psi}_0$, V_P is given by (11), that is to say that if we denote

$$\Phi \equiv \frac{\sqrt{2m}}{\hbar}\int\left(h\nu + \hat{a}/r\right)d\ell, \tag{20}$$

then (17) becomes

$$\boldsymbol{\Xi} = -\left[\mathbf{grad}\log\left(h\nu + \hat{a}/r\right)\right] \wedge \mathbf{curl}\left[\boldsymbol{\xi}_0 \exp(i\Phi)\right]. \tag{21}$$

Let us now consider more specially this expression for $\boldsymbol{\Xi}$ given in (21). First, one has

$$\mathbf{grad}\log\left(h\nu + \hat{a}/r\right) = -\frac{\hat{a}}{\left(h\nu + \hat{a}/r\right)}\frac{\mathbf{r}}{r^3}, \tag{22}$$

furthermore, by using the left identity (15), and considering that

$$\mathbf{grad}\exp(i\Phi) = \left(i\omega\mathbf{u}/V_P\right)\exp(i\Phi) \tag{23}$$

where **u** is the unitary vector along the trajectory of the $\mathrm{Par(m,e)}$ at its position, one has

$$\mathbf{curl}\left[\boldsymbol{\xi}_0 \exp(i\Phi)\right] \equiv \exp(i\Phi)\left[\mathbf{curl}\,\boldsymbol{\xi}_0 + i\frac{\sqrt{2m}}{\hbar}\left(h\nu + \hat{a}/r\right)\mathbf{u} \wedge \boldsymbol{\xi}_0\right]. \tag{24}$$

Yet, since the only condition that $\boldsymbol{\xi}_0$ has to satisfy is to be perpendicular to the plane of the trajectory of $\mathrm{Par(m,e)}$, one can take $\boldsymbol{\xi}_0$ to be also constant, in this case (21) becomes

$$\boldsymbol{\Xi} = i\frac{\sqrt{2m}}{\hbar}\frac{\hat{a}}{r^3}\exp(i\Phi)\mathbf{r} \wedge \left(\mathbf{u} \wedge \boldsymbol{\xi}_0\right), \tag{25}$$

and $\mathbf{r} \wedge \left(\mathbf{u} \wedge \boldsymbol{\xi}_0\right)$ becomes $-\left(\mathbf{u}\cdot\mathbf{r}\right)\boldsymbol{\xi}_0$, it follows finally that

$$\boldsymbol{\Xi} \cong -i\frac{\sqrt{2m}}{\hbar}\frac{\hat{a}}{r^3}\left(\mathbf{u}\cdot\mathbf{r}\right)\boldsymbol{\psi}_0. \tag{26}$$

Now , one sees that

$$\left|\boldsymbol{\Xi}\right| << \left|\frac{2m}{\hbar^2}\left(h\nu + \frac{\hat{a}}{r}\right)\boldsymbol{\psi}_0\right|, \tag{27}$$

and moreover, that in a circular bound state then **u** and **r** are orthogonal, i.e., $\mathbf{u}\cdot\mathbf{r} = 0$, i.e., $\boldsymbol{\Xi} = 0$. It follows that (19) can be written with a good approximation, considering that $\hat{a}/r \cong eA_4$,

$$-\frac{\hbar^2}{2m}\nabla^2\psi_0 \cong eA_4\psi_0 + h\nu\psi_0, \quad (28)$$

Now, multiplying the tow members of (28) by $\exp(-i2\pi\nu t)$ and denoting

$$\psi \equiv \psi_0 \exp(-i2\pi\nu t),$$

Equation (28) becomes

$$-\frac{\hbar^2}{2m}\nabla^2\psi \cong eA_4\psi + h\nu\psi$$

that can be written as following

$$-\frac{\hbar^2}{2m}\nabla^2\psi \cong eA_4\psi + i\hbar\partial_t\psi. \quad (28a)$$

Equation (28a) is Schrodinger's equation. We have therefore demonstrated that this equation is a particular form of the ether elasticity equation (1), i.e., that: *the ether elasticity theory generalizes the quantum mechanics*.

4. Some Other Known Results Ensuing Also From the Ether Elasticity Theory

4.1 The Bohr-Sommerfeld Condition

For simplicity we consider a $Par(m,e)$ submitted only to a electrostatic field created by a $Par(m_0,q_0)$ and use as in Zareski (2013), the following notations: if ω is fixed, and ξ, ϕ, and ϕ' are functions of $\omega+\Delta\omega$, then they will be denoted $\xi(\Delta\omega)$, $\phi(\Delta\omega)$, and $\phi'(\Delta\omega)$, and if $\Delta\omega = 0$, then they will be denoted simply ξ, ϕ, and ϕ'. Following the finite increment theorem one has

$$\phi(\Delta\omega) = \phi + \Delta\omega\phi' + \frac{1}{2}(\Delta\omega)^2\phi''(\theta\Delta\omega),$$

where $\phi''(\theta\Delta\omega)$ is the value of $\partial\phi'/\partial\omega$, when ω takes the value $\omega+\theta\Delta\omega$, ($0<\theta<1$). Now like in Zareski (2013), we show now that $(\Delta\omega)^2\phi''(\theta\Delta\omega)$ is very small in front of $\Delta\omega\phi'$, i.e., is negligible, indeed one can verify that in absence of gravitation, then

$$\phi''(\theta\Delta\omega) = -\frac{\hbar}{c}\left(mc^2\right)^2\int\frac{d\ell}{\left[(E_T + eA_4)^2 - (mc^2)^2\right]^{3/2}}.$$

Considering that m is the mass of the electron, one has, in MKSA unit, $\frac{\hbar}{c}\left(mc^2\right)^2 \cong 10^{-56}$, therefore one can write with a very good approximation, as in Zareski (2013) that

$$\phi(\Delta\omega) = \phi + \Delta\omega\phi', \quad (28b)$$

i.e.,

$$\xi(\Delta\omega) = \xi\exp(i\Delta\omega\phi'). \quad (28c)$$

and that a $Par(m,e)$ is a superposition $\hat{\xi}(\Delta\omega)$ of waves ξ defined by

$$\hat{\xi}(\Delta\omega) \equiv \frac{1}{\Delta\omega}\int_{-\Delta\omega/2}^{\Delta\omega/2}\xi(\vartheta)d\vartheta. \quad (28d)$$

for which the explicit expression is ,

$$\hat{\xi}(\Delta\omega) = \xi_0\exp\left[i\omega\left(-t+\int\frac{d\ell}{V_P}\right)\right]SINC\left[\frac{\Delta\omega}{2}\left(-t+\int\frac{d\ell}{V}\right)\right], \quad (28e)$$

where, since the maximum of $SINC\left[\frac{\Delta\omega}{2}\left(-t+\int\frac{d\ell}{V_0}\right)\right]$ which is of small volume moves with the velocity V.

In a bound state of a $Par(m,e)$ submitted to a Schwarzschild field and to a Coulomb one, due to $Par(m_0,q_0)$, the waves ξ that compose $\hat{\xi}$ interfere with themselves. In this interference, only reminds a certain wave ξ that do not destruct itself in this interference, but on the contrary, resonates. This resonance happens when a close trajectory of $Par(m,e)$ contains an integer number "n" of wave lengths I_w.

Let us consider the case where the trajectories described by $Par(m,e)$ attracted by $Par(m_0,q_0)$ are circular, and located in the plane $\theta = \pi/2$. In such a circular state, I_w is constant since it do not depend upon the angle φ described by the constant radius vector r denoted then ρ. The resonance condition is then such that

$$2\pi\rho/I_w = n. \tag{29}$$

Now the expression for the total frequency ν_T is

$$\nu_T = E_T/h, \tag{30}$$

and since $I_w = V_P/\nu_T$, the expression for I_w is

$$I_w = hV_P/E_T. \tag{31}$$

In this circular case, we can express V_P as a function of the component p_φ of the momentum tensor defined by

$$p_\varphi \equiv \partial L_{Gc}/\partial\dot{\varphi}, \tag{32}$$

where L_{Gc} is the Lagrange-Einstein function in this case. Indeed, in this case where the trajectories are circumferences of radius ρ in the plane $\theta = \pi/2$, the expression for L_{Gc} is

$$L_{Gc} = -mc\dot{s}_c + eA_4\dot{x}^4/c, \tag{33}$$

where

$$\dot{s}_c = \sqrt{\gamma^2\left(\dot{x}^4\right)^2 - \dot{\varphi}^2\rho^2}, \tag{34}$$

From (2) and (3), one sees that $V_p = E_T/p_j u^j$, and since ρ is constant, it follows that

$$p_j u^j = p_\varphi\, d\varphi/(\rho d\varphi) \equiv p_\varphi/\rho,$$

therefore, V_P can be written in the following form

$$V_P = E_T\rho/p_\varphi \tag{35}$$

and I_w as following

$$I_w = h\rho/p_\varphi. \tag{36}$$

Inserting this expression for I_w in (29), one retrieves the Bohr-Sommerfeld relation,

$$p_\varphi = n\hbar, \tag{37}$$

which is a resonance condition for the wave ξ defined in (2) or (3), in that circular bound state.

4.2 The Permitted, (Eigen), Values of r and $h\nu$

We determine now the values of ν and ρ that cause this resonance by determining two equations involving them. From (32)-(34), it follows that, in this circular bound state,

$$p_\varphi = mc\dot{\varphi}\rho^2/\dot{s}_c \equiv mc\rho V/\dot{s}_c. \tag{38}$$

Now, in this space-time, the expression for the velocity V in this circular motion, is, (ibid),

$$V = \frac{c\gamma}{\left(mc^2 + h\nu + eA_4\right)}\sqrt{\left(mc^2 + h\nu + eA_4\right)^2 - \gamma^2\left(mc^2\right)^2}, \tag{39}$$

which, in the non-relativistic approximation, becomes, considering (9),

$$V \cong \sqrt{\frac{2}{m}\left(h\nu + \frac{\hat{a}}{\rho}\right)}. \tag{40}$$

It follows, by inserting (40), in (38), that

$$p_\varphi \cong \rho\sqrt{2m\left(h\nu + \hat{a}/\rho\right)}, \tag{41}$$

i.e., considering (37), one obtains

$$(n\hbar)^2 \cong 2m\rho^2(h\nu + \hat{a}/\rho). \tag{42}$$

Equation (42) connects ν and ρ, and, on account of (40), yields

$$V^2 \cong \left(\frac{n\hbar}{\rho m}\right)^2. \tag{43}$$

In order to determine another equation of ν and or of ρ, we use the following other motion equation

$$\frac{d}{dt}\frac{\partial L_{Gc}}{\partial \dot{r}} - \frac{\partial L_{Gc}}{\partial r} = 0. \tag{44}$$

From (33), one sees that $\partial L_{Gc}/\partial\dot{r} = 0$, it follows also that $\partial L_{Gc}/\partial r = 0$, therefore (44) becomes, considering (33),

$$-\frac{1}{2}mc\frac{\alpha c^2/\rho^2 - 2\dot{\varphi}^2\rho}{\sqrt{\gamma^2c^2 - V^2}} + e\partial_\rho A_4 = 0. \tag{45}$$

Keeping in mind that $\dot{\varphi}\rho = V$, and that $\partial A_4/\partial\rho = q_0/(4\pi\varepsilon_0\rho^2)$, (45) becomes, in the non-relativistic approximation,

$$m\rho V^2 - \hat{a} \cong 0, \tag{46}$$

and taking into account (43) and (10), one obtains

$$\rho \cong (n\hbar)^2/(\hat{a}m). \tag{47}$$

Inserting (47) into (42), one obtains

$$h\nu = -\frac{1}{2}\frac{\hat{a}^2 m}{(n\hbar)^2}, \tag{48}$$

and since $|eq_0|/(4\pi\varepsilon) >> mm_0k$, Equation (48) can be written also with a good approximation

$$h\nu = -\frac{1}{2}\frac{m}{(n\hbar)^2}\left(\frac{eq_0}{4\pi\varepsilon}\right)^2. \tag{49}$$

One sees that the relation (49) and (47), obtained from the theory of the waves ξ in the elastic ether are the same as those obtained from the current quantum mechanics theory. It follows again that there is a relation between these two theories and, moreover, that the ether elasticity theory generalizes the usual quantum mechanics theory.

5. Conclusions

Therefore the ether elasticity theory here presented only in the case of the Schrodinger and of circular quantum states can yield more results than only the Schrodinger equation since it lies on the physical properties of a specific elastic medium: the ether in which propagate waves and where the fields are changes in the elastic properties of this medium. Finally both the ether elasticity theory and the quantum mechanics theory yield the Schrodinger equation, but this equation is only a particular result of the ether elasticity theory.

In a next paper we will show that the electron spin ensues also from this ether elasticity theory.

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