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The Essence of the Phenomenon Time and its Causal Relation to the Process of the Human Seeing and Hearing

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Abstract

Based on the experimental data of the effect of pendulum (PE) and of the third law of Kepler (3LK), an analysis of the essence of time is given. It is shown that an identity of the PE-time with the 3LK-time is possible only in the case when we presume the existence of a dual basic state of the whole nature. This model is based on the one side on the gravity, i.e. the one-dimensional state, the statics, and on the other side on the electromagnetism, i.e. the two-dimensional state, the dynamics. This model suggests the essence of time to be the dynamics. Moreover, it is shown that the localization-state of the 3LK-time, which in fact is observable in form of frequency [Hz], is describable by time [s] only, when it is based on this dual model, resulting in the relation [Hz] = [s-1]. Besides, this model allows to yield a solution of the three-body-problem (3BP), as well as to formulate an equation, which shows that a causal connection between the gravitational force and the PE is given. Furthermore, as has been shown that the process of human seeing and hearing can be described by this physical model of the dual states of being, thus it is demonstrated the effect of seeing and hearing to be in fact a clear biophysical process. Finally, it is shown that the basic units meter, kilogram, second and ampere allow to be the suitable matter to disclose by localization the possibility of causal effects at the state of dynamics.

Keywords: Time; Space; Pendulum effect; Third law of Kepler; Three-body-problem; Force; Seeing; Hearing; Biophysics

Introduction

Lee Smolin emphasized in his book "The Trouble with Physics" that the main unsolved problem of physics is the phenomenon time [1]. This fault was eliminated by the recently published paper [2], where it has been shown that the phenomenon "time" can become understandable, referring to the curious experimental data of the Quantum-Hall-Effect (QHE), discovered in 1980 by *K von Klitzing* [3,4] and awarded 1985 the Nobel-Price, as well as to the physical description of the processes of seeing and hearing [5,6], and, as will be shown in this paper, to the experimental data of the process of the pendulum effect and its far-reaching consequences.

The effect of pendulum (PE) is used to determine time since *Christian Huygens* (1629–1695), the discoverer. The extensive exploration of the PE discloses that this specific method to determine time is dependent on the category square time, considered with respect to the length of the pendulum. This specific square effect of the time appears to be in accordance with the experimental findings of the gravitational free fall on the surface of Earth and with the physical description of time by the third law of *Kepler*. Thus,

a comprehensive analysis of the pendulum effect appears to be necessary.

The Description of the Pendulum Effect

The extensive experimental studies of the pendulum effect (PE), described in Dorda G [7], discloses that this process is limited on the surface of Earth by the approximate length of 4 x 10^{-3} m. As will be shown, this limited length of the pendulum signifies to be a physically meaningful effect only, when we identify this specific length with the limiting length of Earth λ_{Earth}, given by Dorda G [5].

$$\lambda_{\text{Earth}} = (L/M)\, M_{\text{Earth}} = 4.436(09)\times 10^{-3}\,\text{m}\ . \qquad (1)$$

Here L and M are the length and the mass of *Planck*, and their relation L/M = 7.42565(74) x 10^{-28} m kg^{-1} is given, using the experimental data of the constant of gravity $G = (L/M)\, c^2$ = 6.67384(80) x 10^{-11} $m^3\, kg^{-1}\, s^{-2}$ [8]. The mass M_{Earth} is the experimentally determined value of mass of Earth M_{Earth} = 5.974 x 10^{24} kg, [8] p. 90, considered to be concentrated as a *point* in the three-dimensional space. This point-state supposes the existence of a causal connection between three basic units, i.e. between the threefold state of the category length, the square state of the category time and the category mass. Based on the experience with the third law of *Kepler* (3LK), it is given in the concentrated form by the generally valid constant of the gravitation $G = (L/M)\, c^2$. Thus, we can assume that Equation (1) signifies at the point state of Earth the existence of a causal connection between the category lengths with the category mass, considered in similarity to the connection of the category length with the category time, given at the velocity of light c. Therefore, the constant G appears to be the guarantee of the existence of a causal connection between the categories length, mass and time, at which the in this paper discussed time is always observable only as a period. Evidently, referring to the third law of *Kepler* (3LK), the square of time of Earth is causally given by the threefold state of the category length, as well as indirectly by the state of the category mass, connected with the constant of gravity G. Thus, it is ingenious to compare the experimentally determined time of the PE with the experimentally determined time of the 3LK.

The experimental studies of the PE on the surface of Earth show that the pendulum effect demonstrates the existence of the causal relation of the square time $t_{\text{PE,Earth}}{}^2$ to the length of the pendulum $l_{\text{PE,Earth}}$. Thus, we can formulate

$$t_{\text{PE Earth}}{}^2 = l_{\text{PE Earth}} / g_{\text{PE Earth}}\ , \qquad (2a)$$

i.e. at the state of the experimentally observed limit we have

$$t_{\text{PE Earth},o^2} = \lambda_{\text{Earth}} / g_{\text{PE Earth}}\ . \qquad (2b)$$

These equations show that the proportional constant of the PE $g_{\text{PE,Earth}}$ is a causal factor between the category square time and the category length on the surface of Earth.

The equation of the 3LK supposes that the cosmical body, in our case the Earth, has a spherical form, i.e. that the mass of the Earth M_{Earth} is considered to be concentrated – in similarity to Equation (1) – in a *point*. The point-state of the mass of Earth can be evaluated on the basis of the equation, which yields the average value of the radiuses of Earth, expressed by R_{Earth}. The experience shows that the best way to ascertain this average value R_{Earth} is given by means of the connection of the experimentally found value of the square equator radius with the value of the radius at the pole of the Earth, i.e. by

$$\left(R_{\text{Earth, equa}}\right)^2 \times R_{\text{Earth, pole}} = R_{\text{Earth}}{}^3 = \left(6.3710074\times 10^6\right)^3\ \text{m}^3\ , \qquad (3)$$

This relation shows that – at the given mass of the Earth M_{Earth} = 5.974 x 10^{24} kg and reflecting the three-dimensional state of the nature – the square of the equator-radius $R_{\text{Earth, equa}}{}^2$ = (6.378140 x 10^6)^2 m^2, multiplicity with the pole-radius $R_{\text{Earth, pole}}$ = 6.356766 x 10^6 m. [8], yields the average value of radius of Earth, obtaining R_{Earth} = 6.3710074 x 10^6 m. This method is effective, as it allows realizing the identity of the category time of the PE with the time, determined by means of the point-related, i.e. spherically described Earth. Thus this R_{Earth} will be named "generalized radius of Earth", being related to the value of Earth M_{Earth} = 5.974 x 10^{24} kg.

Assuming the identity of the essence of the PE time with the 3LK orbital related time, and considering the effect of the Equation (3), therefore it is physically allowed – in agreement with Equation (2) and based on the experimental experience – to assume that the square of the generalized radius of Earth $R_{\text{Earth}}{}^2$ reflects the square of the surface of Earth related orbital time. Consequently, we can formulate the far-reaching equation

$$g_{\text{PE Earth}} = \lambda_{\text{Earth}} / t_{\text{PE Earth, o}}{}^2 = R_{\text{Earth}} / t_{G,\text{3LK}}{}^2 = \left(GM_{\text{Earth}}\right) / R_{\text{Earth}}{}^2\ , \qquad (4)$$

Where the specific part of the 3LK is distinguished from the PE by the index $_{\text{G,3LK}}$. It should be mentioned the at this equation (4) used mass M_{Earth} signifies the point related mass.

Based on the mass M_{Earth} and on the generalized radius R_{Earth} of Earth, the value of the difference between the time

of the third law of *Kepler* (3LK) and the time of the PE becomes obvious, when we compare the value of the square orbital time, which is on the surface of Earth given by $t_{G,3LK}^2$ = 6.486(09) x 10^5 s^2, with the value of the square limited time of the PE, given at Equation (2b) by $t_{PE,Earth,o}^2$ = 4,516(22) x 10^{-4} s^2. The relation $t_{G,3LK}^2$ / $t_{PE,Earth.o}^2$ discloses to be at the surface of Earth a constant number $a_{G.E}$

$$t_{G,3LK}^2 / t_{PE,Earth.o}^2 = a_{G.E} = 1.4361(76)\ x\ 10^9 . \quad (5)$$

The Equation (4) also shows that the difference between the value of the generalized radius of Earth R_{Earth} and the value of the PE related limiting value of the length of Earth λ_{Earth} must be given by the same number $a_{G.E}$, i.e.

$$R_{Earth} / \lambda_{Earth} = a_{G.E} = 1.4361(76)\ x\ 10^9 . \quad (6)$$

This number $a_{G.E}$ was originally derived from the Earth related 3LK, shown at Dorda G [7], pp. 13-14, Equations (4)-(8), and termed "gravitational number". It has been shown at Dorda G [5] that this number is related to the square velocity at the surface of Earth v_{Earth}^2, given by

$$a_{G.E} = c^2 / v_{Earth}^2 . \quad (7a)$$

This equation reveals that the square generalized radius of Earth R_{Earth}^2, given according to Equations (4) and (7a) by

$$R_{Earth}^2 = c^2\ t_{PE,Earth,o}^2 = \left(g_{PE\,Earth}\right)^{-1} GM_{Earth} , \quad (7b)$$

Is, using the Equation (3), causally related to the mass of Earth M_{Earth}. This finding allows to determine in generalized form the value $g_{PE,Earth}$ of Equation (4): Taking for M_{Earth} the value M_{Earth} = 5.974 x 10^{24} kg [8], for the constant of gravity G the experimentally found value $G = (L/M)\ c^2$ = 6.67384(80) x 10^{-11} $m^3\ kg^{-1}\ s^{-2}$ [8], and using, according to Equation (3), the value R_{Earth}^2 = 4.05897(35) x 10^{13} m, then we obtain for the proportional constant of the pendulum effect on the surface of Earth $g_{PE,Earth}$ the average value

$$g_{PE\,Earth} = 9.822(57)\,\mathrm{m\ s^{-2}} . \quad (8)$$

The Formulation of Force

The equation (8) shows that $g_{PE,Earth}$ refers to the dimensions m s^{-2}. A magnitude with equal dimensions m s^{-2} can be detected in connection with the experimental formulation of the gravitational force F_G, which on the surface of Earth is given by

$$F_{G,\,Earth,x} = G\left(M_{Earth} M_{Earth,x}\right) / R_{Earth}^2 = g_o M_{Earth,x} . \quad (9)$$

Here G is the gravitational constant, M_{Earth} the mass and R_{Earth} the generalized radius of the Earth, $M_{Earth,x}$ the so-called test mass at the gravitational interaction of the force on the surface of Earth, for which is valid $M_{Earth} >> M_{Earth,x}$, and g_o the gravitational acceleration. The Equation (9) demonstrates that g_o is described by an identic form as the $g_{PE,Earth}$, shown by Equation (4), i.e. by the causally connected magnitudes M_{Earth}, R_{Earth}^2 and G. Consequently, g_o reveals to be an identical magnitude as the $g_{PE,Earth}$, i.e. we have for g_o the value g_o = 9.822(57) m s^{-2}. Thus, we can emphasize that the Equation (9) shows, impressively, the possibility to demonstrate the identity of the gravitational acceleration g_o with the proportional constant $g_{PE,Earth}$ of the pendulum effect, supposing that the both interacting masses M_{Earth} and $M_{Earth,x}$ are considered – in similarity to the Equations (1) and (4) – to be concentrated as points at the three-dimensional space.

The Solution of the Three-Body-Problem (3BP) and the Basis of the Category Time

The analyses of the PE, realized together with the 3LK, have shown that the category square time is at the Earth causally connected with the constant of gravitation G. Moreover, it has been also observed by experiment on the surface of Earth that the expression of the square of the period of time $t_{G,3LK}^2$ is causally related to the square equator radius $R_{Earth,\,equa}^2$, i.e. in average form expressed to the R_{Earth}^2. These both fundamental observations lead to the far-reaching equation, which shows at the constant of gravity G the existence of a structure of being, given by only two states

$$G = c^2 (L/M) = R_{Earth}^3 / \left(t_{G,3LK}^2 M_{Earth}\right) = \left(R_{Earth}^2 / t_{G,3LK}^2\right)\left(R_{Earth} / M_{Earth}\right) \quad (10)$$

This equation shows that beside the experimentally observed square related state of the radius R_{Earth}^2 to the square time $t_{G,3LK}^2$, which is e.g. given by the third law of *Kepler*, it appears necessary with respect to the expression of the constant of gravitation G to assume that the radius $R_{Earth,\,pole}$ of Earth must be causally related to the mass M_{Earth}. Evidently, formulating G by both the relation $R_{Earth}^2/t_{G,3LK}^2$ and the relation R_{Earth}/M_{Earth}, it becomes in this case possible to describe the point-related state of Earth by these two basic states. Thus, it should be emphasized that, according to the general validity of Equation (10), the structures of the cosmos appears to be based solely on *two fundamental states*, expressed by

1) the relation $R_{Earth}^2/t_{G,3LK}^2$, which represents the existence of the wavy, i.e. the non-observable "2D-state", the *dynamics*; moreover, the existence of this 2D-state becomes observable, i.e. localized, by the existence of the three-dimensional space, i.e. by masses, which allows to realize light, electromagnetism, frequency and also time;
2) the relation R_{Earth}/M_{Earth}, which represents the "1D-state",

i.e. showing the existence of *statics*, observable as masses, or as gravitational interaction (space).

The in the foregoing chapter considered effect of the gravitational force supports experimentally this specific model of *two* fundamentally different states at the nature, as this force occurs always without any effect of time. i.e. without any dynamics, showing only gravitational interaction of masses, i.e. of the M_{Earth} with the $M_{\text{Earth},x}$. Furthermore, also the solution of the up to now not understood three-body-problem of physics (3BP) becomes evident, when we consider that this 3BP effect shows to be a gravitational, i.e. static interaction, demonstrating to be a clear 1D-effect, given without any additive effect of dynamics. This finding appears to be the main physical indication of the existence of the dual state of the being.

Moreover, it should be pointed out that the required, experimentally confirmed identity of time of the pendulum effect (PE) with time of the third law of *Kepler* (3LK) is given only in the case, when the value of the indirect square of the frequency of the 3LK, i.e. $f_{G,3\text{LK}}^{-2}$ [Hz^{-2}] – which in fact refers to the *infinity* of being – , is identical with the square of the time $t_{G,3\text{LK}}^{\ 2}$ [s^2], i.e. of the *finiteness*, as both magnitudes refer to the relation [Hz] = [s^{-1}]. It is evident that this interesting possibility to identify $f_{G,3\text{LK}}^{\ -2}$ with $t_{G,3\text{LK}}^{\ 2}$ is given *only* on the basis of the proposed model of the dual system of the being, which refers the essence of time to be the state of dynamics. Seen in this connection it should be emphasized that a dynamic related process becomes observable in form of finiteness by localization. Thus – as will be manifested in the next chapter – this specific process of localization of a given matter is possible only by means of the human seeing and hearing.

The Background of the Connection of Physics with Biophysics

Novel, very important observations are obtained, when we compare the results of the analysis of the PE- and 3LK-effects, i.e. the dual-state model of the physics, with the results of the physical description of the process of the human seeing and hearing. In this case are explored wave related, biological effects. When we apply on the processes of seeing and hearing the Differentiated Structure of Space (DSS), i.e. the model of the 2D- and 1D-states, then we know quite novel facts, described at Dorda G [5,6].

In the case of the investigation of seeing [5], it was analyzed the process of the observation of the *Hubble* galaxies (HE), as it is an optical observation, based on seeing. Studying this effect, it has been shown that the redshift of the galaxies cannot be the result of the classic Doppler Effect model, valued as a difference of wavelengths, but as direct information about the state of the given galaxy. This means, the redshift has to be considered a light wave radiation, reflecting the heat radiation law, i.e. the Wien's displacement law. Thus, this description is a clear electron state related description, reflecting the model of the 2D- and 1D-states of the QHE. This model has been comprehensively analysed and the conclusions have been verified by the agreement of the calculation with the experimentally determined values, e.g. at the case of the background radiation, or of the radius and of the mass of the Milky Way [5].

Moreover, as shown in Dorda G [5], the connection between the DSS model and the seeing has been further strengthened by the finding of the structure of the eye. As disclosed in *The Feynman Lectures on Physics* [9], human vision is the result of the processing of two signals, independently given on the one side by the rod cells, and on the other side by the uvula cells. In this textbook it is shown that the rod cells yield signals at the twilight, i.e. signals without any electromagnetic light absorption, whereas the uvulas show signals solely by electromagnetic effects, i.e. by colored light. This biological differentiation reflects in an absolute manner the physical model of spatial differentiation between gravitation and electromagnetism, called Differentiated Structure of Space (DSS), which shows that the rod signals represent the 1D-related gravitational interaction, whereas the signals of the uvula cells reflect the absorption of the electromagnetic light, i.e. the 2D-related signals. Thus, we can state that the physical description of the process of seeing [5], which is based on the existence of both the rods and the uvulas, refers to the physical dualistic model, described in the foregoing chapters. This important finding can be, furthermore, substantiated by the physical description of the process of hearing, comprehensively analysed in Dorda G [6].

It has been shown in *Fletcher H* and *Munson WA* [10] that the experimental data of sound, obtained by the extensive investigation of *Fletcher H* and *Munson WA*, can be, similarly to the process of seeing, physically described on the basis of the differentiated structure of the three-dimensional space (DSS). As is demonstrated by *Fletcher H* and *Munson WA* [10], the analysis of the loudness of sound can be performed independently of the sound pressure as well as its intensity. Furthermore, *Fletcher H and Munson WA* [10] presented findings showing that the observed dependences of sound on the frequency f_x differ considerably when we compare the sound curves at frequencies $f_x < f_o$ with the curves at frequencies $f_o < f_x$, where f_o is an experimentally observed limiting frequency of about f_o = 800 Hz. The analysis of this differentiation has been published in Dorda G [6], where it is shown that the experimental data of the curves of the sound

loudness obtained by the pressure investigation, are *identical* with the data of the curves of the sound loudness, obtained by the investigation of the intensity. This experimental result discloses that the relation between the *square* value of the sound *intensity*, shown with respect to the *linear* data of the sound *pressure*, is always *constant*. This finding is highly important, as it represents the dual state effect of being. Furthermore, it is very revealing that the curves of sound at the frequencies $f_o < f_x$ could be, as shown in Dorda G [6], described by quantum effects of the kind of QHE, a quite novel observation, which refers, in similarity to the QHE, to the effect of the dual state model. Thus, it is evident that both these results of the investigation of sound additionally confirm the observation of the process of seeing, manifesting the existence of a causal connection of these specific biological processes with the specific physical process of the 1D- and 2D-states, i.e. the process of the two states in the nature, clearly differentiated in *statics* and *dynamics*.

The finding of the causal connection of the physical model, related to the state of the mass and radius of the Earth, with the biological process of seeing and hearing, which also refer to the boundary condition of the Earth, suggest the daring idea that the origin of all physical observation can be the thinking process of the human seeing and hearing. This model appears to be in this respect possible, as especially the hearing is the main important process to realize communication between the human, which e.g. allows developing the technique and the science. This assumption is supported by the idea that especially the human is attempted to find some causal order at the given dynamic states. Really, to find causalities at the 2D-state related signals of hearing and seeing would explain, why – starting from the basis, the dual system "statics–dynamics" of the whole being – we have additionally the system of the basic units meter, kilogram, second and ampere, as this system allows to observe causal connections in between the given findings of the dynamic state.

Conclusion

It has been shown that

1) the identity of the time, determined by the pendulum effect (PE) and by the third law of Kepler (3LK), is only given, when the frequency f in [Hz] is formulated in indirect proportionality to time [s], i.e. [Hz] = [s^{-1}]. Really, this [Hz] = [s^{-1}] manifests the identity of infinity with the finiteness, which is possible only on the basis of the dual state of the being, i.e. on the basis of the independent existence of statics and dynamics.
2) The three-body-problem (3BP) can be solved only, when we assume the existence of the dual state of being. This observation is valid also for the gravitational force.
3) The process of the human seeing and hearing has to be described on the basis of physical findings about the independent existence of the static, i.e. gravitational state, and the electromagnetic, i.e. dynamic state of all being.

Especially the physical description of the human seeing and hearing on the basis of the existence of the dual state of the nature is most important, as it discloses the existence of the causal connection between physics and biology, and what is more, it approves also the daring idea, that the human and his thinking, especially his process of seeing and hearing [5,6], could be the origin of the basic units in form of meter, kilogram, second and ampere.

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