



SOFIA TECHNICAL UNIVERSITY

PROF. PETAR RASHKOV PENCHEV, DOCTOR OF TECHNICAL SCIENCES  
DOCTOR HONORIS CAUSA OF SOFIA TECHNICAL UNIVERSITY

FROM A UNITARY ELECTROMAGNETIC MATTER  
TO A UNITARY SCIENCE OF NATURE

THERE IS NO NATURAL PHENOMENON WHICH IS NOT  
A RESULT FROM MOTION OF ELECTROMAGNETIC MATTER

# THE CRASH OF QUANTUM MECHANICS

*“A crucial prerequisite for the power of knowledge is not the belief in a reputedly infallible authority, but the irresistible power of experimental facts which irrefutably reveal the most reliable authority, Nature itself.”*

*(Life’s wisdom)*

*„Our ideas of reality cannot be final, so we should always be ready to change our point of view, i.e. to change the axiomatic basis of physics so as to substantiate the new experimental data observed by us into a logically most perfect way.“*

A. Einstein, 1931

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## **The crash of quantum mechanics.**

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3A, Ivan Borimechkata St, Sofia

E-mail: [economist@abv.bg](mailto:economist@abv.bg)

Author and producer: Prof. P. R. Penchev, Dr Tech Scs

Addresses for contact with the author, Prof. P.R. Penchev

Sofia Technical University

Electrotechnical Department

8, Kl. Ohridski Blvd

Sofia, 1756

e-mail: [iliana@tu-sofia.bg](mailto:iliana@tu-sofia.bg)

[yatchev@tu-sofia.bg](mailto:yatchev@tu-sofia.bg)

Mladost 1,

bl. 90, entr. 9

Sofia 1797

Home phone: +359 2 870 68 05

+359 885 13 83 09

e-mail: [iliana@tu-sofia.bg](mailto:iliana@tu-sofia.bg)

e-mail: [iliana@tu-sofia.bg](mailto:iliana@tu-sofia.bg)

[yatchev@tu-sofia.bg](mailto:yatchev@tu-sofia.bg)

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# THE CRASH OF QUANTUM MECHANICS

## APOSTROPHE

In a statement of 1900, Max Planck inconsistently professed that it was very difficult for him to accept that energy is radiated in portions (quanta), as in classical physics it was assumed that the energy radiation was a continuous process. This thesis was accepted as fundamental in the section of quantum mechanics and it was therefore called quantum mechanics. However, under these conditions, there are no logical grounds to create a new science, called quantum mechanics.

But essentially the concept of quantum means (has the sense of) a limited amount of something material as a quantity: a portion of energy, a quantity of mass, or a portion of mass. And in physics, all formulas are derived only for quantized quantities (quantities which are limited in value). *None of unlimited (non-quantized) quantities have ever been used. I.e. the whole classical physics is quantized – it is quantum physics.*

*This circumstance in principle questions the very concept of quantum mechanics, since all physics is quantum physics.*

For example: a) it is known that as far back as in "Opticks ..." [9] of 1704, I. Newton wrote that light consisted of small bodies, i.e. of discrete (quantum) particle and so it is now commonly agreed that he found light to be corpuscles, while Fresnel argued that light was a wave process, and b) P. Ehrenfest in 1914, according to [1] (Chapter V, § 2) proved that the amount (quantum) of wave energy  $W$ , with frequency  $\nu$ , emitted for time interval  $\Delta t = \text{const.}$  equals the product of a constant  $H$ , with dimension [J.s] multiplied by frequency  $\nu$ , i.e.

$$\text{a) } W = H \cdot \nu; \text{ b) } H = \text{const.} \rightarrow [\text{J.s}]; \quad (\text{A})$$

I.e. the formula of the photon energy is not unique, but has a classical form

$$\text{a) } W_f = h \cdot \nu; \text{ b) } h - \text{Planck constant} \rightarrow [\text{J.s}]; \quad (\text{B})$$

Furthermore, it is known from literature that quantum mechanics deals with particles whose sizes are of the order of the size of atom which means sizes of the order of  $10^{-8}$  m. However, the photon, which is emitted for time approximately  $\tau = 10^{-8}$  s at velocity  $c = 3 \cdot 10^8$  m.s $^{-1}$ , has length  $\ell_f = \tau \cdot c = 10^{-8} \cdot 3 \cdot 10^8 = 3$  m, which is much larger,  $\approx 10^8$  times that of the atom size of  $10^{-8}$  m.

N. Bohr's model of the atom is based only on classical physics. In his lecture in 1923, when Nobel Prize was awarded to him, N. Bohr in [3] described the emission of photons as a classical process. Nothing is given in quantum mechanics about gravitational phenomena, either, much as it claims to be the most general science of natural phenomena, while unable to explain even why bodies fall on earth. **For about 80 years has quantum mechanics existed and still has it not solved any specific numerical example of the Schrödinger equation, for whichever particular case with valid experimental confirmation, i.e. the claims of quantum mechanics are groundless in their essence – they are chimeras.**

The above data seem to create the impression that in quantum mechanics there are things that are not quite in synchrony with physical reality, i.e. that it does not seem to give a reliable picture of physical phenomena.

As for the thesis about de Broglie wave, in [6], Chapter V, § 35 we read: "*De Broglie waves move along with the classical particle. De Broglie waves and the particle – this is one and the same object. There is nothing else.*" **I.e. de Broglie waves are inseparable from the body.** Under these conditions, there should be relevant methods to measure the frequency, wave length and energy of these inseparable from the body waves, which methods should enable experimental measurement. **Such methods, however, do not exist.** Davisson-Germer method also has nothing to do with any inseparable from the body (electron) waves, but is for emitted waves. **Therefore, no viable experimental proof of de Broglie waves exists.** Moreover, their energy is insignificant relative to the energy of the body (electrons). **The law of energy conservation rejects these waves. These are the arguments as a specific example in support of the thesis that de Broglie waves should be dropped out from physics.**

Unreal is also the idea of Heisenberg inequality, which has no experimental validation in a numerical example: calculated and experimentally confirmed.

These flaws or inconsistencies, which have been examined in detail in this book, are the reason to claim that quantum mechanics does not really exist, i.e. a crash of quantum mechanics has occurred.

# PART ONE. PREREQUISITE

## 1. INTRODUCTORY THOUGHTS

### 1.1. General formulations

*This rule holds true in science:* "THE INITIAL PRINCIPLE OF KNOWLEDGE ABOUT NATURE AND THE CRITERION OF ITS AUTHENTICITY IS THE EXPERIMENT – THE PRACTICE". This is consistent with the definition of Leonardo da Vinci (1452 - 1519): "Science is a product of experience."

*This MOTTO is placed to the whole book – the famous life's wisdom:* "BEFORE FACTS EVEN GODS KEEP SILENT".

Paraphrased for scientific research, this sentence of wisdom will state: "BEFORE THE IRRESISTIBLE POWER OF EXPERIMENTAL FACTS (LOGIC) EVEN "THE MOST INGENIOUS THEORIES" MAY GIVE WAY, MAY DROP OUT".

The truths about the manifestations of reality, confirmed by experimental facts are always decisive for the mental models created by human mind!

*Science has the ultimate and primary goal to unite facts in a hierarchical causal and genetically uniform system of independent logical elements, a system of diverse forms of manifestation of a substantial nature (essence), known as a unitary material continuum of fragments of natural resources - the World.* And there is no place in it for matter without a material or field form, as it is the one and only carrier and generator of its own manifestations – in accordance with Spinoza's idea of "Causa Sui" (matter is the cause of its own manifestations). These manifestations, generated by reason of matter itself (without any eternal interference), are the subject of scientific study to obtain experimental evidence, **which after interpretation becomes scientific evidence, which is the initial resource (basis) and logical foundation of science.**

*In this sense each item of scientific knowledge is based on empirical experiment, because the mental process, through which knowledge is formed (created) is always based on the resource of reflections (imprints) of the natural entity in human mind.* Therefore, the meaning of the theoretical foundations or the logical bases of physics (of knowledge about physics), which are publicized as its theoretical or empirical foundations in essence, always have (directly or indirectly) its root in the experimental regularities of Nature. In this aspect (sense) new ideas, which arise in human mind (even when considered to be purely intuitive) are based on the resource of reflected facts from the natural entity in the human mind. Out of this resource, through the process of scientific reasoning, is deduced (formed) the physical truth as laws, principles, statements and so forth about the natural entity.

The physical science is not *a priori*, but is an empirical science, and the validation of the authenticity of its claims as truths **becomes only by means of appropriate validating experimental facts.** In this sense, since *the experimental fact (the empirical regularity) with irresistible evidential power is also its supportive point for evidence and inferences of physical truths, as laws, principles and postulates.*

*Because of this, it is agreed that the experiment (the empirical regularity) has a STATUTE OF LOGICAL NECESSITY.* Id est, the material experiment is an expression of the meaning of logic or it is **THE LOGICAL FOUNDATION OF THE CLAIM** (law, principle and so on).

*At the same time, it is the initial moment of generating and solving new scientific problems, because the genetic scheme of the fact is:*

#### **OBSERVATION-MEASUREMENT-INTERPRETATION-FACT (1-1).**

Since, essentially, scientific facts are reflection of natural entities and carriers of empirical knowledge about relevant realities, they are described verbally and through mathematics. Here a question arises about the relationship between scientific reasoning via abstracted (idealized) notions (models) and the common sense. This relation is accepted to be truthful only then, when the scientific claim, as a result of the scientific reasoning under respective causal correlations has experimental confirmation in Nature, *because the experimental fact as an empirical regularity is also a logical necessity.* In this sense, scientific facts (as experimental manifestations) are also models (initial principles) of gnoseological analyses of the processes associated with the laws of natural entities (realities), since they adequately reflect their nature as part of the whole - the world, and, explicitly or not, they always bear the characteristics of the whole.

*In the presented above meaning, here follows the conclusion that: every scientific truth in its root must have a determined, direct or indirect, empirical basis, because "EXPERIMENT HAS IRRESISTIBLE EVIDENTIAL POWER".*

## **1.2. Initial resource of knowledge**

There is nothing else in human mind (brain) but what *has been perceived through human senses in the form of REFLECTIONS of natural entities in the brain. FOR THIS REASON, REFLECTIONS ARE THE SOLE AND ONLY INITIAL RESOURCE (RAW MATERIAL) OUT OF WHICH IS FORMED, through mental processes of reasoning (mental models and experiments), ALL THE KNOWLEDGE OR ALL THE TRUTH ABOUT THE WORLD.*

This conclusion is grounded on the the axiomatic truth that experimental facts, as natural entity, which are reflected in human brain, are empirical regularities – logical necessity, on the one hand, and on the other, they are the logical foundation of knowledge of natural entities. In this aspect and in essence they are the primary real source (direct or indirect) of knowledge, as a result of the principle of observability, and at the same time they are also a criterion of adequacy (veracity) to the reality.

*In this sense knowledge and logic are products of experiment, i.e. they have one and the same experimental origin.* And through them are also defined the essence and origin of such concepts as theoretical knowledge and theoretical basis of knowledge, **which always have experimental origin in their roots.**

This truth laconically and clearly is expressed by the text:

"The contents and the form of scientific reasoning is ultimately and entirely conditioned by the material world and by the laws of formal logic themselves. *That is why they are instilled into our mind with such irresistible power, since they represent the material experiment"*

*The experiment is that Archimedes supporting point, through which it is possible to shake or throw down one or another „unshakable“ theories. And life experiment states: „there is no final truths, because science is developing, and experiment has irresistible power".*

## **2. ON THE NOTIONS OF MATTER AND MASS**

### **2.1. General formulations**

Matter is the subject of the science of physics, which studies only its physical manifestations (properties, processes, phenomena and regularities). However, matter is not a compact object (fragment) in the form of a metaphysical body, but a tandem (unity-complex) of its diverse manifestations in time and space. IN SCIENCE THE TANDEM OF MATTER REPRESENTS A MENTAL IDEALIZED (ABSTRACTED) OBJECT, EXPRESSED THROUGH THE ABSTRACTED NOTION OF MASS, WHOSE CONTENTS IS IN CONFORMITY WITH THE PURPOSES OF STUDY. MATTER IS ALWAYS THE INITIAL AND PRIMARY (FOUNDATIONAL) SUPPORTIVE-LOGICAL POINT IN THE CONCEPTUAL INTERPRETATION OF PHYSICAL REALITY. *Mass is quantity of matter without any volume or structure and is represented only as a dimensionless point, WITH ALL THE DIVERSE MANIFESTATIONS OF ITS RELEVANT QUANTITY OF MATTER.*

*In each historical epoch of the development of science, the notion of matter accumulates knowledge from the general level of permeation of human mind into the essence of reality.*

At the very beginning of generation of human scientific process, *the notion of matter (under various names) became a logical tool for reflection of the universal unity of the picture of the World. In this form and meaning, the notion of matter is the only primary and initial (starting) basis (idea) for the formation (creation) of scientific view over the natural entity – the World.*

The science of physics studies the empirical manifestations of matter, which is the primary initial resource and supporting point of all scientific facts, because it is carrier and generator of all natural manifestations (as natural entity, physical reality, phenomena) in the World. Nonetheless, the notion of **matter** is not used in physics; instead, the notion of **mass** is used.

In this sense *the notion of quantity of matter  $Q$ – $m$ , according to Galileo-Newton had as its abstraction (as synonym) or idealization the notion of mass  $m$ .* Newton in [8] (p. 23) wrote: "It is this quantity [of matter] that I mean hereafter everywhere under the name of body or mass." and more: "the same [the mass] is known by the weight of each body; for it is proportional to the weight". This is how **Newton emphasized that the quantity of matter  $Q$  and the quantity of mass  $m$  are gravimetrically defined by the same way and that both quantities are identical in value. Mass is an abstraction (idealization), not a property of the quantity of matter. For the specific purposes of the abstraction, for**

*description of dynamic phenomena (properties and processes) of matter, the mass is devoid of all properties of the quantity of matter. The notion of mass is used as an incomplete substitute for the notion of quantity of matter, wherever it is possible and necessary, depending on the purpose of abstraction. The mass  $m$  as an abstraction of quantity of matter must have the significant for dynamics properties (manifestations). Such properties, necessary in dynamics, are inertness and gravitation, but its property of volume is not necessary, therefore **the quantity of matter is abstracted as mass into a dimensionless point and without structure**, that is why in mathematical models the mass is considered only in a dimensionless point, but with all the properties of the quantity of matter, except for the volume and its structure, and it is placed in the centre of gravity of the material object.*

Under these conditions of abstraction of the quantity of matter, *placed in the centre of gravity of the objects* in the form of mass – pointlike notion without a volume or structure, without an error and to a great extent is simplified the mathematical description of the models of material objects and of their relevant material manifestations (phenomena). With this, since the mass has no structure, are obtained more convenient (simplified) mathematical procedures.

**The quantity of matter  $Q$  and the quantity of mass  $m$  are measured by the same method and have identical gravimetric values. In terms of their quantities, this law holds true:**

$$Q = m. \quad (2-1)$$

**That is why when using the notion of mass, it is essentially the quantity of matter without a volume or structure. Id est, in physics the notion of matter should be used in explicit form, and for certain purposes – in implicit form, through the notion of mass, while observing (2-1).**

***Matter is not passive, but active, since it carries in itself the active principle called cause of its own existence and evolution, i.e. it is the active principle and generator of its manifestations.***

Matter cannot be created out of nothing and is indestructible. This is the principle of conservation of matter and energy (abbreviated as PCE). For its activeness (generation) in each manifestation (process) *holds true the scheme cause – result (generator – manifestation), whence follow the inferences (interpretations):*

*First.* Matter is the generator of all material manifestations, i.e. also of the empirical regularities (experimental facts).

*Second.* Because the resource of experimental facts forms the initial basis of the logical foundation of knowledge, *it follows that matter (through its manifestations) also carries in itself the resource of the logical foundation – the theoretical basis – the deductive principle of physics.*

Or matter itself generates its diverse manifestations according to the scheme: *the manifestation is a unity of cause and result. This is the logical motivation or it forms the principle of causality, which is also the basis of the principle of common sense or logical necessity.*

By taking into account PCE, there follows the conclusion that **the principle of causality, respectively common sense, is its result.**

*And so, the process cause - result is characterized by the fact that a certain amount of the tandem (complex) matter - energy, as a starting, initial resource, under relevant conditions, generates other material objects (or manifestations) with new characteristic genetically homogenous force connections, respectively with new characteristic features of their manifestations. In this aspect, the process of conversion (cause - result) from one into another natural entity results into alteration of the forms of the manifestations and the quantities of fragments from the previous resource of the tandem in other resources as per their kinds and forms and quantities, while observing the laws of conservation and so retaining their nature (their genetic unity), whereby during the conversion no new resource (matter) is brought in of any other nature (essence). Id est, the process of conversion develops in the aspect of Spinoza's thesis "Causa Sui".*

### **2.1.1 Inferences**

**1. Each form (field and substantial) of matter has its abstraction of mass, regardless of its state of rest or motion.**

**2. An expression of the correlational link between the concepts of matter and mass is: mass is matter without volume and structure.**

**3. Mass is not a property of matter, but its abstract notion (idealization).**

### 2.1.2. Conclusion

1. *Matter itself is the cause of its manifestations – Causa Sui.*

2. *The principle (law) of conservation – PC of the tandem (complex) matter-energy (PCE) is an axiomatic truth, which confirms the truth that there naturally exists a unity of the tandem matter-energy of the natural entity, the physical reality (reality) - the World.*

3. *M. Planck was right when he stated that every natural process is in essence a conversion of the tandem matter-energy from one kind (form) into another, i.e. that the processes are expression of the regularity cause-result (of common sense).*

## 3. ON LAPLACE'S DETERMINISM AND THE DEDUCTIVE PRINCIPLE – THE PRINCIPAL

### 3.1. Motivations and essence of Laplace's determinism

As a result of the principles that:

a) matter is the carrier and generator of all natural entities – NE (phenomena, processes, properties, objects and so on), i.e. there are no immaterial NE;

b) matter is eternal, i.e. it cannot be created out of nothing, nor be converted into nothing, and the law of conservation of matter (the mass) and the energy, LMEC, holds true for matter;

c) matter is homogenous in essence, because if it was not homogenous, LMEC could not exist, since it would not be known to which kind of matter LMEC refers, in case there were more than one kind of matter and energy.

These principles mean that each NE is preceded by another NE, out of which is obtained as a result a new NE. i.e. each reality is preceded by other realities or that as a result of the interaction, from one kind of NEs are generated other kinds of NEs.

For example:

a) from the interaction between non-accelerated electron  $e_0^-$  and proton  $e_0^+$  are generated photons  $\gamma$

$$e_0^- + e_0^+ \rightarrow \gamma_1 + \gamma_2; \quad (3-1)$$

b) between the accelerated  $e^-$  and  $e^+$  are generated protons (proton  $p$  and antiproton  $\bar{p}$ ) or neutrons (neutron  $n$  and antineutron  $\bar{n}$ )

$$a) e^- + e^+ \rightarrow e_0^- + e_0^+ + (p + \bar{p}); \quad b) e^- + e^+ \rightarrow e_0^- + e_0^+ + (n + \bar{n}); \quad (3-2)$$

*Or in all conversions of matter from one structure (state) into another structure (state) none of quantity of matter is destroyed and none is created, but restructuring takes place while observing LMEC.*

**i.e. Laplace's understanding of determinism is that the initial state of the objects (NE) and the respective external and internal conditions are seen as the cause of their next new state. i.e. the external and internal conditions are seen as causes of alteration from one deterministic state of objects into a new deterministic state.**

*Or in the interpretatio, it is necessary that each natural phenomenon should have a determined result from the preceding state under relevant conditions.* In this aspect, since LMEC holds true, non-deterministic (random or probabilistic) natural entities (phenomena) do not exist, if the interpreted models of interacting objects are fully and adequately determined, in conformity with the actual reality, as far as the new state of NE (phenomenon) can be exactly studied. Or in other words, all their necessary for the interpretation properties (signs, parameters) are known. Or **the principle is motivated that no phenomenon can occur without appropriate cause, i.e. without it being preceded by other real determined phenomena, which are its determining reason.**

Since the laws of various phenomena are interlinked with each other, **but are not reducible to each other, while Laplace absolutizes that all phenomena are mechanical processes.** This fact was the error of Laplace, which resulted in rejection of Laplace's determinism, since in those times it was accepted that processes are of different matters, that is why his thesis was rejected. **But regardless of this error, the motivations of Laplace's determinism in the presented above aspect, still hold true, and therefore his thesis is relevant even today. Along with the extension of the knowledge of NEs, the application of Laplace's determinism also extends.**

### 3.2. Laplace's determinism motivates the essence of causality

The basic meaning of the principle of causality is that each NE (phenomenon) is conditioned by another NE (phenomenon) under relevant conditions. i.e. matter itself is the cause (generator, source) of its manifestations. or the cause is an expression of the internal activeness of matter and that it does not need anything external to manifest its own essence under relevant conditions.

*This means that if we discuss the cause, there must be motion of matter and interaction (exchange of matters between objects), and thence alteration in the structure of the objects, which interact. I.e. EACH NATURAL PHENOMENON (OBJECT) IS CONDITIONED BY ANOTHER NATURAL PHENOMENON, BY MEANS OF THE MOTION OF THE OBJECTS OR OF PARTS OF THEIR MATTER, ONE TOWARDS ANOTHER, I.E. IT IS NECESSARY THAT THERE IS A MECHANICAL PROCESS, WHICH IN A MOST GENERAL SENSE MEANS MOTION OF HOMOGENOUS MATTER.*

*In this aspect in the basis of the cause is motion of part of matter (or the whole matter) relative another part, i.e. without motion there is no cause, and since matter itself is the cause of its manifestations, it follows that motion is inherent to matter, or it is selfmotion of matter, or an expression of its internal activeness through external manifestations.*

Therefore, it is impossible for the states of NEs (objects, phenomena and so on) to undergo alteration without a relevant material impact – there are no causeless alterations of the states of NEs.

### 3.3. Deductive principle – the theoretical foundations of physical phenomena

#### 3.3.1. Matter is only of electromagnetic nature – electromagnetic matter in field and substantial forms

Essentially, science studies the manifestations of matter, and in particular, it studies the various states of the structures and movements of matter since they are manifestations of matter occurring as natural phenomena. *And matter is something, out of which is formed the system of natural entities, objects (bodies, phenomena, processes, etc), whose manifestations are studied by science and then scientific facts are defined through respective notions, called properties and regularities (laws or principles).*

*Proceeding from the described by I. Newton in [9] „Opticks...“ of 1704, which was set fourth in the queries from 1 to 31, as consequences, in a synthesized form, are described the following experimental facts:*

*“Are not the Rays of Light very small Bodies emitted from shining Substances”  
“The changing of Bodies into Light, and Light into Bodies ....”  
“... is very conformable to the Course of Nature, ...”  
“ [...] it is manifest that Light consists of Parts. Light [...] spends about seven or eight minutes [...] from the Sun to the Earth.”* }  $K$

In modern terminology, these Newtonian laws of the system  $K$  would state:

*“All substantial forms of electromagnetic matter emit and absorb field forms (electromagnetic waves – photons) of electromagnetic matter.”  
“Substantial forms of electromagnetic matter convert into field forms of electromagnetic matter, and its field forms (electromagnetic waves – photons) convert into substantial forms of electromagnetic matter.”  
“These are normal natural phenomena (processes).”  
“Light is a flow of elementary particles, photons, which move incessantly at the velocity of light  $c$ .”* }  $K'$

THESE EXPERIMENTAL FACTS, DESCRIBED BY NEWTON, ARE EXPERIMENTAL EVIDENCE THAT MATTER IN NATURE IS ONLY ELECTROMAGNETIC IN A FIELD AND SUBSTANTIAL FORMS.

*This evidence of Newton's was confirmed in 1860 by Kirchhoff, who, without quoting Newton, postulated his experimental law of Kirchhoff, which states:*

*“All bodies emit and absorb radiant energy (electromagnetic waves, P.P.'s note), whereby the ratio of the emitted to the absorbed energy depends on the frequency and temperature of the bodies, but it does not depend on the kind of the bodies.”*

I.e. the experimental facts, described by Newton and Kirchhoff prove in a most irrefutable way, *for experiment has irresistible evidential force, and experimental (empirical) laws are logical laws, that*

matter (mass) of all natural entities (objects, phenomena and processes) is only of electromagnetic essence – it is electromagnetic matter (mass  $m$ ), which constantly changes both in quantitative respect, i.e.  $m \neq \text{const.}$ , and in respect of its structural states from substantial into field form and vice versa.

In this case we assume that matter is a structure of a homogeneous initial (primary) resource whose nature (properties) is unknown. The nature of the resource is unknown, it is not experimentally established, because it can not be established experimentally, because it cannot be manifested as an independent reality without assuming some kind of spatial structure, which is in some kind of a natural phenomenon of matter. And the matter with the smallest amounts of initial resource is called an elementary particle, elementary particles, respectively. Elementary particles in physics, according to the proposal of W. Heisenberg, are accepted to be a) of homogenous nature; b) in the form of substantial and field states and c) can convert from substantial into field forms and vice versa.

Since matter and energy are inseparable from each other, it follows that energies are only of electromagnetic nature, i.e. there is only electromagnetic matter and electromagnetic energy in various structural states.

This fact can be proved by using Newton's approach, as follows:

Matter (mass)  $m$  of electromagnetic waves, which move at the velocity of light  $c$  have momentum  $\vec{P}_c$ , mass  $m$  and velocity  $c$ , i.e.

$$\text{a) } \vec{P}_c = m\vec{c}; \text{ b) } m \neq \text{const.}; \text{ c) } c = \text{const.}; \text{ d) } \frac{dc}{dt} = 0; \quad (3-1)$$

When the electromagnetic matter (mass)  $m$  of electromagnetic waves moves at velocity  $c$  and with momentum  $\vec{P}_c$  (3-1 a), to the derivative of the momentum corresponds electromagnetic force

$$\text{a) } \vec{F} = \frac{d\vec{P}}{dt} = \frac{dm}{dt} \cdot \vec{c} + \frac{d\vec{c}}{dt} \cdot m = \frac{dm}{dt} \cdot \vec{c} + 0 = \frac{dm}{dt} \cdot \vec{c}; \text{ b) } F \rightarrow [N] = [J \cdot m^{-1}] = \frac{\text{energy}}{\text{distance}} = \frac{W}{r}; \quad (3-2)$$

Energy  $dW$ , which electromagnetic force  $F$  imparts to the object, upon which it acts along distance  $d\vec{r} = \vec{c} \cdot dt$ , i.e. for time  $dt$  is

$$\text{a) } dW = \vec{F} \cdot d\vec{r} = \frac{dm}{dt} \cdot \vec{c} \cdot \vec{c} \cdot dt = dm \cdot c^2; \text{ b) } W = \int_0^m dW = m \cdot c^2; \quad (3-3)$$

Since electromagnetic substance can convert into a field and vice versa, it follows that the law (3-4)

$$W = m \cdot c^2; \quad (3-4)$$

holds true both for the field and for the substantial form of electromagnetic matter. This results from the 1704 Newton's definition that matter is electromagnetic.

**This law (3-4) is a direct result from Newton's mechanics in "Principles..." [8] of 1687 and the experimental facts, described by him in "Opticks..." [9] of 1704., therefore, this law should be treated as classical.**

### P.S. Here it should be emphasized that

a) J. K. Maxwell in „Treatise on electricity and magnetism" of 1873 in paragraph 792 under the title "Energy and pressure of emission" wrote: "**That is why in a medium, where waves propagate, there is pressure in direction normal to the waves and numerically equal to the energy contained in a unit of volume** (density of energy, P.P.'s note)."

This law, notated via a mathematical formula, states

$$\text{a) } p = \rho \cdot c = \frac{w}{c}; \rightarrow \text{b) } \vec{P} = m \cdot \vec{c} = \frac{W}{c} \cdot \vec{c}_0; \text{ c) } W = m \cdot c^2; \text{ d) } \vec{c}_0 = \frac{\vec{c}}{|\vec{c}|}; \quad (3-5)$$

where:  $\rho$  is density of masses of electromagnetic waves;  $c$  – velocity of electromagnetic waves ( light);  $w$  – density of energy of electromagnetic waves.

After integrating (3-5)a for volume  $V$  we have (3-5)b and (3-5)c, where:  $m$  is the mass, and  $W$  the energy of electromagnetic matter of waves.

The law (3-4), respectively (3-5)c was given by Einstein in 1905, and by Maxwell 32 years before that, in 1873

b) P. N. Lebedev in a report in Strasburg on 30 July 1891 wrote that Maxwell in 1873 gave the law (3-5)c and, moreover, that:

b.1) A. Bartoli in 1885 and b.2) L. Boltzmann in 1884 gave a law analogous to the law (3-5)c

According to [11] (§ 3.3.4), since the theoretical basis of electromagnetic energies and masses are given by Maxwell's equations, without the gravitational fields, while S. Poisson described Newton's gravitation in 1813 by the following differential equations:

$$\text{a) } \text{rot} \vec{G} = 0; \quad \text{b) } \text{div} \vec{G} = -\rho_m \cdot 4 \cdot \pi \cdot \gamma; \quad (3-6)$$

where as per Newton in [9] experimentally proved that matter is electromagnetic, it follows that  $\rho_m$  is

$$\text{a) } \rho_m = \frac{dm}{dV} = \frac{\epsilon_0 \cdot E^2}{2 \cdot c^2} = \frac{\mu_0 \cdot H^2}{2 \cdot c^2} = \frac{d(Q_T)}{dV}; \quad \text{b) } \rho_E = \frac{\epsilon_0 \cdot E^2}{2 \cdot c^2}; \quad \text{c) } \rho_H = \frac{\mu_0 \cdot H^2}{2 \cdot c^2}; \quad (3-7)$$

which is the density of the mass of electromagnetic matter in substantial or field form. And their respective gravitational fields generated by electromagnetic matter are

$$\text{a) } \vec{G}_{\rho_m} = -\frac{\rho_m \cdot \gamma \cdot \vec{r}_0}{r^2}; \quad (3-8)$$

It is apparent that the electric  $\vec{E}$  and magnetic  $\vec{H}$  fields (or rather the densities of their masses) generate gravitational fields, which are described by the equations of Poisson (3-6) through the densities of their masses.

**This circumstance is the reason to consider the equations of Poisson (3-6) as gravitational part of the theory of electromagnetic matter. And in this sense there follows the inference that they, being part of the theory of electromagnetic matter, should be united into one system, as a second part after the equations of Maxwell, which are the first part, which system, described with observance of the laws: a) of conservation of the electric charge, b) the three laws of Newton and c) their corollaries, form the deductive principle (the theoretical foundations of the theory of electromagnetic matter, which system because it is a leading principle, which is in the basis (root) of all theories about the manifestations of electromagnetic matter in the form of natural entities, is called here**

#### PRINCIPAL

$$\left. \begin{array}{l} \text{a) } \text{rot} \vec{E} = -\frac{\partial \vec{B}}{\partial t}; \quad \text{b) } \text{div} \vec{D} = \rho_e; \quad \text{c) } \vec{D} = \epsilon \cdot \vec{E}; \quad \text{I} \\ \text{a) } \text{rot} \vec{H} = \frac{\partial \vec{D}}{\partial t} + \vec{j}; \quad \text{b) } \text{div} \vec{B} = 0; \quad \text{c) } \vec{B} = \mu \cdot \vec{H}; \quad \text{II} \\ \text{a) } \text{rot} \vec{G} = 0; \quad \text{b) } \text{div} \vec{G} = -\rho_m \cdot 4 \cdot \pi \cdot \gamma; \quad \text{III} \end{array} \right\} \quad (3-9)$$

where these designations are new:  $\vec{D}$  and  $\vec{B}$  are electric and magnetic inductions;  $\rho_e$  - density of the electric charge;  $\vec{j}$  - density of current, if there is any;  $\rho_m$  - density of electromagnetic matter (gravitational charge), the mass.

These inferences follow from (3-9):

**1. they describe the unity of the regularities both of field and of substantial forms of electromagnetic matter;**

**2. they prove the unity and inseparability of electromagnetic and gravitational fields, i.e. their genetic unity;**

**3. they show that at  $\rho_e = 0$  the unity and inseparability of electromagnetic waves is described as well as the generated by them electric, magnetic ( $\vec{E}$  and  $\vec{H}$ ) and gravitational field ( $\vec{G}$ ) through the respective densities of their matters (masses)  $\rho_E + \rho_H = \rho_m$ .**

**4. That the gravitational field has electromagnetic nature, i.e. that it is a secondary electromagnetic field.**

## Emphasis

*Here the fact should be emphasized that the differential equations practically have unlimited number of real solutions, which depend on the unlimited number of boundary conditions, determined by the unlimited number of situations, which occur in nature. This property of differential equations enables them to describe the natural diversity, i.e. they satisfy the requirement of unlimited number of solutions for description of natural diversity.*

In **The Principal** all quantities are genetically homogenous. I.e. the Principal describes the homogeneity (the unity) of: a) the substantial and field forms of electromagnetic matter and that they can convert (restructure) from one into the other forms; b) the electromagnetic and gravitational fields, and that there is no object (phenomenon) which does not generate simultaneously both (electromagnetic and gravitational) fields and c) **this is the embryo as an initial deductive principle, which directly or indirectly is in the root of all sciences studying natural phenomena.**

## 4. RELATIONSHIPS BETWEEN MASS AND ENERGY AND VELOCITY

### 4.1. General formulations

If the well-known expression for the force  $\vec{F}$ , which according to Newton is equal to the derivative of momentum  $\vec{P}$  relative to time  $t$ , is multiplied and divided by velocity  $\vec{v}$ , we have the derivative of the energy relative to pathway  $r$ :

$$\text{a) } \vec{F} = \frac{d\vec{P}}{dt} \cdot \frac{\vec{v}}{\vec{v}} = \frac{dW}{dr} \cdot \vec{r}_0; \text{ b) } dW = \vec{v} \cdot d\vec{P}; \text{ c) } \vec{r}_0 = \frac{\vec{r}}{|\vec{r}|}; \quad (4-1)$$

In fact, this relationship is not new, it is known from classical physics, where it is assumed that work  $A$  is equal to the product of force  $\vec{F}$  and pathway  $\vec{r}$  ( $A = \vec{F} \cdot \vec{r}$ ), since the quantity of work  $A$  is a measure of the quantity of energy  $W$  if energy  $W$  is potential, or

$$\text{a) } dA = \vec{F} \cdot d\vec{r} = dW; \text{ b) } \vec{F} = \frac{dA}{dr} \cdot \vec{r}_0 = \frac{dW}{dr} \cdot \vec{r}_0; \quad (4-2)$$

**In this aspect, the notion of force, in a general, explicit form, has the meaning of energy exchanged between interacting objects for a unit of pathway.** In this sense, the notion of interaction leads to the known interpretation that during interaction, energy and matter are exchanged, since every quantity of energy has the respective quantity of matter as its carrier. Id est, this idea was implicitly present even in classical physics, viz. in the sense that matter and the energy during interaction change in a quantitative way.

If (4-1) is written for the substantial and field form of electromagnetic matter – of matter in general – using the respective notations for masses  $m_B$  and  $m_C$ , for energies  $W_B$  and  $W_C$  and for velocities  $v_B$  and  $v_C$ , we arrive at the classical relationships:

$$\text{a) } dW_B = v_B \cdot dP_B = v_B^2 \cdot dm_B; \text{ b) } dW_C = v_C \cdot dP_C = v_C^2 \cdot dm_C, \quad (4-3)\text{a}$$

Since

$$\text{a) } \frac{dv_B}{dt} = 0; \text{ b) } \frac{dv_C}{dt} = \frac{dc}{dt} = 0; \quad (4-3)\text{b}$$

where at substantial and field wave velocities  $v_B = v_0$ ,  $v_C = c$

$$\text{a) } dW_B = v_B \cdot dP_B = v_0^2 \cdot dm_B; \text{ b) } dW_C = v_C \cdot dP_C = c^2 \cdot dm_C, \quad (4-4)$$

since in a most general case

$$\text{a) } dP_B = m_B \cdot dv_B + v_B \cdot dm_B = \frac{dW_B}{v_B}; \text{ b) } dP_C = m_C \cdot dv_C + v_C \cdot dm_C = \frac{dW_C}{v_C}; \quad (4-5)$$

If (4-5) is multiplied by  $v_B^2$  and  $v_C^2$  and respectively divided by  $v_0^2$  and  $c^2$ , we have

$$\text{a) } \frac{dW_B}{v_0^2} = m_B \cdot d\left(\frac{v^2}{v_0^2}\right) + dm_B \cdot \left(\frac{v^2}{v_0^2}\right) = dm_B; \text{ b) } dm_B = -\frac{1}{2} m_B \cdot d\left(1 - \frac{v^2}{v_0^2}\right) + dm_B \cdot \left(1 - \frac{v^2}{v_0^2}\right) \text{ and} \quad (4-6)$$

$$\text{a) } \frac{dW_C}{c^2} = m_C \cdot d\left(\frac{v^2}{c^2}\right) + dm_C \cdot \left(\frac{v^2}{c^2}\right) = dm_C; \text{ b) } dm_C = -\frac{1}{2} m_C \cdot d\left(1 - \frac{v^2}{c^2}\right) + dm_C \cdot \left(1 - \frac{v^2}{c^2}\right), \quad (4-7)$$

or if the differential equations (4-6) and (4-7) are processed, they obtain this form

$$\text{a) } \frac{dm_B}{m_B} = -\frac{1}{2} \frac{d\left(1 - \frac{v^2}{v_0^2}\right)}{1 - \frac{v^2}{v_0^2}}; \text{ b) } \frac{dm_C}{m_C} = -\frac{1}{2} \frac{d\left(1 - \frac{v^2}{c^2}\right)}{1 - \frac{v^2}{c^2}}. \quad (4-8)$$

The solutions to equation (4-8) with boundary conditions

$$\text{a) } v = 0 \rightarrow m = m_{0B} = m_0; \text{ b) } v \neq 0 \rightarrow m = m_B \neq m_{0B} = m_0 \quad (4-9)$$

$$\text{a) } v = 0 \rightarrow m = m_{0C} = m_0; \text{ b) } v \neq 0 \rightarrow m = m_C \neq m_{0C} = m_0 \quad (4-10)$$

are respectively:

$$\text{a) } m_B = m_{0B} \cdot \left(1 - \frac{v^2}{v_0^2}\right)^{\frac{1}{2}}; \text{ b) } m_C = m_{0C} \cdot \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}. \quad (4-11)$$

If in (4-4), we take into account (4-11), then for the full energies we have:

$$W_B = m_B \cdot v_0^2 = m_{0B} \cdot v_0^2 \cdot \left(1 - \frac{v^2}{v_0^2}\right) = W_{0B} \cdot \left(1 - \frac{v^2}{v_0^2}\right)^{\frac{1}{2}} \text{ and} \quad (4-12)$$

$$W_C = m_C \cdot c^2 = m_{0C} \cdot c^2 \cdot \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}} = W_{0C} \cdot \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}, \quad (4-13)$$

whence at  $v = 0$  we derive the regularities of the internal energies, which bodies have at rest

$$\text{a) } W_{0B} = m_{0B} \cdot v_0^2; \text{ b) } W_{0B} = m_{0C} \cdot c^2; \text{ c) } m = \frac{W}{c^2}. \quad (4-14)$$

Since the substantial form of matter can be converted into a field form, in a most general case, the indexes “B” and “C” can be dropped and (4-10) and (4-12), (4-13) and (4-14) can be summarized in unitary regularities.

$$\text{a) } m = m_0 \cdot \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}; \text{ b) } W = m_0 \cdot c^2 \cdot \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}; \text{ c) } W = m \cdot c^2, \quad (4-15)$$

without using Lorentz transformations.

**In this way, we have shown that (4-15) are classical, not relativistic laws (from the Special Theory of Relativity), whereby we have taken into account the fact that even classical physics (electromagnetism), in an apparent, while not yet summarized way, uses the notion of electromagnetic matter introduced by Maxwell as an essence of the electromagnetic field.**

## 4.2. Summaries

*1. Electromagnetic matter is composed (structured) of restructured electric charges with a square of effective value  $Q_T^2$ . The fact that according to Maxwell kinetic energy is magnetic energy implies the summarized conclusion that natural objects are made of electromagnetic matter (in a field form and in a substantial form) and that it is a structure of restructured electric charges. These charges are in explicit or implicit, restructured form, i.e. the charges is in independent or summarized (as, for example, in neutrons and other elementary particles) implicit state.*

**HOWEVER, REGARDLESS OF WHAT STATE ELECTRIC CHARGES ARE IN, THEY ALWAYS MANIFEST THEIR MAIN (ATTRIBUTIVE) PROPERTY AT MOTION (VELOCITY ( $v \neq 0$ )) TO GENERATE (CREATE) A MAGNETIC FIELD ASSOCIATED WITH THEMSELVES - MAGNETIC ENERGY, WHICH IS CALLED KINETIC. And the energy at rest ( $v = 0$ ) is the energy of their electrostatic and gravitational fields.**

Their gravitational energies and masses are ignored (not accounted for), since they are **about  $10^{40}$  times smaller than the electrostatic energy and mass.**

2. Essentially, magnetic energy of electric charges is the transformed energy (electromagnetic or gravitational), imparted onto them by force  $F_d$ , which the charges have absorbed from outside in order to be accelerated (for their mass to be accelerated) up to a respective velocity  $v \left( \vec{v} = \frac{\vec{F}_d}{m_e} t \right)$ , by the action of the motion force  $\vec{F}_d$ .

**IN THIS SENSE, THE ENERGY ABSORBED FROM OUTSIDE IS TRANSFORMED INTO MAGNETIC ENERGY. IT IS THAT ENERGY WHICH AT  $v \ll c$  IS PROPORTIONAL TO THE MASS OF THE BODY  $m_q$  AND THE SQUARE OF ITS VELOCITY, I.E**

$$W_{qH} = m_q \frac{v^2}{2}; \quad (4-16)$$

And this magnetic energy  $W_{qH}$  has mass  $m_{qH} = \frac{W_{qH}}{c^2}$ , which is bound inseparably to the mass of the charge at rest  $m_{T0}$ . Because of this, at low velocity  $v \neq 0$  the mass of the body is a sum of its mass at rest and its magnetic mass,  $m_{qH} \ll m_{T0}$  and therefore it is ignored, i.e

$$m_q = m_{T0} + m_{qH} \approx m_{T0}; \quad (4-17)$$

Considering Newton's formulation that mass is an abstracted notion of the notion of matter, this conclusion follows:

**WHEN A BODY (ITS CHARGE) IS ACCELERATED, ITS QUANTITY OF MATTER INCREASES, SINCE THE MATTER, WHICH IT HAS OBTAINED FROM OUTSIDE – FROM ITS MOTIVE FORCE (ELECTROMAGNETIC OR GRAVITATIONAL) – ADDS TO ITS MATTER AT REST ( $v = 0$ ).**

## PART TWO

### 1. GENERAL INTRODUCTION

The term „Quantum mechanics“ was first used by N. Bohr in [2] in 1915. And in modern theory of quantum mechanics, since 1927 on, the most significant moments, connected to Planck constant  $h$  of 1900, are:

1. Niels Bohr model of atom and emission and absorption of photons by the atom.
2. De Broglie waves.
3. Heisenberg inequality.
4. Schrödinger equation.

### 2. N. BOHR'S MODEL OF ATOM AND EMISSION AND ABSORPTION OF PHOTONS BY THE ATOM ACCORDING TO CLASSICAL PHYSICS

In a closed system, such as is an electron in an atom, without any influence from external fields, the electron is attracted by the electric field of the nucleus  $\vec{E}_n$  by the centripetal force, which is with a minus sign, since it is attraction and it is

$$\vec{F}_e = -q_e \cdot \vec{E}_n = -\frac{q_e \cdot q_n \cdot \vec{r}_0}{4\pi\epsilon_0 r^2} = -\frac{\beta \cdot \vec{r}_0}{r^2}; \quad \beta = \frac{q_e \cdot q_n}{4\pi\epsilon_0}; \quad (2-1)$$

For an electron to retain a stable orbit at distance  $r = r_0$  it is necessary that its velocity  $\vec{v}_0$  be perpendicular to force  $\vec{F}_e$  (2-1), **since then, according to classical physics, the force does not release energy to the electron, i. e.**

$$dW = \vec{F}_e \cdot d\vec{r} = \vec{F}_e \cdot \vec{v}_0 \cdot dt \cdot \cos \frac{\pi}{2} = 0, \quad (2-2)$$

**but only changes the direction of the velocity along the orbit which is a circle.**

The kinetic energy  $W_{k0}$  and the potential  $W_{p0}$  energy of the electron along an orbit of radius  $r_0$  are

$$\text{a) } W_{k0} = \frac{m_{e0} \cdot v_0^2}{2}; \text{ b) } W_{p0} = + \frac{\alpha}{r_0}; \quad (2-3)$$

The full energy of the electron is

$$W_0 = W_{k0} + W_{p0} = \frac{m_{e0} \cdot v_0^2}{2} + \frac{\alpha}{r_0} = \text{const}; \quad (2-4)$$

where:  $\alpha$  is a constant.

The moment of impulse of the electron  $L_0$ , which has dimensionality Joule by a second  $[J.s]$ , is with the dimensionality of Planck constant  $-h$ , is

$$[\vec{L}_0] = [\vec{r}_0 \cdot \vec{p}_0] = m_{e0} [\vec{r}_0 \cdot \vec{v}_0] = K_L = \text{const.}; \quad (2-5)$$

The derivative of  $L_0$  towards the time is

$$\text{a) } \frac{d\vec{L}_0}{dt} = [\vec{r}_0 \cdot \vec{F}_c] = M = 0; \text{ b) } \vec{F}_c = \frac{d\vec{P}_c}{dt} = \frac{d(m_{e0} \cdot \vec{v}_0)}{dt} = - \frac{\alpha}{r^2}; \quad (2-6)$$

since in this case  $\vec{r}_0$  and  $\vec{F}_c$  are perpendicular.

And since there is no external influence, it follows that

$$\text{a) } W_{k0} = \text{const.}; \text{ b) } W_{p0} = \text{const.}; \rightarrow \text{c) } M = 0; \text{ d) } L_0 = \text{const.}; \quad (2-7)$$

Two cases are possible, in which (2-7) is violated

**Case A.** If the electron absorbs one photon from the outside (a quantity of electromagnetic energy), which is the kinetic energy  $W_f$ , its kinetic energy increases to

$$W'_k = W_{k0} + W_f = \frac{m_{e0} \cdot v_0^2}{2} + W_f = \frac{m_{e0} \cdot v^2}{2} > W_{k0}; \quad (2-8)$$

I.e. the square of velocity  $v^2$  after absorption of the photon is

$$v'^2 = v_0^2 + \frac{2 \cdot W_f}{m_{e0}} > v_0^2; \quad (2-9)$$

Since the full energy of the electron (2-4) must be constant, according to (2-4), it follows that the potential energy of the electron should change to

$$W'_p = W_{p0} - W_f = \frac{\alpha}{r_0} - W_f = - \frac{\alpha}{r}; \quad (2-10)$$

Or the radius of the orbit will increase to

$$\text{a) } r' = r_0 \left( \frac{\alpha}{\alpha - W_f \cdot r_0} \right) > r_0; \text{ b) } \frac{\alpha}{\alpha - W_f \cdot r_0} > 1; \quad (2-11)$$

I. e. having absorbed a photon, the electron, according to classical theory, moves to a higher orbit.

Along with that, the angular momentum increases to

$$[\vec{L}]' = [\vec{r}' \cdot \vec{p}'] = m_{e0} \cdot [\vec{r}' \cdot \vec{v}'] > \vec{L}_0; \quad (2-12)$$

*Regardless of the classical approach, here (case A) a new quantity of kinetic energy  $W_f$  is added and that is why the angular momentum in such processes is not constant (const.) as it is in classical bodies, in which their kinetic energy is constant; therefore  $L = \text{const.}$ , too. **I. e. the general definition of  $L$  implies that when the kinetic energy of the body changes, then***

$$\text{I. At a) } W_k = \text{const.}; \rightarrow \text{b) } L = \text{const.}; \quad (2-13)$$

$$\text{II. At a) } W_k \neq \text{const.}; \rightarrow \text{b) } L \neq \text{const.}; \quad (2-14)$$

**Case B.** If the electron emits a photon with electromagnetic energy  $W_f$ , then its magnetic (kinetic) energy decreases to

$$W'_k = W_{k0} - W_f = \frac{m_{e0} \cdot v_0^2}{2} - W_f = \frac{m_{e0} \cdot v'^2}{2} < W_{k0}; \quad (2-15)$$

I.e. after the emission of the photon, the velocity of the electron is

$$v'^2 = v_0^2 - \frac{2 \cdot W_f}{m_{e0}} < v_0^2; \quad (2-16)$$

Since  $W_0$  (2-4) is constant, the potential energy of the electron changes from  $W_{p0}$  to

$$W_p^* = W_{p0} + W_f = -\left(\frac{\alpha}{r_0} + W_f\right) = -\frac{\alpha}{r^*}; \quad (2-17)$$

or the radius of the electron decreases to

$$\text{a) } r^* = r_0 \left( \frac{\alpha}{\alpha + W_f \cdot r_0} \right) < r_0; \text{ b) } \frac{\alpha}{\alpha - W_f \cdot r_0} < 1; \quad (2-18)$$

I. e. with the emission of a photon, the electron, according to the classical theory, moves to a lower orbit.

$$\vec{L} = [\vec{r}^* \cdot \vec{p}^*] = m_{e0} \cdot [\vec{r}^* \cdot \vec{v}^*] < L_0; \quad (2-19)$$

From the presented above, a new law is defined about the classical electrodynamics and mechanics, which states: **With the change of the electromagnetic energy of the body (electric charge), the angular momentum of the body changes as well, i. e. the angular momentum, with a variable energy of the body, is variable – it is not constant.**

**Case C.** If force  $\vec{F}_e$  is perpendicular to velocity  $\vec{v} - \vec{F} \perp \vec{v}$  the elementary energy during the action of this force on the electron at velocity  $v$  is

$$\text{a) } dW = \vec{F}_e \cdot \vec{v} = F_e \cdot v \cdot \cos \frac{\pi}{2} = F_e \cdot v \cdot 0 = 0; \rightarrow \text{b) } r_0 = \text{const.}; \quad (2-20)$$

Here the angular momentum  $L$  does not change – it remains  $L_0$

$$L = [\vec{r}_0 \cdot \vec{P}_0] = m_{e0} \cdot [\vec{r}_0 \cdot \vec{v}_n] = L_0; \quad (2-21)$$

I.e. the electron does not obtain energy, because force  $\vec{F}_e$  and velocity  $\vec{v}_0$  are perpendicular (a fact known from classical mechanics). The velocity alters only its direction (course), but not its value (size). That is why it moves along almost a circle (the same orbit).

About this case C) N. Bohr in his lecture of December 1922, reference [3] (p. 425) § “The quantum theory of atomic constitution“, delivered when was he received his Nobel Prize, in the text describing his second postulate, he stated as follows: „2. In contradiction to the classical electromagnetic theory no radiation takes place from the atom in the stationary states themselves.“ This statement of N. Bohr’s, namely that according to classical electromagnetic theory the electron must not radiate, is apparently unfounded, according to classical physics (2-20), when we take into account the description of the above case C), which describes the motion of the electron in the atom along a constant orbit.

Further on (in the second postulate) N. Bohr in [3] continued with this text: „[but] a process of transition between two stationary states can be accompanied by the emission of electromagnetic radiation, which will have the same properties as that which would be sent out according to the classical theory from an electrified particle (P.P.’s note: electrons and positrons are electrified, electrically charged, particles) executing an harmonic vibration with constant frequency. This frequency  $\nu$  has, however, no simple relation to the motion of the particles of the atom, but is given by the relation

$$h \cdot \nu = W' - W''; \quad (2-22)$$

where:  $h$  is Planck constant;  $W'$  and  $W''$  are the values of the energy of the atom in the two stationary states that form the initial and final state of the radiation process. Conversely, irradiation of the atom with electromagnetic waves of this frequency can lead to an absorption process, whereby the atom is transformed back from the latter stationary state to the former.“

In [5] § 1 N. Bohr wrote: „Regardless of the fundamental difference of quantum theory of atomic processes from the theory of the conventional electrodynamics, in a definite sense, it should be a summary of the latter“.

It is evident from N. Bohr’s words in the second postulate of [3] as presented above that the emission of photons by electrons of the atom was described by N. Bohr in 1923 as a classical electromagnetic process. An in 1913 in [4] at the end of paragraph „Conclusive notes“ in point 1 and 2, it is written:

„1. The emission (or absorption) of energies does not occur continuously, as it was accepted in the conventional electrodynamics, but only during transition from one „stationary” state into another.

2. The dynamic balance of the systems in the stationary state is determined by the conventional laws of mechanics, while for the transition between the different stationary states, these laws are not valid (P.P.’s note: do not hold true).“

**Here p. 1 is not correct, because according to [1] (ch. 5, § 2) P. Ehrenfest proved in 1914, before N. Bohr, that the emitted wave energy  $W$  for time  $t = n.v = n.T$  ( $n = 1, 2, 3, \dots$ )  $v$  – frequency;  $T$  – the period of one wave is always**

$$\text{a) } W = \text{const.} \cdot v = H \cdot v; \text{ b) } H = \text{const.}; \quad (2-23)$$

i.e. the energy is in portions (quanta), as it is with photons.

$$W_f = h \cdot v; \quad h = \text{const.}; \quad (2-24)$$

*And p. 2 was disproved by N. Bohr himself in 1923 in [3] with the text of the second postulate, which stated: „[but] a process of transition between two stationary states can be accompanied by the emission of electromagnetic radiation, which will have the same properties as that which would be sent out according to the classical theory from an electrified particle executing an harmonic vibration with constant frequency. “*

## 2.1. Conclusion about N. Bohr’s argumentation of emission and absorption of photons by the atom

*The processes in the atom, concerning both the forces, acting on the electrons in the atom and the emission and absorption of photons by the atoms (their electrons) are described by classical laws and therefore, these processes are classical, i.e. there is nothing specifically new as a feature typical only of quantum mechanics.*

**P.S.** For solutions of processes in the atom according to N. Bohr’s model, with more than one electron, for example for  $n$  electrons, the electrodynamics requires that the energies of interaction of each electron with the rest ( $n - 1$ ) electrons should also be accounted for. However, for the time being, this problem has no solution in physics. And generally seen, **the problem of interaction between three bodies has no full solution in physics. That is why there is no solution for Bohr’s model for an atom with more than one electron, for the presented above reasons.**

**In this aspect, Bohr’s model is adequate to reality, but it offers solution only for one electron and that solution is in conformity with classical electrodynamics.**

## 2.2. On the question of quantizing (portions) of energies and masses in physics

It is known that the smallest values of electric charges  $q_e = \mp 1,6 \cdot 10^{-19}$  C are in portions (they are quantized). On the other hand, the masses and energies of all material objects, being only of electromagnetic matter, are result of restructured electric charges and their electromagnetic energies, which means that they are also in portions (quantized). However, this fact is hard to prove experimentally, since the internal electromagnetic energy of the electrons is very small (see § 3.3.1 in Part One)  $W_{e0} = m_{e0} \cdot c^2 = 9,1 \cdot 10^{-31} \cdot 10^{16} \approx 8,3 \cdot 10^{-16}$  J relative to the internal energy of macroobjects.

This is the motivation to assert that the mass of the electron at velocity  $v$

$$m_e = m_e \cdot \left( 1 - \frac{v^2}{c^2} \right)^{-\frac{1}{2}}; \quad (2-25)$$

is also quantized or, more specifically, velocity  $v^2$  is also in portions (quantized).

***In this sense, the kinetic energy of the of electron at a relevant orbit at velocity  $v$  also has quantized magnetic (kinetic) energy, i.e.***

$$W_{He} = \frac{m_{e0} \cdot v^2}{2}; \quad (2-26)$$

***is quantized.***

Since  $W_{He}$ , respectively the centripetal acceleration  $a_{uc} = v^2 / 2$  then the radiuses of the orbits should also be quantized.

For example, the centripetal force is

$$\vec{F}_{uc} = m_{e0} \cdot \vec{a}_{uc} = q_e^2 \cdot \vec{E}_\pi = m_{e0} \cdot \frac{v^2 \cdot \vec{r}_0}{2} = \frac{m_0 \cdot v^2 \cdot \vec{r}_0}{v \cdot t} = m_{e0} \cdot \frac{\vec{v}}{t} = m_{e0} \cdot \vec{a} \quad (2-27)$$

And the magnetic (kinetic) energy is

$$dW = \vec{F}_{uc} \cdot d\vec{r} = m_{e0} \cdot \vec{a} \cdot \vec{v} \cdot dt; \quad (2-28)$$

is also quantized.

### Inference

All values of masses, energies and forces in physics are quantized (in portions), but this fact, due to the very small values of the quanta in macroobjects, almost cannot be measured experimentally.

## 3. NOT EMITTED (INSEPARABLE) FROM THE BODY (SYSTEM) WAVES – DE BROGLIE WAVES

### 3.1. General formulations

#### 3.1.1. One incorrectness, which refers to de Broglie waves

According to Max Born [1] (supplement 10) „Compton effect“ the length of the Compton wave can be expressed as

$$\Delta\lambda = \frac{h \cdot c}{m_0 \cdot c^2} = \frac{h}{m_0 \cdot c}; \quad (3.1-1)$$

It is important to emphasize here that the Compton wave with its length is described with the expression for the emitted by the body waves

$$\frac{h \cdot c}{m_0 \cdot c^2} = \frac{\text{momentum of quantity of motion} \times \text{velocity } c}{\text{energy of the electron at rest}}; \quad (3.1-2)$$

but not with the expression

$$\frac{h}{m_0 \cdot c} = \frac{\text{momentum of quantity of motion}}{\text{mass of the electron at rest} \times \text{velocity } c}; \quad (3.1-3)$$

The product of the mass of the electron at rest ( $m_0$ ) and velocity  $c$ , according to (3.1-3) has dimensionality of momentum, but it is not a real momentum, because the electron with mass at rest  $m_0$  cannot move at velocity  $c$ . The motivation of this fact is that the mass of the electron  $m_e$  at velocity  $v$  is

$$m_e = m_{e0} \cdot \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}; \quad (3.1-4)$$

which at velocity  $v = c$  is

$$m_e = \frac{m_{e0}}{(1-1)^{\frac{1}{2}}} = \frac{m_{e0}}{0} \rightarrow 0; \quad (3.1-5)$$

Due to this fact (3.1-5) it cannot be asserted that the length of the Compton wave, described through (3.1-3), which is equal to

$$\Delta\lambda = \frac{\text{momentum of quantity of motion}}{\text{momentum of the electron}}; \quad (3.1-6)$$

because (3.1-3), respectively (3.1-6) have only meaning as a number, which is equal to the wave length, but not a physical meaning of a notation of the physical quantity wave length of photon.

For example in annihilation of electron  $e_0^-$  and positron  $e_0^+$  photons are generated with velocity  $c$ , frequency  $\nu$  and wave length  $\lambda$ , as follows

$$\text{a) } e_0^- + e_0^+ \rightarrow 2\gamma; \text{ b) } m_{e0} \cdot c^2 + m_{e0} \cdot c^2 = 2 \cdot W_f = 2 \cdot h \cdot \nu; \text{ c) } \lambda = \frac{h \cdot c}{m_{e0} \cdot c^2} = \frac{h}{m_{e0} \cdot c}; \quad (3.1-7)$$

i.e. the notation of the length of wave  $\lambda_f$  of the photon is

$$\lambda_f = \frac{h.c}{m_0.c^2} = \frac{\text{momentum of quantity of motion} \times \text{velocity } c}{\text{energy of the electron at rest}}; \quad (3.1-8)$$

Not 
$$\lambda = \frac{h}{m_{e0}.c}; \quad (3.1-9)$$

A similar error was also made with the description of the length of the Compton wave, where the velocity  $c$  was cancelled and instead of (3.1-2) or (3.1-8) it resulted in (3.1-3) or (3.1-9).

### 3.1.2. On the physical requirement of a reliable reality of existence of a given real phenomenon or object

*For a physical notion to be a physical quantity (natural entity), it must meet the following requirements:*

- a) it must have a clear definition in the unambiguous meaning of the physical reality;*
- b) it must have a real physical method of measurement – quantitative measurability;*
- c) it must have realized experimental facts, which confirm both the physical reality and the values of the quantitative measurements.*

#### Emphasis on the photon

The emitted power  $N = \frac{dW}{dt}$  ( $W$  is the energy of the photon;  $t$  – time) is generated by the electron (electric charge) according to Larmure published in 1897 (Phil. Mag. 1897. V. XIV, p. 503) with the formula

$$\frac{dW}{dt} = N = \frac{2}{3} \cdot \frac{q_e^2 \cdot a^2}{c}; \quad (3.1-10)$$

where:  $q_e$  is electric charge of the of electron;  $a$  – acceleration of the electron.

And the energy of the photon, which is an independent, emitted quantity in the form of a series of  $n$  electromagnetic waves and moves at velocity  $c$  is

$$W_f = h.\nu = N.\tau;$$

where:  $h$  is Planck constant;  $\nu$  – frequency of the photon;  $\tau$  – time of emission, which as a value is accepted to be  $\tau = 10^{-8}$  s. Not at the velocity of light  $c = 3.10^8$  m.s<sup>-1</sup>.

Under these conditions the average length of the photon is

$$l_f = c.\tau = 3.10^8.10^{-8} = 3 \text{ m}; \quad (3.1-11)$$

Whereby, at a frequency near the light  $\nu = 10^{14}$ Hz , it has a wave length

$$\lambda = \frac{c}{\nu} = \frac{3.10^8}{10^{14}} = 3.10^{-6} \text{ m}; \quad (3.1-12)$$

And the number of the waves  $n$  of the photon is

$$n = \frac{l_f}{\lambda} = \frac{3}{3.10^{-6}} = 10^6 \text{ waves}; \quad (3.1-13)$$

The photon has an emitted mass (field form of electromagnetic matter)

$$m_f = \frac{W_f}{c^2}.\vec{c}_0; \quad \vec{c}_0 = \frac{\vec{c}}{|\vec{c}|}; \quad (3.1-14)$$

and momentum

$$\vec{P}_f = m_f.\vec{c} = \frac{W_f}{c^2}.\vec{c}_0; \quad (3.1-15)$$

and in collision the photon generates force

$$\vec{F}_f = \frac{d\vec{P}}{dt} = \frac{d(m_f.\vec{c})}{dt} = \frac{dW_f}{dr}.\vec{c}_0 = \frac{d.m_f}{dt}.\vec{c} + \frac{d.\vec{c}}{dt}.m_f = \frac{d.m_f}{dt}.\vec{c} + 0 = \frac{d.m_f}{dt}.\vec{c}; \quad d\vec{r} = \vec{c}.dt; \quad (3.1-16)$$

For example, a light photon with:  $\nu = 10^{14}$  Hz,  $\lambda = c / \nu = 3 \cdot 10^{-6}$  m and  $n = l_f / \lambda = 10^6$  waves is a body (object) with energy  $W_f = h \cdot \nu = 6,62 \cdot 10^{-34} \cdot 10^{14} = 6,62 \cdot 10^{-20}$  J and mass  $m_\lambda = 7,35 \cdot 10^{-43}$  kg. And this body (the photon) is emitted and moves at velocity  $c = 3 \cdot 10^8$  m/s, it has momentum  $\vec{P} = m_f \cdot \vec{c} = 2,2 \cdot 10^{-29}$  N.s, and in collision into a solid body it generates mean force  $\vec{F}_f = \frac{\vec{P}}{\Delta t} = \frac{2,2 \cdot 10^{-29} \cdot \vec{r}_0}{\Delta t} - N$ .  $\Delta t$  is the time of the collision, which in absorption of the photon by an electron is equal to time  $\Delta t$  of emission –  $\tau = \Delta t = 3 \cdot 10^{-8}$  s.

*In this sense, the photon as a whole is a body, and as a structure is a series of n waves, which move at velocity c, it has mass  $m_f$  and momentum  $\vec{P}_f$  and generates force  $\vec{F}_f$ .*

These inferences follow from the description of J. K. Maxwell in 1873 in paragraph 638 of „Treatise on electricity and magnetism“, where he wrote: „**We should consider both magnetic and electromagnetic energies as kinetic energies.**“

**In paragraph 636 Maxwell wrote: „... kinetic energy exists wherever there is magnetic field, i.e. in all parts of the field...“**

### 3.2. Wave processes

#### 3.2.1. General formulations

**In quantum mechanics, implicitly and factually, but not explicitly, two kinds of wave phenomena have been introduced, as follows.**

**First.** Waves, emitted (separable) from the the body (emitting system) outside of the body, which waves assume an independent character, such as photons. They have characteristics, defined in a computational way, such as: a) frequency  $\nu$ ; b) wave length  $\lambda = \frac{c}{\nu}$ ; c) period  $T = \frac{1}{\nu}$ ; d) number of waves  $n$ ; e) energy  $W = h \cdot \nu$  for period of time  $\Delta t = nT$ , about which P. Ehrenfest in 1914 proved that it was equal to  $W = \text{const.} \cdot \nu = H \cdot \nu$ ;  $H$  is a constant with dimensionality of  $h$ .

**Second. Waves, not emitted (inseparable) from each body, inside the body itself with mass  $m$ . Because [6], chapter 5, paragraph 35 reads: „De Broglie waves are not waves, which move along with the classical particle, which they „guide“. De Broglie waves and the particle – this is one and the same object; there is nothing else. The reality consists in the fact that the particles, which are created by nature, have the property of waves.“**

#### 3.2.2 Emitted wave processes in classical physics

In classical physics, the wave energies  $W$  are described for moment values of time  $t$ , i.e.

$$W = W_0 \cdot \sin^2 \omega_0 t = W(t); \quad (3.2-1)$$

The emitted energy by the atom in the form of a photon is described for a finite time equal to the time of emission  $\Delta t = \tau$ , by the formula

$$W_f = h \cdot \nu_0; \quad (3.2-2)$$

where:  $W_0$  is amplitude of the emitted energy;  $\omega_0 = 2 \cdot \pi \cdot \nu_0$  – circular frequency;  $h$  – Planck constant.

In order to analyse the characteristics of the wave energies, described by (3.2-1) in comparison with the energies, described by (3.2-2), they must be reduced under the same condition, i.e. (3.2-1) must be processed for a finite time  $\Delta t = n \cdot T_0$  ( $n$  is an integer,  $T_0$  – the period of one wave).

The emitted energy for time  $\Delta t = n \cdot T_0$  (where  $T_0 = \frac{1}{\nu_0}$  is the period at frequency  $\nu_0$ ), according to P. Ehrenfest of 1914 is

$$W_n = W(t) \cdot \Delta t = W(t) \cdot n \cdot T_0 = H \cdot \nu; \quad (3.2-3)$$

where at certain frequency  $\nu$ , the constant  $H$  should be

$$\text{a) } H = W_n / \nu; \text{ b) } W_n = H \cdot \nu; \quad (3.2-4)$$

### 3.2.2.1. With waves in elastic medium

Since mechanical wave processes result from deformation of the substantial form of electromagnetic matter, **mechanical wave processes are essentially substantial electromagnetic processes**. And the known electromagnetic wave processes are essentially field electromagnetic processes, because they are manifestations of the field form of electromagnetic matter.

The model under consideration of substantial wave processes, known as mechanical wave processes, consists of a rod of substantial electromagnetic matter with cross-section  $S_0$  and modulus of elasticity (Young modulus)  $E_0$ . On the beginning  $A$  of the rod acts sinusoidal force

$$a) F = F_0 \cdot \sin \omega t = K_f \cdot v^2 \cdot \sin \omega_0 t; \quad b) F_0 = K_f \cdot v^2; \quad (3.2-5)$$

where:  $K_f$  is physical coefficient of proportionality with dimensionality [kg.m];  $v$  – frequency of the wave process;  $\omega = 2\pi\nu$  – angular frequency.

Here it should be emphasized that the relationship (3.2-5)b is not a specific case, but holds true for all wave processes, since under the condition are assigned the amplitude of force  $F_0$  and frequency  $\nu$  of the wave process.

The mechanical waves in electromagnetic matter are considered in the following model.

Let there is a straight rod of firm elastic medium – electromagnetic matter, with cross-section  $S$ , length  $l$ , density of mass  $\rho_0$  and modulus of elasticity  $E_0$ , and let a sinusoidal in time force acts upon its beginning, designated by  $A$  (3.2-5).

As a result of the mechanical tension

$$\rho = \frac{F}{S}; \quad (3.2-6)$$

mechanical deformation  $\alpha_0$  appears at the beginning  $A$  of the rod as well as compactness of the density of the mass  $\Delta\rho_0$  with amplitudes

$$a) \alpha_0 = \frac{\rho_0}{E_0} = \frac{F_0}{S \cdot E_0}; \quad b) \Delta\rho_0 = \alpha_0 \cdot \rho_0; \quad c) \rho_0 = \frac{F_0}{S}. \quad (3.2-7)$$

The compactness of the mass, of the matter of wave  $\Delta\rho$ , moves in the elastic medium at wave velocity  $v_0$  in direction to the end  $B$  of the rod along its length  $l$ . At distance  $r$  from the beginning, the sinusoidal relationship of  $\Delta\rho$  is

$$\Delta\rho = \alpha_0 \cdot \rho_0 \cdot \sin \omega \left( t - \frac{r}{v_0} \right) = \Delta\rho_0 \cdot \sin \omega \left( t - \frac{r}{v_0} \right). \quad (3.2-8)$$

At wave frequency  $\nu_0$  of the mechanical wave process and wave length

$$\lambda = \frac{v_0}{\nu}; \quad (3.2-9)$$

The wave velocity relative to the elastic medium is determined by the regularity

$$v_0^2 = E_0 \cdot \rho_0^{-1} = \text{const.} \rightarrow \left[ \frac{\text{m}^2}{\text{s}^2} \right]; \quad (3.2-10)$$

The compactness of the mass (matter) of the wave of the deformation momentum – of the mass of the generator length  $\lambda_g$  of the mechanical wave is

$$a) m_{\alpha\lambda_g} = \frac{\Delta\rho_0 \cdot S}{\pi} \cdot \lambda_g = \frac{k_f \cdot v^2 \cdot \rho_0 \cdot v_0}{\pi \cdot E_0} = \frac{k_f \cdot \rho_0}{\pi \cdot E_0} \cdot v_0 \cdot v = D \cdot v = \text{const.}; \quad b) D = \frac{k_f \cdot \rho_0 \cdot v_0}{\pi \cdot E_0} = \text{const.}; \quad (3.2-11)$$

**The mass of the wave  $m_{\alpha\lambda_g}$  can move relative to the elastic medium only at the wave velocity  $v_0$  (3.2-10)a of the mechanical waves in the elastic medium of electromagnetic matter. Analogously, as it is with the photon, this mass cannot exist at another velocity relative to the electromagnetic elastic medium, since (3.2-10)a implies:**

$$a) v_0 = \text{const.}; \quad b) \frac{dv_0}{dt} = 0; \quad c) P_{\alpha\lambda_g} = m_{\alpha\lambda_g} \cdot v_0; \quad (3.2-12)$$

i.e. if  $\frac{dv_0}{dt} = 0$ , the momentum  $P_{ac} = m_{ac\lambda} \cdot v_0$  of matter (mass) of the wave (respectively, the momentum of the wave), exists only at the value of velocity, equal to the wave velocity  $v_0$  relative to the elastic medium. Therefore the force is

$$F = \frac{dP_{ac}}{dt} = \frac{d(m_{ac\lambda} \cdot v_0)}{dt} = v_0 \frac{dm_{ac\lambda}}{dt} + 0 \neq 0; \quad (3.2-13)$$

The energy, which corresponds to  $n$  generator waves with length  $\lambda_0$  (3.2-9) is

$$\text{a) } W_{n\lambda_s} = n \cdot \int_0^{\lambda_s} \vec{F} \cdot \vec{v}_0 \cdot dt = n \cdot m_{ac\lambda} \cdot v_0^2 = n \cdot D \cdot v \cdot v_0^2 = H \cdot v; \quad \text{b) } H = n \cdot D \cdot v_0^2 = \text{const.}; \quad (3.2-14)$$

### 3.2.2.2. With usual electromagnetic waves

The solution is for flat waves, for convenience, but the conclusions are generally valid for non-flat waves as well.

The electric field of the waves is:

$$\text{a) } E = E_0 \cdot \sin \omega_0 t; \quad \text{b) } \omega_0 = 2\pi v_0; \quad (3.2-15)$$

Since the quantities  $E_0$  and  $v_0$  are connected into one whole, they can be described as interdependent in the form:

$$\text{a) } K_E = \frac{E_0}{v_0}; \quad \text{b) } E_0 = K_E \cdot v_0; \quad \text{c) } K_E \rightarrow \text{dimensionality [L.M.T}^{-2} \cdot \Gamma^{-1}]; \quad (3.2-16)$$

The density of the energy of one flat wave is:

$$\text{a) } w = \varepsilon_0 \cdot E_0^2 \cdot \sin^2 \omega_0 t = \varepsilon_0 \cdot K_E^2 \cdot v_0^2 \cdot \sin^2 \omega_0 t = w_0 \cdot \sin^2 \omega_0 t; \quad \text{b) } w_0 = \varepsilon_0 \cdot K_E^2 \cdot v_0^2; \quad (3.2-17)$$

The sum of the densities of the energies  $w$  of  $n$  waves is determined by integrating for time  $\tau_n = n \cdot T_0$  and we have

$$\text{a) } W = w_0 \cdot \tau_n = \frac{\varepsilon_0 \cdot K_E^2 \cdot n \cdot v_0}{2} = h_n \cdot v_0; \quad \text{b) } W_n = w_n \cdot V = H_n \cdot v_0; \quad (3.2-18)$$

where:

$$\text{a) } h_n = \frac{\varepsilon_0 \cdot K_E^2 \cdot n}{2} = \text{const.}; \quad \text{b) } H_n = h_n \cdot V = \text{const.} \times \text{обем}; \quad (3.2-19)$$

where:  $h_n$  and  $H_n$  are constants for the specific case of (3.2-15) and at constant volume  $V$ .

### 3.2.3. Not emitted wave processes – de Broglie waves

This presentation of the de Broglie hypothesis is made in accordance with Wichmann's book [6], chapter V. According to this hypothesis, each body of mass  $m_0$  at rest ( $v=0$ ), is a wave package with group velocity  $v$ , where  $v$  is the velocity of motion of the body, it has momentum  $P$ , mass  $m$  and wave length  $\lambda_B$  of de Broglie, as follows:

$$\text{a) } P = m \cdot v; \quad \text{b) } m = m_0 \cdot \left(1 - \frac{v^2}{c^2}\right)^{-1/2}; \quad \text{c) } \lambda_B = \frac{h}{P} = \frac{h}{m \cdot v}; \quad (3.2-20)$$

where:  $h$  is Planck constant.

From  $\lambda_B$  and velocity  $v$  are determined frequency  $\nu_B$  of de Broglie waves and their energy  $W_B$ , as follows

$$\text{a) } \nu_B = \frac{v}{\lambda_B} = \frac{m \cdot v^2}{h}; \quad \text{b) } W_B = h \cdot \nu_B = m \cdot v^2; \quad (3.2-21)$$

In a systemized form, the quantities of de Broglie waves according to E. H. Wichmann are:

$$\text{a) } \lambda_B = \frac{h}{m \cdot v}; \quad \text{b) } \nu_B = \frac{m \cdot v^2}{h}; \quad \text{c) } k_B = \frac{\omega_B}{v} = \frac{2 \cdot \pi \cdot m \cdot v}{h}; \quad \text{d) } W_B = h \cdot \nu_B = m \cdot v^2; \quad (3.2-22)$$

Here it follows from (3.2-20), since there are no other data on de Broglie waves, the dimensions of the body are not given, but are given only its mass  $m$  and velocity  $\vec{v}$ , that there is only one wave of  $\lambda_B$  and  $\nu_B$  and that the energy  $W_B$  is only of this only wave, i.e. there is no reason to discuss that the body of

mass  $m$  and velocity  $v$  has more than one wave – that it has not one, but more than one wave. The place of the wave is in the centre of the mass of the body. In this case there is no method of measuring the length  $\lambda_B$  and the frequency  $\nu_B$  of this wave.

To give an idea of what are the parameters of the electromagnetic waves, connected with the electron and the analogous parameters of de Broglie waves, also connected with the electron, the author of this book presents the following calculated values in Table I, according to the presented above by Wichmann about the electron.

**Table 1**

A. Electromagnetic waves	B. De Broglie waves
1. Wave length	
a) $\lambda = \frac{h.c}{m_e.c^2} = \frac{h}{m_e.c}$ ;	b) $\lambda_B = \frac{h}{m_e.v}$ ;
2. Frequency of the waves	
a) $\nu = \frac{c}{\lambda} = \frac{m_e.c^2}{h}$ ;	b) $\nu_B = \frac{\nu}{\lambda_B} = \frac{m_e.v^2}{h}$ ;
3. Wave energies	
a) $W_R = h.\nu = m_e.c^2$ ;	b) $W_B = h.\nu_B = m_e.v^2 = 2W_k = 2\left(\frac{m_e.v^2}{2}\right) = m_e.v^2$ ;
Here the relation of the energies in non-relativist $v \ll c$ conditions is	
a) $k_w = \frac{W_B}{W_R} = \frac{v^2}{c^2} \ll 1$ ;	b) $v \ll c$ ;

***It is noteworthy with de Broglie waves that for frequency  $\nu_B$  and for wave length  $\lambda_B$  cannot be used the methods with emitted by the body waves, either for wave length  $\lambda_B$ , or for frequency  $\nu_B$  for their experimental ascertainment (measurement), but nonetheless and despite the fact that there is no experimental confirmation of the formulae for  $\lambda_B$  (3.2-18),  $\nu_B$  (3.2-19) and for the energy  $W_B$ , it is accepted in physics that they are real quantities. This circumstance is in serious contradiction with the physical requirement for the reality of one physical quantity.***

***Moreover, it is not clear how many de Broglie waves are contained in energy  $W_B$  (3.2-16)b because the volume and the dimensions of the body with mass  $m$  do not play any role with these waves, but only a volumeless point-like mass is used. It is not clarified yet how many de Broglie waves are there in the body, as is with the waves emitted by the body, for example for the photon.***

***Further on, an experiment of Davisson-Germer is described, but it does not meet the above requirements and it is about emitted waves, it is not about inseparable from the body waves, such as de Broglie waves.***

This explains why the energy  $W_B$  (3.2-22) of de Broglie waves is incompatible with the energy of the body, which generates it, while it must be equal to the energy of the body.

The real value of the energy  $W_R$  of the electron with mass  $m_{e0}$  at velocity  $v$ , according to modern physics is:

$$W_R = m.c^2 = m_{e0}.c^2 \cdot \left(1 - \frac{v^2}{c^2}\right)^{-1/2}; \quad (3.2-23)$$

It is evident that the relation between  $W_B$  and  $W_R$  is

$$a) k_B = \frac{W_B}{W_R} = \frac{m.v^2}{m.c^2} = \frac{v^2}{c^2} \ll 1; \quad b) W_B \ll W_R; \quad (3.2-24)$$

***Id est the energy  $W_B$  of de Broglie waves of the body is incompatible with the law of energy conservation, because their energy is much less than the actual energy of the body  $W_R$ . Or the law for energy conservation rejects any possibility for de Broglie's possibility to actually exist, i. e. de Broglie's hypothesis is unreal.***

And indeed, if the energy of de Broglie waves is computed for one electron from the orbit of an atom, which has mass  $m_{e_0} = 9.1 \cdot 10^{-31}$  kg and velocity of the order of  $10^6$  m/s it is

$$W_B = m_{e_0} \cdot v_e = 9,1 \cdot 10^{-31} \cdot 10^{12} = 9,1 \cdot 10^{-19} \text{ J}; \quad (3.2-25)$$

Its relation to its real energy  $W_R$  is

$$\text{a) } k_B = \frac{W_B}{W_R} = \frac{m_{e_0} \cdot v_e^2}{m_{e_0} \cdot c^2} = \frac{v_e}{c} = \frac{10^{12}}{9 \cdot 10^{18}} = 1,1 \cdot 10^{-5} W_R; \quad \text{b) } W_B = 1,1 \cdot 10^{-5} W_R; \quad (3.2-26)$$

When an electron  $e_0^-$  and a positron  $e_0^+$  annihilate, two photons  $\gamma$  are generated, the energy of the photon being  $W_\gamma = h \cdot \nu$ , i. e.

$$\text{a) } e_0^- + e_0^+ \rightarrow 2 \cdot \gamma; \quad \text{b) } W_{f_\gamma} = h \cdot \nu = m_{e_0} \cdot c^2 = 8,19 \cdot 10^{-14} \text{ J}; \quad (3.2-27)$$

Here the frequency of the photon  $\nu$  and its respective length  $\lambda$  coincide with these in Compton's effect.

$$\text{a) } \lambda = \lambda_k = 2,42 \cdot 10^{-12} \text{ m}; \quad \text{b) } \nu = \nu_k = \frac{c}{\lambda_k} = \frac{3 \cdot 10^8}{2,42 \cdot 10^{-12}} = 1,23 \cdot 10^{20} \text{ Hz}; \quad (3.2-28)$$

**From the energy of de Broglie waves of the electron  $W_B = 9,1 \cdot 10^{-19}$  J (3.2-25) and the emitted energy in the form of photon  $W_{f_\gamma} = 8,19 \cdot 10^{-14}$  J (3.2-27), the unreality of de Broglie waves is confirmed, since it is impossible for an electron with energy of de Broglie waves  $9,1 \cdot 10^{-19}$  J to emit a hundred thousand times larger energy ( $W_{f_\gamma} = 8,19 \cdot 10^{-14}$  J).**

It is obvious that only a small part of the full energy of the electron, which is

$$W_0 = m_{e_0} \cdot c^2 + \frac{m_{e_0} \cdot v^2}{2} = m_{e_0} \cdot c^2 \cdot \left(1 - \frac{v^2}{c^2}\right)^{-1/2}; \quad (3.2-24)$$

only

$$W_B = h \cdot \nu_B = m_0 \cdot v^2 \ll W_0; \quad (3.2-25)$$

is transformed into the hypothetical de Broglie waves. Here with the de Broglie waves, the internal energy of the bodies does not participate as energy parameter. In § 35 is emphasized on the text “*De Broglie waves and the particle – this is one and the same object*“ and that is regardless of (I-3) and (I-4), **which regrettably no one has calculated, so in the literature on quantum mechanics everyone (without exception) assert and use the flawed statement that the energy of de Broglie waves  $W_0 = W_R$  (3.2-29) and their momentum  $P$  (3.2-1) are according to these formulae, but in real fact for the full wave energy of de Broglie waves hold true equation (I-3)b and the relation (I-4) in Table I. THIS FACT INDICATES THAT THE LAW OF ENERGY CONSERVATION REJECTS DE BROGLIE WAVES.**

In [6] is written respectively:

1. In § 29 is written: „Electrons have wave properties, but they are not waves in the classical meaning, their electron wave package cannot be split, in contrast to the classical wave package.“

2. In § 35. is written: “*De Broglie waves are not waves, which move along with the classical particle and guide it. De Broglie waves and the particle - this is the same object. And there is nothing else. The reality is that the particles are a natural fact and have the properties of waves.*”

Moreover, Wichmann in [6] gave a proof in Ch. 5 § 13 that de Broglie waves exist by writing: „We present typical experimental data:  $W_0 = 54$  eV, a maximum of the intensity is observed at  $\theta = 50^\circ$ . For  $n = 1$  for the observable meaning of  $\theta$  corresponds to the length of wave  $\lambda = 1,65$ , and for the length of wave (of de Broglie – P.P.’s note) calculated by formula (3.2-20) it is equal to  $\lambda = 1,67$ ; this is a good correspondence when taking into account the measurement errors. Davisson observed the maximum of a higher order, which corresponds to  $n > 1$  and their results proved consistent with the foreseen by theory.“

It should be emphasized that the above proof for availability of de Broglie waves is based only on identical lengths of the waves, whereby one of them (that of the X-rays, this is explained above in § 13) was measured, and the other, of de Broglie waves, was calculated. **However, this is not sufficient, since**

*firstly, these are waves emitted outside electrons, not de Broglie waves, which are not emitted by electrons, and secondly, the full characteristic for identity requires that the waves should have identical velocities, frequencies and energies.*

Furthermore, not a single publication has ever mentioned that these waves and their energies also create (generate) gravitational fields and gravitational forces. And without such fields there cannot exist any material object. How can one then claim that de Broglie wave is reality.

Here is the real situation.

A. For  $\lambda = 1,65$ , according to text in § 13 from Ch. 5, a wave length of X-rays was measured, i.e. rays which are at velocity  $c$ .

The frequency of the waves is

$$v = \frac{c}{\lambda} = \frac{3 \cdot 10^8}{1,65 \cdot 10^{-8}} = 1,8 \cdot 10^{18} \text{ Hz.}$$

The energy of the photon from the X-rays is

$$W_f = h \cdot v = 6,62 \cdot 10^{-34} \cdot 1,8 \cdot 10^{18} = 1,2 \cdot 10^{-15} \text{ J.}$$

B. for  $\lambda = 1,67$

The velocity of the electron is

$$v_e = \frac{h}{m_0 \lambda_B} = \frac{6,62 \cdot 10^{-34}}{9,1 \cdot 10^{-31} \cdot 1,67 \cdot 10^{-10}} = 4,3 \cdot 10^6 \text{ m/s}$$

the frequency of de Broglie waves is

$$v_B = \frac{v_B}{\lambda_B} = \frac{4,3 \cdot 10^6}{1,67 \cdot 10^{-10}} = 2,57 \cdot 10^6 \text{ Hz}$$

and the length of de Broglie waves

$$\lambda_B = \frac{h}{m_0 \cdot v_e} = \frac{6,62 \cdot 10^{-34}}{9,1 \cdot 10^{-31} \cdot 4,3 \cdot 10^6} = 1,69 \cdot 10^{-9} \text{ m}$$

the energy of de Broglie waves is

$$W_B = h \cdot v_B = 6,62 \cdot 10^{-34} \cdot 2,57 \cdot 10^6 = 1,7 \cdot 10^{-17} \text{ J.}$$

The above data imply that the energy of de Broglie waves in percentage relative to the X-ray waves is

$$W_B (\%) = \frac{W_B \cdot 100}{W_f} = \frac{1,7 \cdot 10^{-17}}{120 \cdot 10^{-17}} \cdot 100 = 1,4\%$$

i.e. only 1.4%.

**This fact points out that the conclusion made of the identity of the two kinds of waves, based only on the length of the waves, was totally groundless.**

Moreover, the electrons in the atom at velocity  $v \approx 5 \cdot 10^6$  m/s, have wave length  $\lambda_B$ , frequency  $v_B$  and energy  $W_{Be}$  respectively equal to

$$\text{a) } \lambda_B = \frac{h}{m_0 \cdot v} = \frac{6,62 \cdot 10^{-34}}{9,1 \cdot 10^{-31} \cdot 5 \cdot 10^6} = 4,27 \cdot 10^{-8} \text{ m; b) } v_B = \frac{v}{\lambda_B} = \frac{5 \cdot 10^6}{4,27 \cdot 10^{-8}} = 1,17 \cdot 10^{14} \text{ Hz;}$$

$$\text{c) } W_{Be} = h \cdot v_B = 6,62 \cdot 10^{-34} \cdot 1,17 \cdot 10^{14} = 7,75 \cdot 10^{-20} \text{ J;}$$

**How, with this energy  $W_{Be} = 7,25 \cdot 10^{-20}$  J of de Broglie waves, could the electron emit a photon with energy  $W_f = 1,2 \cdot 10^{-15}$  J  $\gg W_{Be}$ , naturally, it cannot. This proves that the electrons in the atom cannot be regarded as de Broglie waves, and this fact implies that Schrödinger equation does not reflect any physical reality.**

**Finally, it has never been proved that de Broglie waves can be attracted by the nucleus of the atom so that they move around it and in the volume of the atom.**

## CONCLUSION

The presented here indicates that for the time being there are no experimental facts, which prove that de Broglie waves really exist as a physical phenomenon, i.e. de Broglie waves have no place in physics. I.e. they are just another fragment on the road of history of physics.

This definition in [6] of de Broglie waves „De Broglie waves and the particle – this is one and the same object“ implies the following inferences:

1. As structures, photons (electromagnetic waves) and de Broglie waves have nothing in common, except that they are both called waves.

2. Experimental methods for determining „the lengths of the waves  $\lambda$  and the frequencies  $\nu$  of photons, imply that they have nothing in common with the relevant quantities of not emitted de Broglie waves.

3. To prove experimentally the existence of lengths  $\lambda_B$  and frequencies  $\nu_B$  of de Broglie waves, it is necessary to specify (define) another experimental method, different from that of the photons, for experimental determining of  $\lambda_B$  and  $\nu_B$  of de Broglie waves.

4. For the time being such a different method has not been given, and the method of Davisson and Germer is for photons and therefore it is not a proof for availability of de Broglie waves.

**P.S. Most often, the impossibility experimentally to ascertain the de Broglie waves is explained with the fact that their length  $\lambda_B$  is very small and therefore they cannot be measured, but here is not taken into account the fact that for waves inseparable from the body waves there is no specified method, because the method for the emitted (separable from the body classical waves) is not applicable for inseparable waves – de Broglie waves.**

Finally, in [7] chapter 40 „Emergence of quantum mechanics“ in example 40.6 is described a wave of de Broglie of an electron at velocity  $v = 5,9 \cdot 10^6$  m/s, whose length is  $\lambda_B = 1,2 \cdot 10^{-10}$  m. **This length could be measured, if there were a method of measurement for inseparable of the body waves.** But it is not measured, despite the fact that are measured electromagnetic waves with length  $\lambda = \frac{3 \cdot 10^8}{10^{20}} = 3 \cdot 10^{-12}$  m.

## 4. EMPHASIS ON HEISENBERG INEQUALITY

This inequality states: The impreciseness in the definition of the coordinate  $\Delta x$  in microphysics is connected with the impreciseness of the momentum  $\Delta p$  of the particle, or the impreciseness of its energies  $\Delta W$  is a function of the impreciseness of the time  $\Delta t$ , and two variants are given a) and b) of Heisenberg inequality.

$$\text{a) } \Delta p \cdot \Delta x \geq h; \text{ b) } \Delta W \cdot \Delta t \geq h; \quad (4-1)$$

It is believed that it is impossible simultaneously to measure the coordinate  $\Delta x$  and the momentum  $\Delta p$ . But here is not taken into account the fact that the measurement of the momentum  $\Delta p$  is done in an exactly determined place  $\Delta x$  and at an exactly determined time  $\Delta t$ . I.e. (4-1) does not hold true, but this holds true:

$$\text{a) } \Delta p \cdot \Delta x = h; \text{ b) } \Delta W \cdot \Delta t = h; \quad (4-2)$$

or in other words, inequality (4-1) is rejected.

I.e. only these equations should be used

$$\text{a) } \Delta W = h \cdot \Delta \nu; \rightarrow \text{ b) } W_f = h \cdot \nu; \quad (4-3)$$

*i.e. this is a notation of the law for the energy of the photon –  $W_f$  and at the same time the notation of the law for conservation of energy.*

**In this sense, so that the energy of the photon  $W_f$  can increase, according to (4-1)b, additional energy  $\Delta W_f$  is needed – a fact, which is rejected by the law for conservation of energy. That is why, if such data are obtained during measurement, they are deemed unreal, as it is in macrophysics.**

And it is known that N. Bohr's model gives satisfactory results in the analysis of a hydrogen atom, where there is interaction between two bodies.

**It is important to emphasize that so far there has not been presented not a single experimental confirmation of Heisenberg inequality, with regard to non-observance of the law for conservation of energy.**

*And without such a confirmation there is no reason to claim that it is a physical law, i.e. Heisenberg inequality drops out of physics, since there is no experimental confirmation for non-observance of the law for conservation of energy.*

## 5. EMPHASIS ON SCHRÖDINGER EQUATION

A. The usage of Schrödinger equation to obtain real, specific, numerical values of probabilities for the state of electrons in the atom, with features of real physical quantities is impossible. The reason to assert this are following facts:

1. In principle, it is impossible to give real boundary conditions for the quantities associated with the states of the electrons, such as: a) the radius; b) the potential and c) the kinetic energy. And they are components of Schrödinger equation without which no specific, real solution can be obtained for a given orbit.

2. In principle, there is no real method for measuring the specific real numerical values of the probabilities.

3. *There are no known experimental data, validating that this equation describes real phenomena, referring to the electrons in the atom or a specific comparison of obtained specific experimental numerical values for specific boundary conditions with experimental data under the same conditions, as it is done for all real physical laws and theories.*

**4. There is no experimental validation of the formulations, which are used in this equation, such as:**

4.1. that the electrons in the atom are in the form of de Broglie waves and that they, being waves, move in the closed space of the atom around its nucleus and that the electrons do not have a trajectory because they are waves, but have a potential, which is function of the radius;

4.2. how could it be explained why, in Schrödinger equation, there is a radius with the nucleus as its center since the claim is that the electrons do not have trajectories; the availability of this radius speaks exactly of the opposite, and also, how is the potential described without a radius;

**4.3. that, for a short time, the energy of the electrons as waves can have values greater than those determined by the law of energy conservation. And there are no experimental data to prove that for the electrons, as de Broglie waves, the law of energy conservation does not hold true.**

### B. Inferences

1. *Schrödinger equation does not describe real physical phenomena in the atom (facts) and therefore no specific experimental data can validate it.*

2. *It is a serious physical error to claim that Heisenberg inequality motivates that the law of energy conservation is not obligatory for a short time, for Schrödinger equation, since there are no experimental data validating this equation.*

### C. Conclusion

1. **With the present situation of interpretation of Schrödinger equation, there is no reason to assume that this equation reflects real physical facts (phenomena) in the atom. That is why it should not be used as a physical law, it should be dropped out of quantum mechanics, since it is a logically inconsistent and experimentally unconfirmed hypothesis.**

2. *Since quantum mechanics (Schrödinger equation) claims that the emission of photons by the atoms is a probabilistic process, a question arises as to why the law of Stefan Boltzmann  $\Pi = \sigma.T^4$  is deterministic (with small fluctuations), although it describes a sum of photons.*

### Emphasis

Quantum mechanics does not give a model for description of real spatial phenomena. It claims to give a distribution of the probabilities of respective microphenomena without giving any algorithm a) first, what is the algorithm for specific calculation of their numerical values and b) what is the algorithm for connecting these probabilities with macrophenomena. Quantum mechanics has introduced a non-observable quantity wave function, which according to N. Born depends on de Broglie waves, because they essentially are not real – the law of energy conservation rejects them, whence it follows that rejected is also the wave function in Schrödinger equation.

### D. Ascertainments

#### First

**The reliable part of present-day quantum mechanics was further developed into classical electrodynamics for atomic phenomena. The real, reliable part cannot include de Broglie waves, Schrödinger equation and Heisenberg inequality.**

*Since essentially the theory of M. Planck is a continuation (further development) of the theory of Maxwell and Faraday and that quantizing of the energy in the form of photons results from classical electrodynamics, where the electron is a quantum of energy and a quantum of mass, therefore, the real theory of quantum electromagnetic processes is classical, which has experimental confirmation and is grounded only in classical physics, respectively in classical electrodynamics.*

### **Second**

Essentially, quantum mechanics interprets only microelectromagnetic manifestations of electromagnetic matter, not macromanifestations, and it does not give any algorithm as to how to apply its laws to quantum macrophenomena.

### **Third**

There is no reason to assert that quantum mechanics is a general science (theory) for natural phenomena, since:

a) it interprets only microphenomena of single objects, not a whole ensemble of objects and describes most often their one-moment manifestations with probabilistic laws, **but does not give their laws for a long interval of time, when the laws, according to experiment are deterministic, not probabilities, what is the law of Stefan Boltzmann;**

b) **it does not interpret also the integral laws of the ensembles of phenomena of microobjects, where the microobjects are structural elements of the structure of the ensembles, whose laws are deterministic and are result (function) of the manifestations of the microobjects;**

c) it does not give anything about gravitational phenomena, and without them there is no physical reality. I.e. quantum mechanics does not treat real physical phenomena.

d) in addition, the laws of the ensembles, as one whole structure, are deterministic with ignorable (insignificant) fluctuations.

### **Fourth**

The above facts make it apparent that it cannot be motivated that there exists a new section of physics, which interprets essentially by new scientific facts, different from the classical electrodynamics, called quantum mechanics.

### **Fifth**

*These are the reasons to put forward the thesis that essentially this is* in real fact **THE CRASH OF QUANTUM MECHANICS.**

## **6. EPILOGUE FOR QUANTUM MECHANICS**

In a systemized form, the final meaning of quantum mechanics or in particular for de Broglie waves as waves, which are inseparable from the body, whose waves they are, is defined in literature on quantum mechanics by the following citations:

1. In [6], chapter 1, § 1 is written: „Quantum physics should not be considered an isolated part of physics, which is not connected with the macroscopic world. In fact, it comprises all the physics. And its laws in such a form, in which they are known now, are the most general laws of Nature...“ „The laws of classical physics have approximate character. They are a boundary case of the more powerful and more general laws of quantum mechanics.“

2. In [6], chapter 7, § 13 is written: „All particles in a given physical situation must be described by de Broglie waves. And the fundamental theory of interaction between particles must be a theory, which considers the interaction between de Broglie waves. Exactly such fundamental description of interaction is characteristic of the quantum theory of field.“

3. In [6], chapter 5, § 35 is written: „De Broglie waves are not waves, which move along with the classical particle and lead it. De Broglie waves and the particle - this is the same object. And there is nothing else.“

4. In [7], chapter 41, § 1 is written: „The new theory, which is called quantum mechanics, is created from the corpuscular-wave dualism as a unitary theory.“

5. In [6], chapter 7, § 7 is written: „The theory of Schrödinger is based on the wave equation, known as „Schrödinger equation“. Its solution are de Broglie waves, which are „connected with the particles“.

6. In [7], chapter 41, § 4 is written: „Although some scientists have not yet given up determinism when taking a viewpoint of nature and do not regard quantum mechanics as a complete theory of nature (one of them was Einstein), the majority of physicists recognize quantum mechanics with its probabilistic approach to the description of nature. This approach has become generally acknowledged and has received the name of COPENHAGEN INTERPRETATION OF QUANTUM MECHANICS, in honor of the city, where Niels Bohr lived and worked. Because the probabilistic interpretation of quantum mechanics emerged basically thanks to discussions of Bohr with other physicists.“

As a sentence for the claims of quantum mechanics (physics) from the above citations, which essentially correspond also to the written in other books, is:

1. Its laws are the most general laws of nature.
2. The fundamental theory of interaction between particles is the theory, which regards the interaction between de Broglie waves.
3. The laws of classical physics have an approximate character. They are a boundary case of the more powerful and more general laws of quantum physics.

***These claims of quantum mechanics are not based on the essence of quantum mechanics itself, based on de Broglie waves, which by their definition in quantum mechanics do not have the qualities of physical reality, since:***

**First.** Their energy  $W_B$  is much less than the real energy  $W_R$  of particles with the same mass  $m$ , i.e.

$$\frac{W_B}{W_R} = \frac{m \cdot v^2}{m \cdot c^2} = \frac{v^2}{c^2}; \quad (6-1)$$

With the electron in the atom at velocity  $v_e = 10^6 \text{ m.s}^{-1}$  the relation is

$$\frac{W_B}{W_R} = \frac{10^{12}}{9 \cdot 10^{16}} = 0,11 \cdot 10^{-4} = 1,1 \cdot 10^{-5} \ll W_R; \quad (6-2)$$

I.e. they do not observe the law for conservation of energy, i.e. the energy of de Broglie waves is  $10^5$  times less than the real energy of a body with mass  $m$ .

**Second.** The mass of de Broglie waves of the same body is

$$m_B = \frac{W_B}{c^2} = m \frac{v^2}{c^2} = m \cdot 1,1 \cdot 10^{-5} \ll m; \quad (6-3)$$

I.e. they do not observe the law for conservation of mass (matter).

**Third.** Nowhere in quantum mechanics are given gravitational laws and quantities. And it is known that in the most general (fundamental) laws of classical physics also participate the laws for gravitational phenomena. Under these conditions quantum mechanics excludes cosmos as an element of nature and therefore it drops out as a science.

**Fourth.** Since by definition „de Broglie waves and the particle – this is one and the same object“ they are not classical waves, which are separated from the body (electron) as well as the photon, which is impulse of a series of waves, which move at velocity of light, while the body (the electron), which wmitted them, moves at a significantly lower velocity. That is why the existing method for experimental determining of frequency  $\nu$  and length of the waves  $\lambda$  is not applicable in de Broglie waves. Because of which circumstance the claim that Davisson and Germer proved that de Broglie waves exist is groundless. I.e. even on this very day there is none of experimental methods proposed to determine the length of de Broglie waves, which are not classical waves, but are waves, which are not separated from the body (the object, which generates them).

**Fifth.** If it is accepted that quantum mechanics in its present form as science of single microphenomena is a reliable science, and since no algorithm is given how to apply it for a system of phenomena at macrolevel, i.e. it does not give anything for the real world (nature), which is at macrolevel. And therefore it should be treated as unreality.

***And photons have nothing in common with de Broglie waves and are purely classical phenomenon, i.e. they are not object of quantum mechanics, because they are explained with the proved by P. Ehrenfest in 1914 as classical regularity.***

## GENERAL CONCLUSION

**There are no de Broglie waves, they are just another fragment along the path of history of physics.**

*P.S. Here's the place to cite what R. Feynmann, the Nobel Prize Laureate for quantum mechanics wrote in [10], lecture 6, which states: "I THINK I CAN SAFELY SAY THAT NOBODY UNDERSTANDS QUANTUM MECHANICS".*

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