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Naturics

The unified description of Nature

Who admires Nature, ought to try to understand it,
who wishes to understand Nature, should admire it above all.

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Preface

During the physics-study time on my university, I was sometimes unlucky, because I could not be so much enthusiastic about the then modern physics of the elementary particles and the big-bang cosmology as some of my friends. Deep in my brain, there was always fixed some obstinate feeling that Nature cannot be based on such an unimaginable state represented by the traditional Planck's Scale (of the unnaturally small distances and short periods combined with surprisingly big Planck's mass).

First some twenty years later, I have understood, why my deep feeling had been well founded. The traditional Planck's Scale is correctly constructed, but it uses false numbers. It is not the Nature that is so much strange, but it is the traditional physics with its wish to constrain Nature according to its own theories. Therefore I know today that no following attempts of the traditional theoretical physics, like the string theory, the inflationary expansion, the black-holes hypothesis, or the most recent multi-universe hypothesis can lead to a new, successful description of Nature.

In the present book, you will find a completely new treatment of the foundation of physics, beginning with the necessary improvements of the traditional physics. Besides the Planck's Scale, it is the alternative solution of the Maxwell's equations of the electromagnetic fields and waves which should be corrected. The third important correction regards the unified treatment of the inanimate as well as animated matter.

The resulting unified description of the whole Nature, named Naturics, has been applied to solve the main scientific and technological problems of our modern world. Some of these astonishing solutions are also presented in this book. Some further examples can be found in my previous books (compare the Naturics website: *www.naturics.de*).

For myself, the mostly fascinating aspect of the unified physics is its wonderful simplicity and universality. The simplicity is important mainly from the theoretical point of view. A simple theoretical construction is easier to understand, to

learn, and to control, than a complicated one. The universality, however, is important in first place from a practical point of view in our globalized world. Independent of your primary interest and education, you can apply the universal theory always in the same way, by using of the same tools.

The last one is that aspect of the unified physics which fascinates me above all. No matter whether we describe the true cosmic influence upon our evolution or upon our present life, or we try to understand how the nuclear-matter or the brain-matter works, or we describe the development of any illness in our body, we are always using the same physical description of the observed matter and phenomena. Even if we should be aware that this description is in no way the ultimate description of Nature, we can be sure that it leads us further towards the understanding of Nature than any traditional description ever before.

Chapter 1. Introduction

1. Introduction

1. 1. The dream of the physicists

What does a physicist dream about? Many physicists dream (profesionally) about a single physical equation explaining the whole Universe. Many others dream about a single elementary interaction joining together all the physical interactions theoretically known up to now. In general, we can say that the physicists' dream is some unified physics, a generally valid theory describing all the physical aspects of our natural world.

Such a single equation or a unified physics is the main dream of the physicists not because they are lazy or opportunist. It is because every „true“ scientist feels that the natural world has been organized in an extraordinarily simple way. This feeling is the reason for one of the most powerful rules being used to verify the correctness of any new physical theory. If two or more comparative theories describe a similar complex of the natural phenomena, that one theory with the highest simplicity and elegance will be most readily accepted by the wide scientific community.

One another verifying criterion for a scientific theory is its ability to predict some new natural phenomena, which can be next observed and confirmed by experimentalists. However, here we have to differentiate between the scientific prediction and the spiritual prophecy. Let me explain a simple example of this difference.

When I am starting to write this introduction I look at the clock above my table. It is ten o'clock in the morning. I am sure that it will be eleven o'clock in one hour. Is it a prophecy? Surely not. It is a scientifically well-founded forecast of an event that should happen with high probability. In this case, we will even want to bet that this forecast is unquestionably correct: surely, one hour past ten o’clock is eleven o’clock. Why can we be so sure there? Because we completely trust the scientific method of the calendar that stands behind the forecast. Our measurement of the hour-course has already proven itself million

fold successfully.

Now, in October 2006, we have autumn in Europe. We are sure however that the next winter will come to us again in only few weeks. This confidence is also based on the calendar that lists all annual seasons exactly and has already also confirmed itself during our life several times. These year-sections recur with the same precision again and again, because the movements of the „regular“ members of the Solar System show a stable character, a periodicity. Surely, if we don't generate any „environmental catastrophe“ in the meantime, then winter will come back also this year.

Why then are we not able to predict also what a weather will be in one month or two? Simply because we still do not possess any reliable weather-calendars for all individual places of the Earth. Science hasn't yet been able to produce such a calendar.

Why are we still not able to predict our global climate? Is it also because we have not developed until now the corresponding weather calendars? This time I must emphatically say „no“. In fact, I have developed a scientific calendar for the forecasts of the global climate about twenty years ago. However, it has not been used yet. The problem with a calendar of the global climate is its „long-termness“. Anyone of us will experience its forecasts only once during our life. Because of the length of its cycle, which may be over thousands of years, it may not even recur in the life of a whole civilization. Therefore, we have to learn about the possible variations of the global climate from our own history rather than from our modern meteorological cards. We have to handle this way because we still have not understood the very nature of the global climatic changes.

In this book you can read about a quite new foundation of physics. This new physics allows us to develop various new ideas explaining how the Nature works. Among them we will also find the ideas that hide behind a cosmic calendar leading to the first truly scientific forecast of the global climate. However, despite the importance and attractivity of the global-climate-change problem, there are many other problems that we have to solve as soon as possible by means of the new physics.

If you are not a member of one of the reachest nations of the world, you will probably wish to have solved at first the problem of the clean water or the healthy food for your nation, before you could excite yourself for the environmental protection. Also if a member of your family is cancer-ill, you will surely wish to have developped some individually successful medicine against the illness prior to any other „global solution“. And all nations of the present world, independent of their wealth, are already today confronted with the problem of the unsufficient sources of the available energy. All these problems, as well as the standard problems of the better and cheeper technologies of any kind, are readily solvable by means of the new physics.

I think these are enough reasons for the reading in the present book, even if it should be your first book about physics at all. I am going to write it as simply as possible. However I have to be as serious as necessary for to hold the information really applicable in any scientific, technical or technological topic.

In order to abandon any misunderstanding by reading and using the book, we have always to remember that physics is merely our human point of view upon the way how the Nature works, or shortly saying, it is our scientific description of Nature. In this sense, no explanation of any natural phenomenon could ever be really ultimate, and no critique of any previous version of our physics should be understood as an attack on the person responsible for the description.

It is also important to bear in mind that we are speaking here only about the scientific description of Nature. Therefore we are not able to consider in this book the most important questions of humanity reaching outside the science. The most important of those questions concern of course the Creator of the world. Such questions can be only answered on a serious religious and not scientific basis. I am sure that we are for ever „forced“ to simply believe in our spiritual description of the world-creation, because no science is able to deliver any serious answers to such questions.

The picture of Nature I am going to present in this book, is grandios so much and Nature seems to be organized so simply, that the first spontaneous thing I can believe about the Creator is that he has to be perfect indeed, and that the physical side of his work could not be done better.

1. 2. No unified physics without some modern ether

It has been often postulated, since ancient times, and with increased frequency around the year 1900, that all manifestations of matter ought to be attributed to a universal, primodrial „substance“ called ether. Physicists differed greatly about the details of how a particular property of matter could be explained by the universal properties of the ether, but it was generally agreed that it was the ether that had to explain matter, and not vice versa.

The relativistic and quantum extensions of our traditional description of Nature have intensified the search after some unified physical theory. They have also strengthened the hope that the „modern“ science of the first half of the 20th century already contains all the necessary „building-stones“ for such a unified theory. Unfortunately, as an accompanying result of these „new“ extensions, particularily as a result of the post-Einsteinian „dogma“ about the absolute constancy and universality of the „vacuum“-speed of light, the traditional science of that time has completely banished any form of ether from the foundations of physics.

During the second half of the previous century, physicists have experienced an increasing need to fill their classical vacuum with many strange, abstract objects, like „virtual particles“ and „zero-field fluctuations“. However, it was already too late for the traditional physics; its decline was not more to stop.

There was also two further reasons for the failure of the traditional physics to find out any real unification. The first of them was accelerated through the II-World-War and the „Cold-War“ race to the atomic-weapons-hegemony. It was commonly thought in that time that the study of the nuclear matter, and particularly of the elementary particles, will bring us to the fundamental building-blocks of matter. Unfortunately, during this „blind“ race we have missed the true universal level of matter. We have gained the levels of the smallest natural particles, like proton, neutron and below, but we have lost the right perspective of the universal quanta of matter.

The second reason was the total neglect of the animated matter in our

traditional physical description of Nature. We have concentrated ourselves on the inanimate matter. We have considered the living organisms as somehow functioning mechanical machines, being additionally equipped with a spiritual rather than physical property of life.

I am not going to analyze in this book the historical development of these three misleading ideas. They all will be „neutralized“ as soon as we introduce our „modernized version of ether“, the universal field of light, unifying the inanimate with the animated matter, and containing the universal quanta of matter, being of the size of the finest dust particles, about million times of the size of proton.

In this book we don't describe the creation of our World. We take the Universe as natural as it is and as old as it is. What we create in this book is only our physical description of this natural World, or shortly, our description of Nature.

Practicaly, we are not creating or destroying something materiell in our World. What we create or destroy are only new and old concepts and ideas leading to our new description of Nature. If we are going to speak, for example, about an empty Universe, it means that we should imagine ourselves some physical Universe, from which all matter is removed for a moment. At the end of our conceptional manipulation on this abstract object, we compare its physical properties with those in our real World and find the new description more or less satisfactory, depending on how easily we are able to understand, which way our real Universe works.

It is exactly that kind of job, which the physicists are primarily educated for. Let us do our work well.

Chapter 2. Equivalence of Electrodynamics with Dynamics

2. Equivalence of Electrodynamics with Dynamics

2. 1. The universal Field of Light (FL)

We introduce a universal, omnipresent, primordial or eternal (depending on one's philosophy) field, which we shall call the field of light (FL).

In order to satisfy our intuitive need of a general, unifying, primordial „ether", we introduce our first - „classic" - axiom of this FL: We fill a traditional, real, three-dimensional space with a scalar species having the physical meaning of mass, henceforth called as „wave mass" and denoted by m_w . Strictly speaking, we introduce some homogenous, isotropic, scalar field of mass. In our new name, wave mass, the essential word is „mass". The additional term, „wave", is introduced only in order to distinguish our scalar, primary mass field from the conventionally understood gravitational or inertial mass of the point-like localizable physical objects.

The second - „quantum"- axiom we need here is this: In this scalar field of mass, a kind of immense atmosphere, there exist quantized „matter waves" (like the conventionally known de Broglie waves). These waves are the only experimentally attainable manifestation of the existence of the mass field itself. The mass field without the waves is unobservable, i.e., it does not exist for any observer (living inside it, of course), just as we do not feel the air surrounding us when there is no wind.

Introducing the third - „relativistic" - axiom we assume the following: Every matter wave is completely determined by its velocity vector **c** and its wave vector **k**. The values of these vectors, denoted by c and k, respectively, are assumed (as a consequence of our first axiom) to be the same in any direction of a local reference frame in the field of mass. (As you see, vectors are symbolized here by bold characters.)

It is this classical massive space, together with the quantized, relativistic matter waves existing in it, that we call as our field of light (FL).

The reader should be aware at this moment, that with our third axiom we have introduced the velocity **c** and the wave vector **k** as two primary physical quantities, prior to the displacement and time. A mathematical physicists would say that we have introduced two physical vector fields, **c** and **k**.

It is well-known in the mathematical physics that any vector field **x** may be divided univocally into a source field $\mathbf{x_S}$, and a vortex field, $\mathbf{x_V}$, namely,

$$\mathbf{x} = \mathbf{x_S} + \mathbf{x_V}.$$

The source field, $\mathbf{x_S}$, is defined as vortex-free field, what means mathematically that $\nabla \Lambda \mathbf{x_S} = »0«$. The symbol ∇ means here the vector of the Nabla-operator and Λ denotes an outer product of two vectors, leading to a bivector (here symbolized by » preceding and « following its sign or value) of the plane constructed over these two vectors. The vortex field, $\mathbf{x_V}$, is defined as source-free field, what means mathematically that $\nabla \cdot \mathbf{x_V} = °0$. The dot · means here the inner product of two vectors, leading to a scalar quantity (here symbolized by ° preceding its sign or value).

Due to our first axiom we have further that

$$\mathbf{x} = x(\hat{\mathbf{u}}_S + \hat{\mathbf{u}}_V),$$

where $\hat{\mathbf{u}}$ stands for a corresponding unit vector. Bearing in mind that the source and vortex fields are mutually independent, we have also that $\hat{\mathbf{u}}_S \cdot \hat{\mathbf{u}}_V = °0$.

Let us note that a unit bivector »1«, defined as $»1« = \hat{\mathbf{u}}_V \Lambda \hat{\mathbf{u}}_S$, traces out an oriented plane in our field of light, i.e., a plane with a determined orientation-circulation along $\hat{\mathbf{u}}_V$ and $\hat{\mathbf{u}}_S$. Note that the defined sequence of the both unit vectors means a choice of one of the two possible orientations of the plane, in our case - from $\hat{\mathbf{u}}_V$ to $\hat{\mathbf{u}}_S$.

2. 2. Fundamental equations of the FL

Our starting fundamental fields of the velocity **c** and the wave vector **k** can be now written like this:

$$\mathbf{c} = \mathbf{c_s} + \mathbf{c_v} = c(\hat{\mathbf{u}}_\mathbf{s} + \hat{\mathbf{u}}_\mathbf{v}), \qquad (1)$$

$$\mathbf{k} = \mathbf{k_s} + \mathbf{k_v} = k(\hat{\mathbf{u}}_\mathbf{s} + \hat{\mathbf{u}}_\mathbf{v}). \qquad (2)$$

In accordance with our axioms, we now define, by means of these two vectors, the internal operators of „space“ and „time“ in the FL.

FL-Nabla:

$$\nabla_{FL} = -\mathbf{k_s} = -k\hat{\mathbf{u}}_\mathbf{s}; \qquad (3)$$

FL-Laplacian:

$$»\Delta_{FL}« = (\nabla_{FL})^2 = \nabla_{FL}\Lambda\ \nabla_{FL}\cdot\ +\ \nabla_{FL}\cdot\ \nabla_{FL}\Lambda = k^2»1«; \qquad (4)$$

FL-time derivative:

$$°(\partial/\partial t)_{FL} = f = kc = -\nabla_{FL}\cdot\mathbf{c_s}; \qquad (5)$$

FL-vorticity:

$$»f«= f»1« = \nabla_{FL}\Lambda\ \mathbf{c_v}. \qquad (6)$$

We now consider the first equation of motion of our matter wave (or wave-particle) in the FL, combining its change in space and in time together:

$$»\Delta_{FL}«\cdot\ \mathbf{c} = °(\partial/\partial t)_{FL}\mathbf{k}. \qquad (7)$$

Now, by introducing into this equation a displacement field $\mathbf{r}^{\pm}$;

$$\mathbf{r}^{\pm} = \mathbf{r_s}^{\pm} + \mathbf{r_v}^{\pm} = \pm r(\hat{\mathbf{u}}_\mathbf{s} + \hat{\mathbf{u}}_\mathbf{v}), \qquad (8)$$

where $r = 1/k$, we obtain the following fundamental equations of the FL:

$$»\Delta_{FL}« \cdot \mathbf{r}^{\pm} = \pm\mathbf{k}, \qquad (9)$$

$$°(\partial/\partial t)_{FL}\mathbf{r}^{\pm} = \pm\mathbf{c}, \qquad (10)$$

where we should choose the same sign (+ or -) simultaneously on both sides of each equation. By choosing the „-“ sign, we describe the reaction of the field of light to the existence of the matter wave (wave-particle) in it. By choosing the „+“ sign, we describe the action of the FL itself on the matter wave. Here, one can directly find certain conceptual correspondence between our two reference frames and the traditional Newtonian action and reaction fields of force.

For simplicity of denotation we will omit henceforth the explicit reference of our space- and time-operator to the FL. Our field of light is the only case considered in this book. We also abandon, where possible, the additional sign ° for scalar quantities.

Let us now define a mass-flux wave vector $\mathbf{y}_m^{\pm}$:

$$\mathbf{y}_m^{\pm} = m_w\mathbf{r}^{\pm} = \pm m_w r^2\mathbf{k} = \pm\Phi_w(m)\mathbf{k}. \qquad (11)$$

By using our time-operator $f = \partial/\partial t$ and the fundamental Eq.(10), we can obtain from this vector all dynamical quantities, which one usually needs in physics. For example, there follow the relations

$$f\,\mathbf{y}_m^{\pm} = \pm m_w\mathbf{c} = \pm\mathbf{p} = \pm f\Phi_w(m)\mathbf{k} = \pm J\mathbf{k}, \qquad (12)$$

and

$$f^2\mathbf{y}_m^{\pm} = \pm f\mathbf{p} = \pm\mathbf{F} = m_w f^2\mathbf{r}^{\pm} = m_w\mathbf{a}^{\pm} = \pm fJ\mathbf{k} = \pm W\mathbf{k}. \qquad (13)$$

From the above definitions of the momentum **p**, action J, force **F**, acceleration **a**, and energy W, there follow immediately other well-known relations of the traditional physics:

$$J = f\Phi_w(m) = fm_w r^2 = m_w cr,$$

$$W = fJ = f^2 m_w r^2 = m_w c^2, \qquad (14)$$

$$\mathbf{p} = m_w \mathbf{c} = J\mathbf{k},$$

$$\mathbf{F}^{\pm} = \pm f\mathbf{p} = m_w \mathbf{a}^{\pm} = \pm W\mathbf{k}.$$

With our axioms, we have thus really introduced all the important quantum and relativistic relations of the FL, being identical with the corresponding dynamical equations of the traditional physics.

2. 3. Maxwell's equations and the Lorentz force

In analogy to the wave mass m_w, we now introduce a wave electric charge q_w and the corresponding charge-flux wave vector $\mathbf{y}_q$. We assume this new wave vector being identical with the mass-flux wave vector (11)

$$q_w \mathbf{x}_q^{\pm} = \mathbf{y}_q^{\pm} = \mathbf{y}_m^{\pm} = m_w \mathbf{r}^{\pm} . \qquad (15)$$

This means that we assume the electric charge q_w to be merely a scaling factor with a role in electrodynamics similar to that played by mass m_w in dynamics. We are going to show now that all important equations of the traditional electrodynamics are consistent with this assumption.

We introduce our new version of the electromagnetic field through an electric field **E** and a wave-magnetic field $\mathbf{B}_w$ in the following manner:

$$\begin{aligned} \mathbf{p} &= J\mathbf{k} = m_w \mathbf{c} = q_w \mathbf{B}_w ; \\ \mathbf{F}^{\pm} &= \pm f\mathbf{p} = \pm W\mathbf{k} = m_w \mathbf{a}^{\pm} = q_w \mathbf{E}^{\pm} . \end{aligned} \qquad (16)$$

Note that the unit of dimension of the wave-magnetic field $\mathbf{B}_w$ is the traditional tesla multiplied by meter, so it is not directly the magnetic field induction $\mathbf{B}_L$

known from Lorentz-force formula. However, we adopt this name - wave-magnetic field - for our new field, $\mathbf{B}_w$, in order to point to its direct connection with the traditional field of the magnetic induction, $\mathbf{B}_L$.

We determine the relationship between them by using a projection ψ of the bivector »B_w« = $\nabla \wedge \mathbf{B}_w = \nabla \wedge \mathbf{B}_{w,\mathbf{v}}$ onto a corresponding traditional (axial) vector $\nabla \times \mathbf{B}_{w,\mathbf{v}}$, leading to the third unit vector of the traditional reference frame: $\hat{}\mathbf{1} = \hat{\mathbf{u}}_\mathbf{v} \times \hat{\mathbf{u}}_\mathbf{s} =$ ψ(»1«). In this 3-dimensional reference frame we have indeed the relation: $\mathbf{B}_L$ = ψ(»B_w«) = $\nabla \times \mathbf{B}_{w,\mathbf{v}} = B_L\hat{}\mathbf{1}$. There follow some further useful relations: $\nabla \cdot \mathbf{B}_w = -B_L$; $\nabla \wedge \mathbf{B}_w = B_L$»1« , where we have, according to Eq.(16), that $B_L = kB_w = km_wc/q_w = p/rq_w$; here you can directly compare the units of B_L and B_w .

We also introduce an auxiliary dimensionless quantity, ε_q , called charge permittivity of the FL, as $\varepsilon_q = q_w^2/Jc$, and a related quantity, magnetic permeability of the FL, μ_q, as $\mu_q = 1/\varepsilon_q c^2$.

Considering our definition of Laplacian (4), one can realize that the first fundamental equation of the FL, Eq.(9), contains the following two relations:

$$\nabla \cdot \mathbf{r}_\mathbf{s}^{-} = 1; \qquad (17)$$

$$\nabla \wedge \mathbf{r}_\mathbf{v}^{-} = -\text{»}1\text{«}. \qquad (18)$$

Now, we multiply Eq.(17) by ρ_q/ε_q , where $\rho_q = q_w/r^3$ is the electric charge density. Using our definition (16) of the electric field, we obtain directly the first of the Maxwell's equations, Gauss's law for electricity

$$\nabla \cdot \mathbf{E}_\mathbf{s}^{-} = (1/\varepsilon_q)\rho_q \, . \qquad (19)$$

In a similar way, applying the relation $\rho_q/\varepsilon_q = fkB_w$ for Eq.(18), we obtain Faraday's law of the electromagnetic induction:

$$\nabla \wedge \mathbf{E}_\mathbf{v}^{-} = -(\partial/\partial t)\text{»}B_{w,v}\text{«}. \qquad (20)$$

Let us consider now the second fundamental equation of the FL, Eq.(10). Its multiplication by the same expression as above yields $(\partial/\partial t)\mathbf{E}^{-} = -(1/\varepsilon_q)\rho_q\mathbf{c}$. If we now introduce two further traditionally used quantities, the electric induction $D_q = \varepsilon_q E = q_w/r^2$, and the electric current density $\mathbf{j}_q = \rho_q\mathbf{c}$, we can rewrite this equation as

$$(\partial/\partial t)\mathbf{D}_q^{-} = -\mathbf{j}_q. \qquad (21)$$

The density vector, $\mathbf{j}_q$, satisfies the following relations

$$\Phi_w(\mathbf{j}_q) = r^2\rho_q\mathbf{c} = fq_w(\hat{\mathbf{u}}_s + \hat{\mathbf{u}}_v) = \mathbf{I}_q, \qquad (22)$$

where $\mathbf{I}_q$ denotes the traditional-physics vector of the electric-current intensity. In order to recognize Eq.(21) as the Ampere-Maxwell equation, it is sufficient to use our previous definitions of $\mathbf{D}_q$ and $\mathbf{k}_v$ and rewrite the vortex component of the left-hand side of this equation into the following form

$$(\partial/\partial t)\mathbf{D}_{q,v}^{-} = f\,\mathbf{D}_{q,v}^{-} = -fq_w k^2\hat{\mathbf{u}}_v = -fq_w k\nabla\cdot\,\text{»}1\text{«} = -\nabla\cdot\,\text{»}\mathbf{I}_{q,v}\text{«}$$

Therefore, Eq.(21) takes on the form

$$-\nabla\cdot\,\text{»}\mathbf{I}_{q,v}\text{«} + (\partial/\partial t)\mathbf{D}_{q,s}^{-} = -\mathbf{j}_q. \qquad (23)$$

It is the well-known Ampere-Maxwell equation indeed, with one reservation, however: The minus sign at the front of the first term on the left-hand side of Eq.(23) is reversed in comparison with that one usually accepted in Maxwell's theory.

The fourth Maxwell's equation is fulfilled identically, as one has

$$\nabla\Lambda\text{»}B_{w,v}\text{«} = 0, \qquad (24)$$

because of the definition $\text{»}B_{w,v}\text{«} = \nabla\,\Lambda\,\mathbf{B}_{w,v}$.

Taking a divergence on both sides of Eq.(21), and using (19), one obtains directly the continuity equation

$$\nabla \cdot \mathbf{j}_{q,\mathbf{s}} + (\partial/\partial t)\rho_q = 0. \qquad (25)$$

Finally, let us now consider an action force exerted on a charge q_w in an electromagnetic field. Using our definitions and the following relation

$$\mathbf{c_s} \cdot \text{»}B_{w,v}\text{«} = -\mathbf{c_s} \times \psi(\text{»}B_{w,v}\text{«}) = -\mathbf{c_s} \times \mathbf{B}_L,$$

we obtain readily

$$\mathbf{F}^+ = q_w\mathbf{E_s}^+ + q_w\mathbf{E_v}^+ = q_w\mathbf{E_s}^+ - q_w\mathbf{E_s}^+ \cdot \text{»}1\text{«}$$

$$= q_w\mathbf{E_s}^+ - q_w\mathbf{c_s} \cdot \text{»}B_{w,v}\text{«} = q_w\mathbf{E_s}^+ + q_w\mathbf{c_s} \times \mathbf{B}_L. \quad (26)$$

This is evidently the Lorentz „action-force“ formula obtained directly from the same field equations as the above set of Maxwell's equations. This is our important observation: The equation of motion in an electromagnetic field arises from the same fundamental equations of our field of light as the electromagnetic field itself.

2. 4. No electromagnetic waves in vacuum

From our definitions (4) and (5) of the operators Δ and ∂/∂t, we see that any quantity X in the field of light fulfills the homogeneous d'Alembert equation (wave equation):

$$\Box X = \Delta X - (1/c^2)(\partial^2/\partial t^2)X = 0.$$

However, it does not mean that we are able to „create“ electromagnetic waves in vacuum. The equations of the previous sections suggest that the electromagnetic fields (and waves) cannot exist if there are no their sources, charges ρ_q and currents $\mathbf{j}_q$. Let us consider this situation more exactly, because our new theory differs in that important point from the traditional Maxwellian

electromagnetic theory.

If we try to remove the field sources from the electromagnetic field, what means that we try to put ρ_q and $\mathbf{j}_q$ equal to zero, we obtain, for example, the Ampere-Maxwell equation (23) in the following, incomplete form

$$-\nabla \cdot \langle\!\langle \mathbf{I}_{q,v} \rangle\!\rangle + f\varepsilon_q \mathbf{E}_s^- = 0. \qquad (27)$$

Multiplying (27) by $\mu_q f$, we have

$$-\nabla \cdot (f \langle\!\langle \mathbf{B}_{w,v} \rangle\!\rangle) + (1/c^2) f^2 \mathbf{E}_s^- = 0,$$

or due to Faraday's Eq.(20),

$$\Delta \mathbf{E}_v^- + k^2 \mathbf{E}_s^- = k^2 (\mathbf{E}_v^- + \mathbf{E}_s^-) = 0.$$

On the strength of the linear independence of $\mathbf{E}_v^-$ and $\mathbf{E}_s^-$, the only solution of the last relation is $|\mathbf{E}_v^-| = |\mathbf{E}_s^-| = 0$, which means an absence of the electric field in any space which the sources are removed from. It is thus impossible to emanate any electromagnetic waves in a space void of the electromagnetic sources at all.

It was evidently pure chance that had allowed Maxwell to obtain the wave equation fulfilled in vacuum. When adding his new (in his times) displacement current to Ampere's equation, Maxwell had apparently assumed the component with the vortex current to have an opposite sign as he ought to have assumed, probably as a direct consequence of the then chosen sign of the electric current (from plus to minus). Therefore, in place of Eq.(27), he had considered a similar equation, but one with the reversed sign, which in our notation takes on the form $\nabla \cdot \langle\!\langle \mathbf{I}_{q,v} \rangle\!\rangle + f\varepsilon_q \mathbf{E}_s^- = 0$. Hence, on the contrary to our result, he had obtained that: $\Delta \mathbf{E}_v^- - (1/c^2)(\partial^2/\partial t^2)\mathbf{E}_s^- = 0$.

Maxwell did not take into consideration the fact that the electric field in Ampere's equation was the vortex component, and in his own displacement term it was the source component of the total electric field. Since he also did

not distinguished the action field from the reaction field, instead of the last equation, he wrote a similar but incomplete equation, $\Delta\mathbf{E} - (1/c^2)(\partial^2/\partial t^2)\mathbf{E} = 0$, where the mentioned indexes are simply omitted.

The equation obtained in such a procedure is a wave equation, of course. However, we now see the fortuitousness of its appearance in Maxwell's theory of the electromagnetic waves in vacuum. According to our theory, the electromagnetic waves can exist outside the sources, but never outside the field of light, where there are no sources.

2. 5. Dynamical analogies to Maxwell's equations and Lorentz force

In previus sections, we have shown that the assumed equivalence of the material field $\mathbf{y}_m$ with the charge field $\mathbf{y}_q$ leads directly from the fundamental equations of the FL to all electrodynamical equations of the traditional physics. Maxwell's traditional theory of electromagnetism was the most successful part of the traditional physics. Therefore, it could be useful and instructive to check, which experiences of this successful theory could be also stimulating in our corresponding dynamical description of Nature. Taking directly advantage of the assumed equivalence between $\mathbf{y}_m$ and $\mathbf{y}_q$, we are going now to deduce the dynamical analogies to Maxwell's equations and the Lorentz-force formula.

We introduce some dynamical counterparts of our auxiliary electrodynamical quantities. First of all, we define the „acceleration permittivity“ of the FL as: $\varepsilon_m = m_w^2/Jc = 1/G_w$, where G_w can be treated as a generalized „gravitational constant“. Next, we introduce a related quantity, the velocity permeability of the FL, μ_m, being $\mu_m = 1/\varepsilon_m c^2$, the mass-current density, $\mathbf{j}_m$, as $\mathbf{j}_m = \rho_m\mathbf{c}$, $= k^2\mathbf{I}_m$, and the planar mass density $\mathbf{D}_m^{\pm} = \varepsilon_m\mathbf{a}^{\pm} = m_w k^2(\hat{\mathbf{u}}_s + \hat{\mathbf{u}}_v)$.

The equations we are looking for, are then as follows. The „Gauss law for mass“, in analogy to Eq.(19), is:

$$\nabla\cdot\mathbf{a}_s^{-} = (1/\varepsilon_m)\rho_m = f^2,$$

or

$$\nabla \cdot \mathbf{D}_{\mathrm{m}}^{-} = \rho_m \,. \qquad (28)$$

The „dynamical Faraday's law“, in analogy to Eq.(20), is:

$$\nabla \Lambda \mathbf{a}_{\mathbf{v}}^{-} = -(\partial/\partial t)\text{»f«}, \qquad (29)$$

that by analogy may be called as the law of acceler-rotational induction.

The „dynamical Ampere-Maxwell equation“, in analogy to Eq.(23), is:

$$(\partial/\partial t)\mathbf{D}_{\mathrm{m}}^{-} = -\mathbf{j}_m. \qquad (30)$$

Finally, the „Gauss law for vortivity“, in analogy to Eq.(24), is:

$$\nabla \Lambda \text{»f«} = 0. \qquad (31)$$

Divergence put over Eq.(30) leads, together with Eq.(28), to scalar continuity equation for mass m_w:

$$\nabla \cdot \mathbf{j}_{\mathrm{m},\mathbf{s}} + (\partial/\partial t)\rho_m = 0,$$

or

$$\nabla \cdot \mathbf{p}_{\mathbf{s}} + (\partial/\partial t)m_w = 0. \qquad (32)$$

In a similar way, one obtains a bivector continuity equation for the rotating mass, »m_w« = m_w»1«, „outspread“ in the plane of bivector »1«:

$$\nabla \Lambda \mathbf{p}_{\mathbf{v}} - (\partial/\partial t)\text{»}m_w\text{«} = 0. \qquad (33)$$

The simplest interpretation of the dynamical Maxwell's equations is a straight-forward translation of their electrodynamical counterparts into the language of the dynamical terms.

Thus, one can read Eq.(28) like this: the source (linear) acceleration-field flux,

multiplied by $\varepsilon_m = 1/G_w$, „flowing“ across a closed surface, is equal to the total mass confined inside this surface.

From Eq.(29) it follows that any change in time of a flux of vorticity in the FL is compensated with an induction in that field of a vortex (rotational) acceleration field (with the Lenz-type rule for the minus sign). Any flux of vorticity, if constant in time, means a constancy of the vortex acceleration.

As concerns Eq.(30), the simplest interpretation is that the total current of mass is always a sum of the source and vortex components of the temporal change of the planar mass density.

The fourth equation, Eq.(31), is just a statement of the fact that the rotational field »f« (= f »1«) is sourceless, like the magnetic Gauss law represents a lack of any scalar sources of the magnetic field »B_w« .

The above simplest interpretation of the dynamical analogies to Maxwell's equations is not the only one of such possibilities. These dynamical equations can be read, for example, also in the following, more general and perhaps more important fashion.

It can be seen that Eq.(28) may be used as a definition of the second-order time-derivative operator; the second-order time derivative in the FL being a scalar source of the acceleration reaction field $\mathbf{a}^-$, whereas as a result of (5), the first-order time derivative is a scalar source of the velocity reaction field $\mathbf{c}^-$.

Similarly, because of (6), Eq.(29) means that the vortex acceleration field is produced as a second-order time derivative of the unit bivector »1«, i.e., as an acceleration of the existing rotation or as a change in time of the rotation velocity. As long as the rotation goes through a uniform motion (in atomic or cosmic space), there is no FL-reaction accelerating or delaying this process of rotation; in other words, there is no effect of inertia. A uniform rotation accompanying any uniform translational motion of a massive object (wave-particle) is as natural a phenomenon in the FL as a steady vortex magnetic field accompanying a uniform translational motion of charged particles, for example, a flow of a steady electric current along a wire conductor. As a matter of fact, it

is one and the same phenomenon described in two different languages.

Further, the scalar continuity equation (32) can be interpreted as a conservation law for a linear (source) momentum, whereas the bivector continuity equation (33) as a law of conservation of the angular (vortex) momentum.

Finally, let us consider the dynamical analogy to Lorentz force. As a result of Eq.(14) we can write

$$\mathbf{F}^{\pm} = m_w \mathbf{a}_s^{\pm} + m_w \mathbf{a}_v^{\pm} = m_w \mathbf{a}_s^{\pm} \pm m_w \mathbf{c}_s \times \mathbf{f}, \qquad (34)$$

where we have used the relations $\mathbf{a}_v^{+} = -\mathbf{a}_s^{+} \cdot 1 = -\mathbf{c}_s \cdot f = \mathbf{c}_s \times \psi(f) = \mathbf{c}_s \times \mathbf{f}$. Equation (34) really defines the Lorentz force formula, where the role of the electric charge is played by the mass m_w and that of the electromagnetic field by the acceler-rotational field.

2. 6. The unified dynamical and electrodynamical description of Nature

Despite the reached equivalence of the dynamical and electrodynamical description of the natural phenomena, the mass-charge duality is apparent only, because the electric charge has the only sense of a scaling factor in our formalism, on the contrary to the fundamental role of mass. Using the charge scaling instead of the natural mass scaling, we transform our considerations from the dynamical phenomena to the equivalent electrodynamical ones. Electrodynamics is equivalent to dynamics in the sense that any electro-dynamical phenomenon has its counterpart in dynamics.

Let us look at Eq.(16) again:

$$\mathbf{F}^{\pm} = \pm f\mathbf{p} = \pm fJ\mathbf{k} = \pm W\mathbf{k} = m_w \mathbf{a}^{\pm} = q_w \mathbf{E}^{\pm} . \qquad (35)$$

By using our previously introduced auxiliary quantities ε_q and $\varepsilon_m = 1/G_w$, we can rewrite this equation to another interesting form:

$$\mathbf{F}^{\pm} = \pm\varepsilon_q G_w J(\hat{\mathbf{u}}_\mathbf{s} + \hat{\mathbf{u}}_\mathbf{v}) \ . \qquad (36)$$

The equations (35) and (36) summarize all our results obtainable with the language and terminology of the traditional physics. Firstly, they unite Newton's equation of motion, $\mathbf{F} = \partial\mathbf{p}/\partial t$, with de Broglie's wave equation $\mathbf{p} = J\mathbf{k}$, and with Planck-Einstein equation, $W = Jf$. It means a distinct evidence of the wave-particle duality as an essential attribute of the FL. Secondly, these relations clearly state that dynamical forces and electrodynamical forces are one and the same interaction. What we use to recognize as electromagnetic interactions acting on individual charged objects in some microscale, has the same physical foundation also on much larger – up to astronomical – scale for complexes of such objects, where we prefer to speak about the dynamical counterpart of the same interactions under the name of gravity.

For myself, the most impressive form of this unified force is the form given by Eq.(36), where we have evidently the electrodynamical factor of the electric charge permittivity ε_q coupled with the gravitational factor G_w (our counterpart of the traditional gravitational constant) and the quantum-mechanical factor of action J. In a universe where the FL exists in accordance with our axioms and assumptions, all the gravitational, electrodynamical and dynamical forces are of the same physical nature. And of course, I believe that I and you, we all are living in such a universe.

2. 7. Summary of the traditional description of Nature

In summary of the traditional description of Nature let us lay stress once more on the fact that the above presented unification of electrodynamics with dynamics was only possible because we have applied our alternative solution of the traditional Maxwell's equations, with the reversed sign in Ampere-Maxwell equation. Although this new theory was published in a scientific journal already 1990, the present book is to my knowledge the first book presenting this alternative to the wider community.

As an additional general conclusion from the presented formalism let us

emphasize the clear evidence of the inseparability of the translational and rotational motions in all physical phenomena that occur in our Universe.

In my opinion, the presented knowledge completes any traditional search for the physically unexplainable point-like elementary particles, the nonexisting vacua, and the superfluous gravitational or nuclear interactions. The main task of the following sections of this book is to present an exemplary way of further modifications of the foundation of physics, being free of the whole traditional ballast, and promising successful applications in our physical description of the inanimate as well as the animated matter.

Chapter 3. Unified foundation of physics

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3. 1. The limits of the traditional physics

All people, independent of their educational level, are convinced that the rules of Nature are very simple and univocal. Nature surely does not need a separate dynamical, electrodynamical and thermodynamical rules governing the natural processes and watching the natural phenomena. Our successful unification of the traditional electrodynamics with dynamics, presented in the previous chapter, is already a great improvement of our description of Nature. We have seen that the electrodynamical and dynamical physical equations describe the same natural relations, though with something different languages.

Nevertheless, our further progress towards some complete unification is not possible with any of such „traditional languages“. The traditional physics is not able to improve ist own foundations. In this physics, there is no place for the animated matter. There is also no possibility to change the traditional defnitions of the fundamental physical quantities like energy, action, electric current or magnetic induction. But without a necessary treatment of the living matter, we cannot understand the natural processes in our own bodies. And without to redefine some of the fundamental physical quantities, we have no chance to realize the physicists' dream about the single equation „regulating“ all natural phenomena.

All people see some problems when they should be forced to leave all their goods and begin a new part of their life without those old things. Especially the older scientists are one of the most conservative groups of people. It lasts always a long time before they are ready to accept some new dogma in their own area of science. The question is mostly not whether or not the new dogma will be accepted but merely when. Do we really need to understand Nature now better than yesterday? Because you are reading this book now, you demonstrate that you are interested to learn something about the new physics. So let us go to the new axiomatics of our unified physical description of Nature.

3. 2. General assumptions of the unified physics

Our unfied foundation of physics is based on a universal, quantized and relativistic physical field of mass. An average level of this universal matter field, called the field of light (FL) is assumed to be directly unobservable. Only the quantized, relativistic fluctuations of this FL are observable. These fluctuations, the relativistic quanta of matter, occasionally called as fluctuons, form the whole matter of our Universe.

Obviously, such a universal physical field of mass is much more a modernized version of the old ether, rather than a simple emptiness of an abstract, mathematical vacuum. We abandon here any abstract, purely mathematical definition of space or space-time, at least as a starting point. I think that space and time should have clear physical meaning from the very beginning. Such physical space and time cannot exist without matter. This means that it is the existence of matter itself, with its observable properties, that allows us to realize space and time, and not vice versa.

In the unified physics, each observable state of matter is a suitable composition of „pure" levels of matter, completely distinguishable by a dimensionless index μ. Each of these „pure" μ-levels consists of its own fluctuons, and all fluctuons belonging to the given μ-level are identical. In this way, all the matter observable in our Universe is assumed to be some specific structure of the FL. In other words, the FL „creates" the observable physical space, time and matter. Now, we are going to describe the way, in which this „creation" happens.

If we follow the traditional relativity theory, we are told to consider the four-dimensional space-time as an abstract space built upon three spatial and one temporal vectors, perpendicular to each other. However, in the previous chapter, we have seen that also the fundamental equations of the traditional physics describe mostly some two-dimensional translation and a two-dimensional rotation, rather than the „classical" case (3+1) of the traditional relativity theory. We will see that it is more plausible to consider the second possibility (a two-dimensional area and a two-dimensional time) rather than the traditional option. This unconventional point of view helps us to better understand the

elementary processes with a participation of a single quantum of matter.

We can imagine the two-dimensional oriented plane of a fluctuon as a bivector of area »A« defined by the outer product of two displacement vectors,

$$»A« = \mathbf{r_1} \Lambda \mathbf{r_2} = r^2 »1«,$$

where »1« is the unit bivector. The plane »A« is perpendicular to the adjoined axial vector, $\mathbf{r_3} = \mathbf{r_1} \times \mathbf{r_2}$, of the traditional 3-dimensional space. The two-dimensional time »t« is a bivector reversal to our previously defined bivector of frequency or FL-vorticity »f«, Eq.(6),

$$»t« = (1/f) »1«,$$

On the other hand, the bivector of frequency can be imagined as an oriented plane, perpendicular to the traditionally used axial vector of the angular frequency, that is, perpendicular to the vector of „internal rotation“ of a quantum of matter, connected in the traditional physics with its spin.

In summary of the first assumption, let us repeat that all observable matter, changing its properties in space and time, is just a product of the FL. Physically this means that all observable levels of the inanimate and the animated matter originate in the universal FL. Mathematically, this assumption means that all possible (i.e., all the known, as well as some still unknown) equations of physics are just suitable modifications of our mathematical definition of the FL. This will be demonstrated in the following sections.

The second important asumption of the unified physics concerns the absolute limitation of the speed of light, as introduced with the traditional theory of relativity. I think, Nature does not need any limits at all. Also the unified physics does not consider the speed of light to be a universal constant of Nature. Of course, the speed of light depends on the state of matter in which the light is propagating. It is also true that for a given state of matter, the speed of light is the highest possible speed of all. But there are countless different states of matter, each having its own specific speed of light. The speeds of light

on different „pure“ levels are therefore different by definition. Furthermore, we assume that for a given „pure“ μ-level of matter, there are no other constituents of the matter besides the proper μ-fluctuons. This means that for each μ-level of matter, the corresponding speed of light is the only possible speed. By the way, this is the reason for the notion of the field of light used here.

Since a deviation of such a μ-level from the average level of the FL is theoretically unlimited, then the characteristic speed of light is also unlimited. So, for example, our neighbouring interplanetary cosmic space, as a good approximation of a „pure“ μ-level of matter, with $\mu = \mu_{vacuum}$, shows the specific value of **c** known as the „vacuum“ speed of light, c_{vacuum}. Nevertheless, as our physics shows (in section 3.5), the value of **c** in nuclear matter, that is inside atomic nuclei or in a nuclear plasma, is much higher than c_{vacuum}. On the contrary, as known from quantum chemistry, the speed of light in the molecular matter is lover than c_{vacuum}. Still lower values of **c** conform to animated matter.

Because of the „liberation“ of the speed of light from the limitation set to it by the relativity theory, the legendary Einstein's relation between energy and mass contains no longer any constant. Energy and mass are independent physical quantities again. Therefore, mass does not need to move during an energy transfer. In the FL mass is not movable. Energy alone changes places in the matter field, being continuously redistributed among different fluctuons of the matter field, and spreading an impression of the endless activity in each part of our Universe. Consequently, only an energy transfer is observable as a relative motion of the transferring objects. It is thus the total energy of a material body that is connected with any motion of the body, and not its mass, whether a molecule, a car, or a moon.

In a similar way, we also conclude that the electric charge, being just a scaling factor equivalent to the mass, is not movable in the FL. An electric current in the unified physics transports energy, but it transports neither electric charge nor mass.

More precisely, we have to think about any motion or current as a transfer of energy between the neighbouring fluctuons, tightly filling the whole observ-

able space, rather than a transport of energy by any massive carriers from one point to another across an empty space.

In summary, our second assumption means the unlimited speed of light.

The third important assumption of the unified physics concerns a relation between the animated and the inanimate matter. Nowadays the traditional physics claims to have described almost all the natural phenomena undergoing our observation. Unfortunately, the contemporary physics too often separates the inanimate matter from the animated one. The unified physics should take into consideration again, as in the ancient past, the fascinating phenomena occuring in the animated matter.

Not only from a spiritual point of view, but also from the point of view of our unified physics, a human being is a unique example of the most complicated objects in our Universe. Human body represents a composition of all possible natural levels of matter complexity. Let us see now, what does it mean in details.

As we already know, the unified physics assumes the universal FL being an average level of the general, relativistic, and quantized matter field. This average FL is a place of permanent constitution and destruction of the universal material membranes, the most fundamental building elements of our Universe. These membranes consist of the universal fluctuons of the FL, which physical properties are in no way extremal but lie (in opposition to the traditional asumptions of the elementary particle physicists) in quite „regular“ ranges of the observable natural values. We shall see leter in this book that, for example, the universal dimension of such a membrane-fluctuon equals to about 5.1 nm, its characteristic electric potential is about 21 mV, and its „own“ speed of light is about 26 km/s. They are quite common natural values indeed.

One of the other physical properties, that we need here to further discuss the quantum properties of the universal matter field, is the energy density. As we will see later, the planar density of energy, i.e., the energy that „belongs“ to the quantum-area of every quantum of matter, is a natural constant, being the same for all matter quanta, on all possible levels of matter complexity. Would it be

possible for our Universe to reach a state of a complete equilibrium, where the energy would be distributed with this universal amount over all universal quanta of the FL, the Universe became unobservable. Only the permanent fluctuations of the FL create the observable matter. In order to apply now our new concept of the universal membanes, we have to observe the spatial density of the field energy, which is not a constant.

If the spatial density of energy actually „delivered“ to a given place of the FL is higher than the universal spatial density, then the membranes of the FL could be locally desintegrated into the fundamental quanta of the inanimate matter – the largest molecules of the traditional physics (like proteins or nanotubes, or something like that) – or in our new language, into the inanimate fragments of the universal membrane.

On the other side, if the actual spatial density of a given region of the FL is at the moment lower than the universal value, then the membrane of this region would either tend to suck up some amount of the energy from its surroundings or tend to prevent any further escape of its energy. This prevention could be reached if the part of the membrane becomes closed, wraping the whole region. In my opinion, the most probable shape of such elementary, closed membrane becomes the typical shape of a donut. In that moment an elementary quantum of the animated matter has been born. For example, prions and other simplest viruses are not much more than such elementary quanta.

It can be advantageous for the further reading, to bear in mind, that although the quanta of the animated matter are characterized with the spatial energy density being lower than its universal value, the total amount of the energy „closed“ in every living quantum is higher than the universal quantum of energy on the FL-level, whereas every quantum of the inanimate matter contains a lower portion of energy.

In summary of our third assumption, we see that as a result of the continuous redistribution of the matter-field energy among various fluctuons, the membranes of the FL could be locally desintegrated into the fundamental quanta of the inanimate matter – the largest molecules – or to be locally closed to form the fundamental quanta of the animated matter – the simplest possible

cells of the living matter.

If the largest molecules become „bombarded“ with aditional quanta of energy from natural sources (as stars, for example) or in our scientific laboratories (by cooking, for example), they can further increase their energy density, becoming atoms, and next even atomic nuclei, with the highest possible energy density.

Similarly, if the fundamental quanta of the living matter will find an advantageous localization allowing them to „eat“ (slowly consume) further portions of energy from their environment, they could grove to more complicated biological cells, and next to nerve cells and even to brain cells, with the highest amount of energy per quantum.

As we see, the main difference between animated and inanimate matter is the direction of the energy transfer. Animated matter uses the inanimate matter as a source of energy, but never vice versa. A corresponding rule in the traditional physics of inanimate matter is known as the second law of thermodynamics. The progressive evolution of animated matter is possible only parallel to the „reversed“ evolution, or better, convolution in the world of inanimate matter. The farther away is a level of the animated matter from the average FL, the stronger compression of the field energy should be produced by the adjoined systems of inanimate matter (from molecules to atomic nuclei), in order to keep the animated matter alive. If I am correct, the above means, for example, that a certain form of nuclear energy drives my brain, when I am working on this book, and also your brain, when you are reading it.

3. 3. Some remarks about the relation to the traditional point of view

We have supposed here that matter consists of fluctuons, the matter-field quanta adjustable to the actual state of matter, rather than of the traditionally considered invariable elementary particles. Consequently, we think that Nature starts neither from quarks nor from atoms to create her fantastic constructions we see around us. We ourselves are composed of various fluctuons rather than of atoms, and I suppose the same is true of any physical object in our Universe.

Imagine, for example, a solid-state crystal irradiated with x rays. Having an excess of energy, the crystal radiates the x rays energy back to its environment. Traditionally we understand the appearing diffraction pattern as a reflection of the atomic nature of the crystal. In doing so, we consider the atoms constituting the irradiated crystal as being practically identical with the atoms of the same crystal without the additional radiation, and also almost identical - with the exception of the valence orbitals – with the free atoms of a corresponding gaseous state of the crystal material.

In our unified physics, the diffraction pattern of the irradiated crystal also reflects a similar, spatially ordered set of fluctuons, as that one constituting the nonirradiated crystal. However, the fluctuons of the irradiated part of the crystalline body have some new properties in comparison with the „nonirradiated“ fluctuons. Each of the „irradiated“ fluctuons now contains a modified center with accordingly reduced dimensions and enhanced energy density. These modified fluctuons exists only in the irradiated part of the crystal and only during its irradiation.

Therefore, each diffraction pattern reflects the crystal structure only approximately, with the approximation depending on the intensity and frequency of the incoming radiation. Obviously, a very intensive electromagnetic radiation can locally change the crystal structure, especially if its state approaches a phase transition, a method widely used by production of the perfect crystals. But only the most energetic „radiation projectiles“, with a much higher amount of the transferable energy than even that of the hardest x-ray photons, are able to create in a solid-state body such drastically reduced centers of the enhanced energy density, which can be interpreted as the traditional atomic nuclei. Those „classical“ atomic nuclei exist in the solid-state body only during such relatively high-energetic experiments as the famous Rutherford experiment with a gold foil. Normally, the central parts of the solid-state fluctuons are much more extended, with appropriately lowered energy density. From the point of view of the unified physics, there are neither empty nor almost empty zones inside any solid-state body. The same is true of an atom or molecule.

In the present book, each physical quantity, as well as each mathematical relation between such quantities, refer in principle to an individual fluctuon

unless a system of fluctuons is considered. So, analogously to the energy, electric current, or magnetic field of a single fluctuon, we have to think, for example, of the mass density or the temperature of this fluctuon. By that, all these values characterize the fluctuon as a whole. The idea of the field of light makes any experimental investigation of the internal structure of the fluctuon superfluous, or even meaningless. Independent of the matter state and the method of investigation, the investigated fluctuon can never be identical with that noninvestigated. According to our assumption, all fluctuons originate in the unobservable FL. Therefore also the „deepest" properties of the fluctuons must remain unobservable. In other words, no scientist becomes ever capable to create his own universe.

In our postulated world of fluctuons, there govern pure relativistic rules. This means, for example, that it is not possible to transfer energy inside a material object (whether an atomic nucleus, a living cell, or the cosmic space) with a speed other than the speed of light adjusted to the actual state of the object. The only possibility to change the speed of this transfer is „to switch" to another state of matter, with the required speed of light.

The relativistic rules mean also that in the world of fluctuons, all equations of mathematical physics are neither integral nor differential equations. The internal operators of the FL, as ∇_{FL}, »Δ_{FL}«, and °$(\partial/\partial t)_{FL}$ (see sect. 2.2) play a role similar to that of the spatial- and time-derivatives of the conventional physics, but they are just operators of multiplication by k, k^2, and $f = ck$, respectively.

Although in principle the unified physics should be treated as completely independent of the conventional physics (this is due to the quite different basic assumptions concerning space, time, matter and motion), it may be worthwhile to point out at this place the conceptual difference between the common photons and the fluctuons of the FL. The photons are quanta of a moving (or being transferred) energy, that is of the energy on the way from one place in space to another. Our fluctuons, on the contrary, are quanta of the immovable universal FL. We can imagine the excitation energy of this field being either successively transferred between the adjacent „resting" fluctuons or carried across this field by the corresponding photons.

3. 4. The unified family of all physical quantities

The four standard physical quantities of the traditional physics are length, time, mass and the electric current (or electric charge). Now, we are going to define our unified family of all physical quantities, which allows us to reduce the number of the necessary standard quantities to just two.

Let us shortly explain here, that during the fourteen years past since the first publication of the unified family, even the last step of the reduction of number of the necessary standard quantities to a single physical quantity has been already also successfully realized and applied to the actual definition of our Cosmic Hierarchy (as described in the book *„The cosmic carousel of life"*). However, the theoretically possible, ultimate reduction of this number to zero cannot be realized until the scientific community has widely accepted the new, unified physics. Only some scientific world-commission can decide which way we wish to follow towards such an ultimate simplification of our physics.

Fortunately, the standard version of our unified physics, using two fundamental physical quantities, as described in the present chapter, does not depend on any common consensus, and it is easy to follow for every scientifically interested person, not necessarily a professional theoretical physicist.

Our standard reduction will be complete if we succeed in defining the quantum mass – the assumed primary property of the FL (compare chapter 2) – by means of some properly chosen spatial and temporal characteristics. The equivalence of the quantum electric charge to its mass has been principally demonstrated already in the previous chapter. Nevertheless, in this previous chapter we have used the traditional definitions for almost all physical quantities, including such fundamental quantities as energy or the electric current. However, in order to reach the full standard unification of all physical quantities, we have to unify their mathematical properties (dimensions) together with their units and their universal values. We will see now, that some of the seemingly very familiar physical quantities of the traditional physics will now obtain new, often very exciting properties. Energy will become our most exciting example.

The only possibility to define the scalar mass °m exclusively by means of some spatial and temporal characteristics of the FL is to choose the bivector of the quantum area »A« and the bivector of the (local) quantum time »t«, and to define the quantum mass as the inner product of these two bivectors:

$$°m = »A« \cdot »t« = »t« \cdot »A«. \qquad (37)$$

If mass °m is the mass of a given fluctuon, then »A« means the „living“ area of the fluctuon in the FL. This fluctuon does not need more space to exist, but on the other hand, it cannot exist in the same state on a smaller area. As discussed in the previous section 3.2, the bivector of the local time »t« can be understood as a period of the internal rotation of the spatially extended fluctuon. Note that it is not possible to construct a similar model in which both the mass and time are scalars, as in the case of the traditional physics.

Changing also, where necessary, the mathematical characteristics (as scalar, vectors, or bivectors) of some other physical quantities (the most important examples being energy, frequency, electric current, electric field and magnetic induction), I have succeeded in constructing of an extremely uniform system of mutual relations between all physical quantities, as presented in Figs. 1 and 2. This system, called „the unified family of all physical quantities“, defines all possible physical quantities only by means of those two chosen quantities, area »A« and time »t«. All possible physical quantities means here that we define all physical quantities known as well as some yet unknown (or simply not used) in the traditional physics.

The definition of the united family is complete, including not only the mutual relations between these quantities, but also their corresponding units and the universal values of each of these quantities, i.e., the values which every given quantity takes on in the universal material level of the FL.

As the two standard physical values of the unified family used in calculation of all other universal values, I have chosen those two physical values, which are most accurately controllable experimentally; they are the values of the Planck's constant of action *h* and the elementary electric charge *e*. I have simply assumed that the presently known values of *h* and *e* are equal, respectively, to

the universal value of action, °J = h°1, and the universal value of the electric charge °q = e°1.

Of course, if the unified family tends to be accepted as the new definition of all physical quantities, it should be possible to demonstrate easily that the choice of these universal values, as well as the previous choice in Eq. (37) of the proper (unified) unit of mass, as kg = m^2s, agree with all measurable physical constants and with other definitions of the physical units. Let us now demonstrate this agreement in detail.

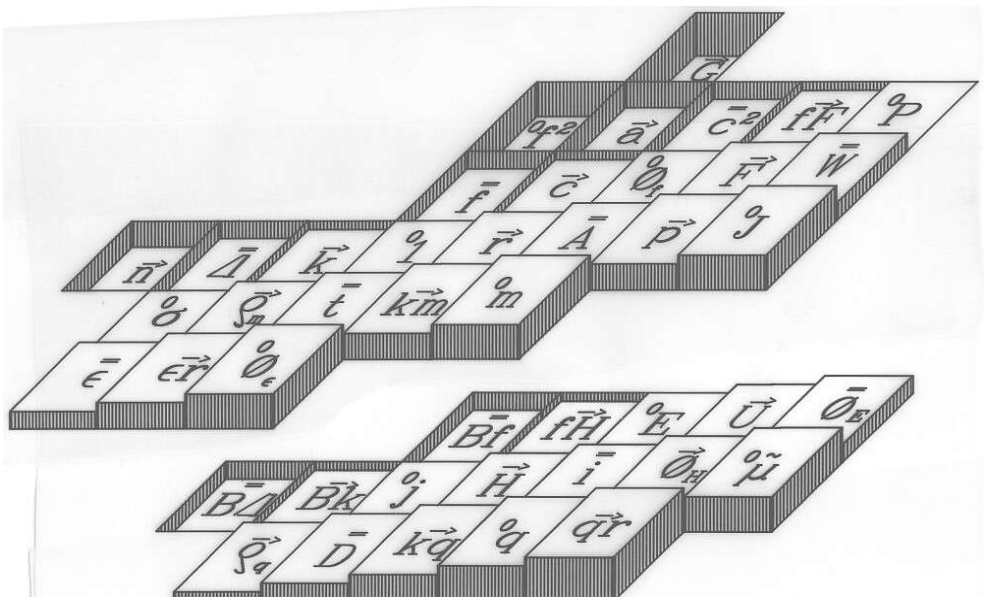


Figure1. The chosen „basic“ physical quantities in mutual correlations: spatial in the horizontal WE direction; temporal in the NS direction; material in the vertical direction of each plane. Upper plane: the dynamical subfamily; lower plane: the electrodynamical subfamily. *(The list of the used symbols is given in Table 1; Bivectors are here marked with doubled stroke above the corresponding symbols).*

The main members of the family are presented in Fig.1 in two subfamilies, „dynamical“ above and „electrodynamical“ below. The third, theoretically

possible, „thermodynamical“ subfamily contains only one important physical quantity, temperature T. Therefore this third subfamily will not be presented graphically, but the temperature will be simply added to the family.

Not all readers of this book should be physicists, therefore we explain in the table below the symbols used in the above figure; we are listing the symbols from top to bottom and from left to right. The rows are numbered with it from -3 to +2 and the columns from -3 to +4. This numeration (not shown in Fig.1) is chosen that way that the scalar universal unity °1 lies on the crossing of row zero and column zero. The numeration can help us in some later applications of the family.

Table 1. Symbols of the physical quantities of the unified family
a) dynamical plane

Row	***Column***	***Dimen-sion***	***Symbol***	***Physical quantity***
-3	1	vector	$\mathbf{G}$	gravitational factor
-2	0	scalar	$\mathbf{f^2}$	frequency square
-2	1	vector	$\mathbf{a}$	acceleration
-2	2	bivector	$\mathbf{c^2}$	squared velocity of light
-2	3	vector	$\mathbf{fF}$	temporal change of force
-2	4	scalar	$\mathbf{P}$	power
-1	0	bivector	$\mathbf{f}$	frequency
-1	1	vector	$\mathbf{c}$	velocity of light
-1	2	scalar	$\mathbf{\Phi_f}$	circulation (flux of frequency)
-1	3	vector	$\mathbf{F}$	force
-1	4	bivector	$\mathbf{W}$	energy
0	-3	vector	$\mathbf{n}$	spatial density
0	-2	bivector	Δ	Laplace operator

Row	*Column*	*Dimen-sion*	*Symbol*	*Physical quantity*
0	-1	vector	**k**	wave vector
0	0	scalar	**1**	universal unity
0	1	vector	**r**	length
0	2	bivector	**A**	area
0	3	vector	**p**	momentum
0	4	scalar	**J**	action
1	-2	scalar	**σ**	electric conductivity
1	-1	vector	$\boldsymbol{\rho_m}$	mass density
1	0	bivector	**t**	time
1	1	vector	**km**	linear distribution of mass
1	2	scalar	**m**	mass
2	-2	bivector	**ε**	dielectric factor
2	-1	vector	**εr**	dielectric length
2	0	scalar	$\boldsymbol{\Phi_\varepsilon}$	optical area (flux of ε)

Let us note that some traditional „electrostatical“ quantities are to be found in the table above. It is not a mistake. They were traditionally defined in such a way that their true nature is more dynamical than electrodynamical. Our unification brings the necessary order in the historical confusion. The seeming intermixture of the subfamilies is no problem at all in our unified family. As we will see soon, the subfamilies are related to each other by dimensionless numerical coefficients. These numbers appear in our unification exclusively in result of the historical „independence“ of the traditional definitions of the dynamical and electrodynamical physical quantities. Regardless of these differences, all these quantities are just specific modifications of our fundamental area and time.

Table 1. Symbols of the physical quantities of the unified family
b) electrodynamical plane

Row	*Column*	*Dimension*	*Symbol*	*Physical quantity*
-1	0	bivector	**Bf**	temporal change of magnetic induction
-1	1	vector	**fH**	temporal change of magnetic field
-1	2	scalar	**E**	electric field
-1	3	vector	**U**	electric potential
-1	4	bivector	$\mathbf{\Phi_E}$	flux of electric field
0	-2	bivector	**BΔ**	planar distribution of magnetic induction
0	-1	vector	**Bk**	linear distribution of magnetic induction
0	0	scalar	**j**	(planar) current density
0	1	vector	**H**	magnetic field
0	2	bivector	**i**	electric current
0	3	vector	$\mathbf{\Phi_H}$	flux of magnetic field
0	4	scalar	**μ~**	magnetic dipole moment
1	-1	vector	$\mathbf{\rho_q}$	electric charge density
1	0	bivector	**D**	planar distribution of electric charge
1	1	vector	**kq**	linear distribution of electric charge
1	2	scalar	**q**	electric charge
1	3	vector	**qr**	electric dipole moment

How can we see that all these listed physical quantities are directly obtainable from the area bivector »A« and time bivector »t«? In order to learn the answer, let us observe the exact organization of the unified family on Fig.1. In both subfamilies, the mutual relations between the individual family members have, firstly, a spatial character in the „West-East“ (left-right) direction of the

subfamily plane, secondly, a temporal character in the Nort-South (top-bottom) direction of the plane, and thirdly, a material-dependent character in the direction vertical to that plane.

Actually this means, that to make a step within the family to the next quantity on the right is equivalent to multiplication of the given quantity by the length vector **r**, whereas a step to the next quantity on the left is equivalent to multiplication by the reciprocal wave vector **k**, where $\mathbf{k} = (1/r)\mathbf{1} = (1/r)(\hat{\mathbf{u}}_S + \hat{\mathbf{u}}_V)$ (compare Eq.(8)). Of course, every double step to the right means a multiplication by the area »A« = $\mathbf{r}_1 \wedge \mathbf{r}_2$, and every double step to the left means a multiplication by Laplacian »Δ« = $\mathbf{k}_1 \wedge \mathbf{k}_2$, and so forth.

Similarly, a change to the adjoining physical quantity immediately below the given quantity just means a multiplication of the qiven quantity by the bivector of time »t«, and a change to the upper adjoining quantity – a multiplication by the reciprocal bivector of frequency (or rotation) »f«, where »f« = $(1/t)$»1«.

Having these simple rules in mind, we are able indeed to write directly some familiar examples of the best known physical equations, like these:

$$\text{»W«} = \mathbf{F} \wedge \mathbf{r}, \qquad {}^{\circ}J = \mathbf{p} \cdot \mathbf{r} = \text{»W«} \cdot \text{»t«},$$

$$\mathbf{c} = \text{»f«} \cdot \mathbf{r}, \qquad \mathbf{F} = \text{»f«} \cdot \mathbf{p}, \qquad (38)$$

$${}^{\circ}E = \mathbf{k} \cdot \mathbf{U}, \qquad \text{»i«} = {}^{\circ}\text{q»f«} = \mathbf{H} \wedge \mathbf{r}.$$

Let us note once more, that the outer product, Λ, results in higher dimension, and the inner product, ·, results in lower dimension of the new physical quantity. The only difference between these relations and those commonly used in the traditional physics arises from our unified multivector characteristics of some of the physical quantities. This leads, for example, to the bivector of energy »W«, instead of the traditional scalar energy, or to the bivector electric current »i« in place of the vector current used in the traditional physics.

From Fig.1, however, there also follow many completely new relations. There

is, for example, the equivalence of the fluctuon momentum **p** to its volume **V** in our universal matter field, **p** = »W« · **r** = **V**, surely not less „extravagant“ for the traditionalists among physicists than our mass definition in Eq.(37). These new relations cannot be made understandable in the language of the traditional physics, based on four independent standard quantities. Such new relations make perhaps the most important practical difference between the two descriptions of Nature – the traditional physics and our unified physics.

As we have marked with the third, vertical dimension of the Fig.1, simultaneously with any spatial and temporal change of the actual position within the unified family, a corresponding transformation of the material dependence, expressed through the material factor, takes place. The material factor, μ^{lev}, is defined as the integer exponent of the material-level index μ. The integer exponent index *lev* increases by one each time we multiply the given quantity by the vector **r**, decreases by one each time we multiply the quantity by the reciprocal vector **k**, increases by 2 if multiplying the quantity by the bivector »t«, and decreases by 2 with each multiplication by the reciprocal bivector »f«.

As we can see in Fig.1, some of the traditionally „typical“ electrodynamical quantities, for example, the dielectric factor »ε« (commonly called dielectric constant), or the electric conductivity °σ, belong to our dynamical subfamily. As mentioned above, this attachment, though necessary for the full unification, makes no problem at all, because it disappears if we realize a simple relation between both subfamilies. As a result of the previously demonstrated equivalence of electrodynamics to dynamics (comp. chapter 2), the electrodynamical subfamily is completely equivalent to the corresponding part of the dynamical subfamily. The electrodynamical family arises by simple multiplication of the latter by the scalar factor of

$$°j = °q/°m = e/m_u,$$

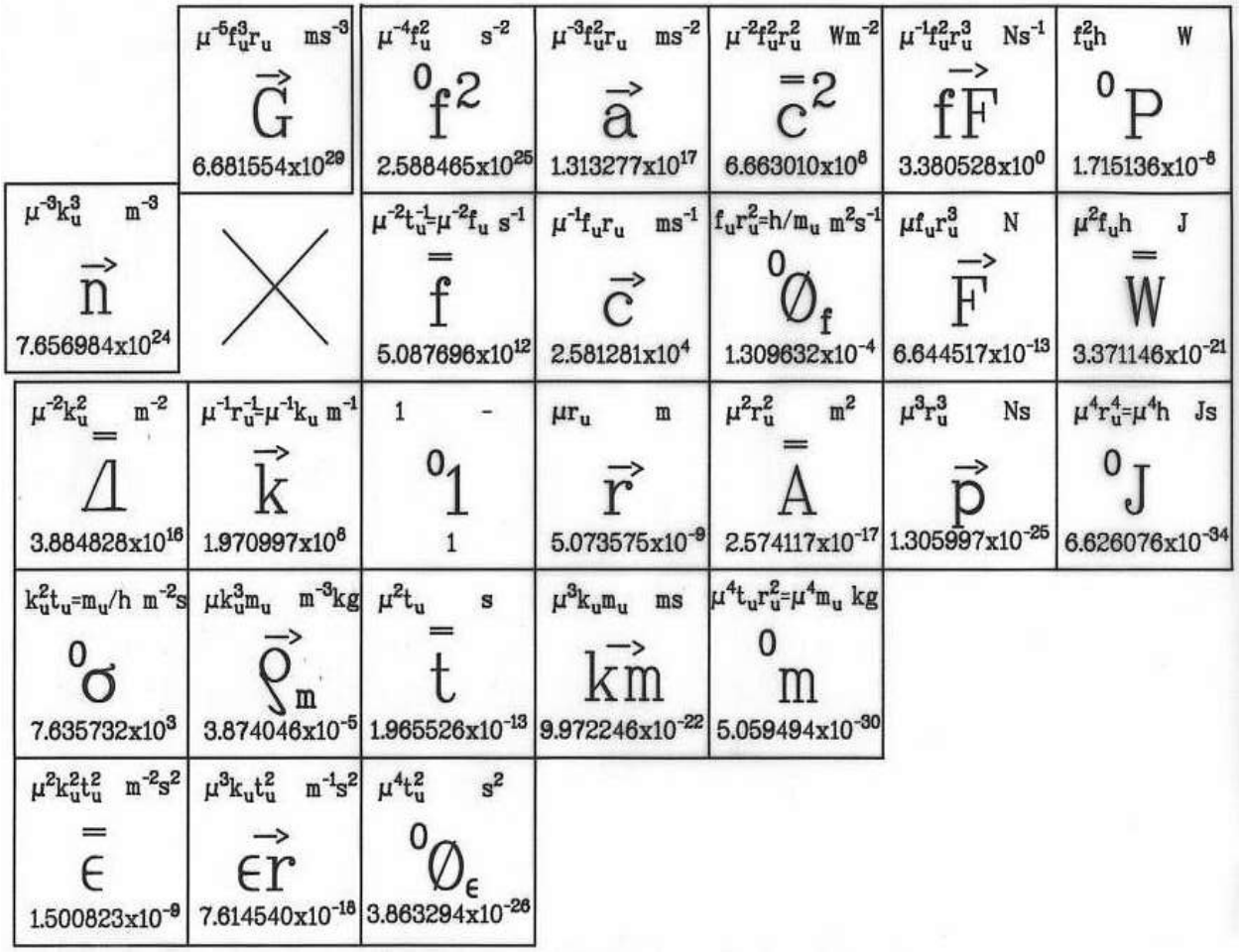
that is by the ratio of the electric charge of a fluctuon to its mass; this factor is a constant value. For example, the magnetic field **H**, positioned exactly below the length **r**, is defined as **H** = (°q/°m)**r**, and the magnetic dipole moment °μ˜ as °μ˜ = (°q/°m)°J.

A detailed realization of the unified family of physical quantities is presented in Fig.2. It is an extended version of Fig.1, containing some additional informations (note the shifted positions of the **G** and **n** „boxes“, simply reducing the picture size). Which are those additional informations?

Firstly, each „box“ of Fig.2, attached to a given physical quantity, contains the complete definition of this quantity expressed by our standard bivectors of space »A« and time »t«, or by the quantities closely related to them, that is, **r**, **k**, and »f«. This definition, given in the upper left corner of each square, also includes the direct dependence on the material factor μ^{lev}. The subscript „u“ in any symbol in this corner means that, after having the total material dependence extracted in the form of the material factor, we can express the remaining part of the definition just through the corresponding universal values of the definig standard quantities.

Secondly, each box of Fig.2 contains the universal value of the shown physical quantity. This value, located below the quantity symbol, is a simple combination, according to the quantity definition, of the two chosen starting universal values of action, $J_u = h = r_u^4$, and the electric charge, $q_u = e = (t_u r_u^3)^{1/2}$. By the way, this last (necessary for the unification) relation of the elementary charge, with the square-root, was, according to my opinion, the reason why the equivalence of the electrodynamics to dynamics won't be reached already earlier.

Thirdly, the size of the unit of each physical quantity is given in the upper right corner. All the units together build a system of physical units closely related to the international system SI. However, some modifications of the SI system are inevitable to secure the required simultaneous consistency within all three categories of correlations in the unified family of all physical quantities. That means: 1) the spatial-temporal-material correlations, as in Fig.1, establishing the relative position of each quantity in the family; 2) the correlations of the universal values; 3) the correlations of units. For example, as a result of the introductory assumption (37), setting that kg = m^2s, we also have to assume that Ω = m/s or T = C/kg = Vs/m^3 = A/m^2.


$\mu^{-5}f_u^3r_u$ ms^{-3}
$\vec{G}$
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$\mu^{-4}f_u^2$ s^{-2}
$^0f^2$
$2.588465x10^{25}$
$\mu^{-3}f_u^2r_u$ ms^{-2}
$\vec{a}$
$1.313277x10^{17}$
$\mu^{-2}f_u^2r_u^2$ Wm^{-2}
$=c^2$
$6.663010x10^8$
$\mu^{-1}f_u^2r_u^3$ Ns^{-1}
$\vec{fF}$
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f_u^2h W
^0P
$1.715136x10^{-8}$
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$\vec{n}$
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$=f$
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$\mu^{-1}f_ur_u$ ms^{-1}
$\vec{c}$
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$1.309632x10^{-4}$
$\mu f_ur_u^3$ N
$\vec{F}$
$6.644517x10^{-13}$
μ^2f_uh J
$=W$
$3.371146x10^{-21}$
$\mu^{-2}k_u^2$ m^{-2}
$=\Delta$
$3.884828x10^{16}$
$\mu^{-1}r_u^{-1}=\mu^{-1}k_u$ m^{-1}
$\vec{k}$
$1.970997x10^8$
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μr_u m
$\vec{r}$
$5.073575x10^{-9}$
$\mu^2r_u^2$ m^2
$=A$
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$\vec{p}$
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^0J
$6.626076x10^{-34}$
$k_u^2t_u=m_u/h$ $m^{-2}s$
$^0\sigma$
$7.635732x10^3$
$\mu k_u^3m_u$ $m^{-3}kg$
$\vec{\rho}_m$
$3.874046x10^{-5}$
μ^2t_u s
$=t$
$1.965526x10^{-13}$
$\mu^3k_um_u$ ms
$\vec{km}$
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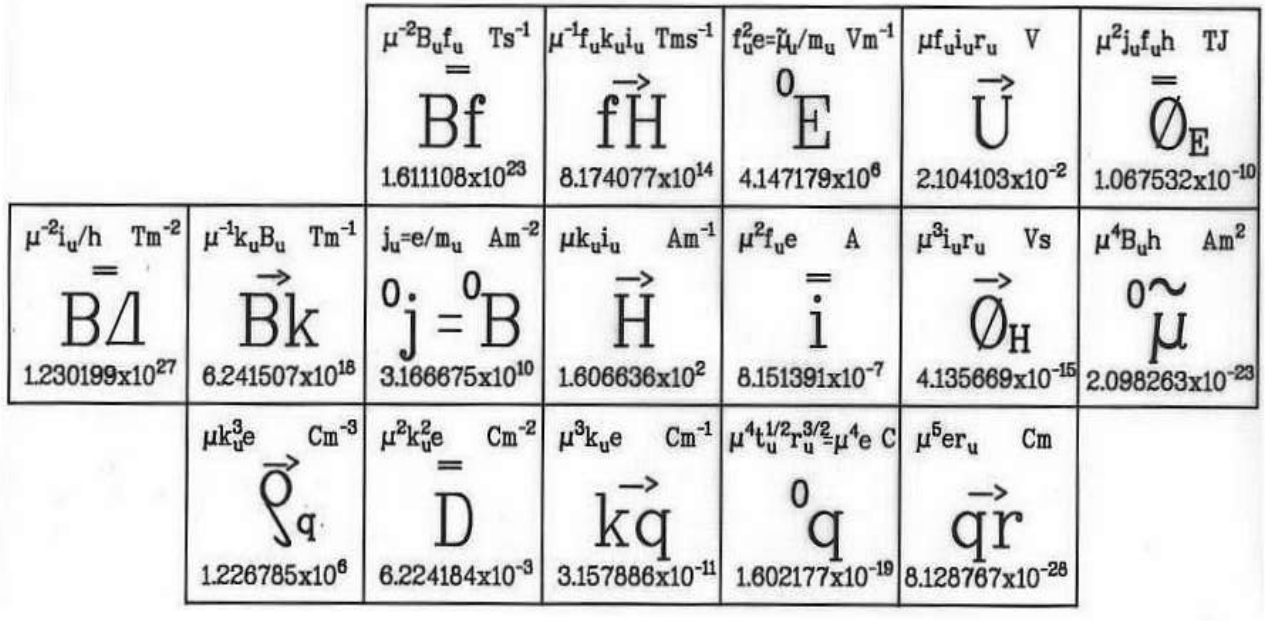


Figure 2. Definition of the unified family of all physical quantities
The defining relations are given in the left upper corners, the definitions of units in the right upper corners, and the universal values below the symbols of the corresponding physical quantities. The dynamical plane is shown on the preceding page (note the shifted positions of G and n in relation to Fig.1- for the picture-size reduction) and the electrodynamical plane is shown here above.

The last group of the additional information, that has found no more place on the single figure, is presented in Table 2 below. This table contains the mostly used further physical quantities, which are equivalent to one of the previously shown „basic“ quantities. It is of course our arbitrary decision, which one from any group of the equivalent quantities will be presented in Figs.1 and 2 as the „basic“ quantity of the group; they all are equivalent to each other in the group. The traditional physics has simply produced much too many of the seemingly independent physical quantities in course of the last two centuries.

Table 2. The frequently used physical quantities equivalent to one of the „basic“ quantities of the unified family (*listed in Table 1***)**
(The equivalent quantities are sorted here alphabetically; d *means the dynamical plane,* e *means the electrodynamical plane of the unified family)*

Equivalent physical quantity	***Equiva-lent symbol***	***Corresponding „basic“ quantity***	***„Basic“ symbol***	***Plane***
angular momentum	$\mathbf{J}$	action	$\mathbf{J}$	d
diffusion coefficient	$\mathbf{D}$	circulation	$\mathbf{\Phi_f}$	d
elastic force coefficient	$\mathbf{k}$	circulation	$\mathbf{\Phi_f}$	d
magnetic induction	$\mathbf{B}$	planar current density	$\mathbf{j}$	e
electric inductance	$\mathbf{L}$	length	$\mathbf{r}$	d
electric resistance	$\mathbf{R}$	light velocity	$\mathbf{c}$	d
electric resistivity	$\mathbf{\rho}$	circulation	$\mathbf{\Phi_f}$	d
electrical mobility	$\mathbf{\mu_n}$	planar distribution of electric charge	$\mathbf{D}$	e
energy density	$\mathbf{\rho_W}$	light velocity	$\mathbf{c}$	d
frequency flux	$\mathbf{J/m}$	circulation	$\mathbf{\Phi_f}$	d
heat flow	$\mathbf{G}$	squared light velocity	$\mathbf{c^2}$	d
length cube	$\mathbf{r^3}$	momentum	$\mathbf{p}$	d

Equivalent physical quantity	*Equiva-lent symbol*	*Corresponding „basic“ quantity*	*„Basic“ symbol*	*Plane*
magnetic flux density	**B**	planar current density	**j**	e
magnetic induction	**B**	planar current density	**j**	e
nabla-minus operator	∇	wave vector	**k**	d
optical path	$\mathbf{n_\lambda}$	time	**t**	d
optical path square	$\boldsymbol{\varepsilon r^2}$	optical area	$\boldsymbol{\Phi_\varepsilon}$	d
period	**T**	time	**t**	d
planar density	$\mathbf{k^2}$	Laplace operator	Δ	d
pressure	**p**	light velocity	**c**	d
quantum of rotation	**K**	circulation	$\boldsymbol{\Phi_f}$	d
radiation intensity	**S**	squared light velocity	$\mathbf{c^2}$	d
reciprocal length	**1/r**	wave vector	**k**	d
reciprocal velocity	**1/c**	mass density	$\boldsymbol{\rho_m}$	d
reciprocal volume	**1/V**	spatial density	**n**	d
refraction index	**n**	mass density	$\boldsymbol{\rho_m}$	d
refraction index square	$\mathbf{n^2}$	dielectric factor	$\boldsymbol{\varepsilon}$	d
rotation	$\boldsymbol{\omega}$	frequency	**f**	d
second time derivative	$\boldsymbol{\partial^2/\partial t^2}$	frequency square	$\mathbf{f^2}$	d
spatial density of current	**i/V**	linear distribution of magnetic induction	**Bk**	e
temporal force density	$\boldsymbol{\partial F/\partial t}$	temporal change of force	**fF**	d
thermodynamical mobility	$\mathbf{B_n}$	Laplace operator	Δ	d
time derivative	$\boldsymbol{\partial/\partial t}$	frequency	**f**	d

Equivalent physical quantity	*Equiva-lent symbol*	*Corresponding „basic“ quantity*	*„Basic“ symbol*	*Plane*
time derivative of B	$\partial B/\partial t$	temporal change of magnetic induction	**Bf**	e
time derivative of H	$\partial H/\partial t$	temporal change of magnetic field	**fH**	e
time square	$\mathbf{t^2}$	optical area	$\mathbf{\Phi_\varepsilon}$	d
velocity	**v**	light velocity	**c**	d
viscosity coefficient	$\boldsymbol{\eta}$	length	**r**	d
voltage	**U**	electric potential	**U**	e
volume	**V**	momentum	**p**	d
volume expansion	$\partial V/\partial t$	force	**F**	d
vorticity	$\boldsymbol{\Omega}$	frequency	**f**	d
wavelength	$\boldsymbol{\lambda}$	length	**r**	d
work	**W**	energy*	**W**	d

(*) Note here once more that we have to use (because of our unification) the equivalent symbol W for energy if we wish to use simultaneously the electric field E having no common equivalent symbol.

At this point the reader is strongly advised to stop for a moment and study Fig.2 carefully, supported with Fig.1, and Tables 1 and 2. One already needs a certain time in order to comprehend how important is that unification, at which one looks here. How this unification changes the basis of our physics, one can comprehend the best if one understands, in which way the variety of all possible physical equations, with all their units and constants, can be reduced on our single equation of the field of the light (compare Eq.(7)).

That sounds extraordinarily „cool“ to be able to say something like that, but we cannot exaggerate with our enthusiasm. The unified family admittedly means an enormous jump in the mathematical description of Nature. However, it is by

no means the end of our physical description of Nature. Completely in the opposite. Only now, we receive into our hands a truly effective tool to explore the Nature, in her entire variety and beauty. We also have now a chance, probably for the first time in our history, to gain the necessary knowledge allowing us to avoid some serious damaging of our natural environment; we only have to apply this knowledge in practice. The time taken here to study the unified family will be also recompensated with the gained confidence in the unified physics.

Despite the seeming simplicity of the unified family of physical quantities, it is impossible to discuss it exhaustively in a single book. It would mean trying to discuss the differences between the unified physics and the whole traditional physics at once. Here, I limit myself to just one instructive example, which is my personal favorite example, because its consideration has given me the first strong belief to be on the right way towards the present unification. This example shows a remarkable symmetry of some fundamental physical relations, following directly from Fig.2, and combining the electromagnetic fields and sources with the dynamical mass and circulation. The other most important equations of physics will be discussed in the following section.

In Fig.2 we read directly that the electric and magnetic sources are given by

$$°q = »t« \cdot »i«, \tag{39}$$

$$°\mu\tilde{} = »A« \cdot »i«, \tag{40}$$

and the electric and magnetic fields are given by

$$°E = »f« \cdot »i« = °f^2°q, \tag{41}$$

$$°B = »\Delta« \cdot »i« = °\Delta^2°\mu\tilde{}. \tag{42}$$

Separate relations between the sources and between the fields can be obtained using the quantum of circulation, $°\Phi_f$, the fundamental constant of the unified physics,

$$°\Phi_f = »A« \cdot »f« = °J/°m = h/m_u,$$

which gives

$$°\mu^{\sim} = °\Phi_f \, °q, \tag{43}$$

$$°E = °\Phi_f \, °B. \tag{44}$$

On the other hand, the „cross“ relations between the sources and fields can be obtained using the mass °m,

$$°q = °m°B, \tag{45}$$

$$°\mu^{\sim} = °m°E. \tag{46}$$

All the above equations are beautiful, aren't they? Could you see among them those equations stating that magnetic dipole moment is either a flux of the electric current or a circulation of the electric charge?

3. 5. The most important equations of physics in the unified version

As we have seen in the previous section, the known as well as some unknown to date physical equations can be simply formulated after a short inspection of Fig.2. In this section we present some of the most important of these equations. We will see that in our unified physics all those equations appear directly in their proper, quantum and relativistic form, showing also directly their material dependence.

We start with the unified version of de Brglie's equation (see Fig.2):

$$\mathbf{p} = °J\mathbf{k} = \mu^4 h\mathbf{k}, \tag{47}$$

where μ is the material-level index. As assumed, the value of Planck's constant h belongs exclusively to the universal FL level, where $\mu = 1$. Equation (47) thus makes it evident, through the material factor μ^4 on the right-hand side, that one makes an error of many orders of magnitude trying to calculate the momentum

p of a particle in the traditional way, that is, using the incomplete original de Broglie's relation, $\mathbf{p} = h\mathbf{k}$. For example, in the atomic space with $\mu = 0.001$, the „lost“ material factor is as high as 10^{-12}.

The same is true of Planck's equation,

$$»W« = °J»f« = \mu^4 h»f«, \qquad (48)$$

and of Schrödinger's equation

$$»W« = °J»f« = (°J^2/°m)»\Delta« = \mu^4(h^2/m_u)»\Delta«, \qquad (49)$$

with the same material factor of μ^4.

Also Einstein's equation takes on a material independent form only if the velocity of light is properly adjusted to the individual state of matter, that is, if

$$»W« = °m»c^2«. \qquad (50)$$

The commonly used form of this equation, setting $c = c_{vacuum}$, can also be made material-independent by using the following definition of the corresponding μ_{vacuum} level of matter:

$$»W« = °m»c^2« = (\mu_{vacuum}^2/\mu^2)°m»c_{vacuum}^2« \qquad (51)$$

A direct comparison with the velocity definition in Fig.2, giving $c = \mu^{-1} c_u$, shows that μ_{vacuum} takes on the value of

$$\mu_{vacuum} = 2\pi/10^7\alpha, \qquad (52)$$

where α is the fine-structure constant of the traditional physics. Only for this specific „classical“ value (52) of the matter-level index μ, can be assured that $\mu_{vacuum} c_{vacuum} = c_u$, which fulfils Eq.(51). Note that it is exactly this contact with the conventional model of physics, with its „absolute“ speed of light c_{vacuum}, where the mysterious constant α and the completely artificial numerical

factor of $2\pi/10^7$ appear in the theory.

Worse still, traditional physics has attached the dimension of N/A^2 to the doubled value of the latter factor and named it the magnetic permeability of some abstract „vacuum“ in which the speed of light were c_{vacuum}. The unified physics does not need these mysterious constants at all (compare Eq.50); c_{vacuum} is just the speed of light on the μ_{vacuum} level of matter, the level existing probably only in some physical laboratories or (approximatelly) in the interplanetary space of our Solar System. Besides, in the unified physics, the magnetic permeability is a dimensionless factor, because of the relation of units $N = A^2$.

Let us now jump to electrodynamics. All our fluctuons (matter waves) fulfill the homogeneous d'Alembert equation, because we have (for example, from Fig.2)

$$»c^2« \cdot »\Delta« - °f^2 = 0. \qquad (53)$$

As we see, all fluctuons fulfill also the continuity condition

$$°\mathbf{j_k} = »f« \cdot \boldsymbol{\rho}_{\mathbf{q}}. \qquad (54)$$

Taking now into consideration our revised definition of the magnetic field and the magnetic induction (also following from Fig.2) we obtain Faraday's equation in two separate forms: one for the magnetic field **H**,

$$°E\mathbf{k} = »f« \cdot \mathbf{H}, \qquad (55)$$

and one for the magnetic induction °B:

$$°E»\Delta« = °B»f«. \qquad (56)$$

Both forms provide us with a relation between a spatial change of the electric field and a temporal change of the corresponding magnetic entity.

The Gauss equation now reads simply

$$»D« \cdot \mathbf{k} = \boldsymbol{\rho_q}. \qquad (57)$$

On the other hand, Ampere's equation

$$\mathbf{k} \cdot \mathbf{H} = °j, \qquad (58)$$

and Maxwell's displacement equation

$$»f« \cdot »D« = °j, \qquad (59)$$

are now completely independent equations, showing that the electric current can be directly produced either by a spatial variation of the magnetic field **H** or by a temporal variation of the electric field »D«, and not otherwise (compare Eqs.(55) and (56)).

Poisson's equations

$$»\Delta« \cdot \mathbf{U} = »c^2« \cdot \boldsymbol{\rho_q}. \qquad (60)$$

is directly connected with Faraday's Eq.(55) and Gauss's Eq.(57) because of the relation

$$»\Delta« \cdot \mathbf{U} = »f« \cdot \mathbf{H}. \qquad (61)$$

Coulomb potential equation is a scalar equation,

$$°E = ° f^2°q = (1/\varepsilon)q/r^2, \qquad (62)$$

and Ohm's equation,

$$\mathbf{U} = »i« \cdot \mathbf{c} = »i« \cdot \mathbf{R}, \qquad (63)$$

shows that the velocity of light in any state of matter can be interpreted as the electric resistance against the energy transfer executed by the electric current »i«. This leads to our unconventional relation of units Ω = m/s.

Note that all these electrodynamical equations, used in the traditional physics, and reviewed above, Eqs.(54) to (63), arrive in their proper relativistic form, independent of any material factor, in contrast to the previously discussed

equations of the traditional quantum physics, Eqs. (47) to (49) and Eq.(51). This means that the common electrodynamical theory is applicable not only to the individual quanta of matter (individual fluctuons), but also to their arbitrary composition. On the contrary, the common quantum theory is applicable only to the individual quanta or to „pure“ μ-levels of individual quanta, but it is not applicable to the material objects containing fluctuons with different values of the level index μ. This difference seems to be the reason for the much wider practical spread of the electrodynamical equations in comparison with the quantum equations.

Nevertheless, the traditional electrodynamical theory also has its serious difficulties with the formulation of a unified, material-independent equation of motion. The problem lies, in my opinion, in the unfortunate material-dependent definition of the Lorentz force, which can also be seen in Fig.2. Namely, we have to introduce the material factor of $1/\mu^3$ in order to compare the size of the dynamical force **F** with its Lorentz counterpart, °q°E or °q**c** · **H**,

$$\left| \mathbf{F} \right| = (1/\mu^3)°q°E = (1/\mu^3)°q\mathbf{c} \cdot \mathbf{H}. \qquad (64)$$

But on the contrary, all classical dynamical definitions of force are material-independent and equivalent to each other,

$$\mathbf{F} = °m\mathbf{a} = »f« \cdot \mathbf{p} = \mathbf{G}°m^2/r^2 . \qquad (65)$$

The additional equivalent expression of force, based on the equivalence between momentum and volume, **p** = **V**, (compare Tab.2), leading to

$$\mathbf{F} = °m\mathbf{a} = »f« \cdot \mathbf{V}, \qquad (66)$$

suggests our new interpretation of the force itself, as a measure of the temporal expansion of each fluctuon. This is however always a local expansion, describing a positive energy transfer into this volume. In opposition, the reaction force describes an analogous contraction of the volume losing (or transfering out) its energy. The local space expansion, as described with Eq. (66) has also nothing in common with the traditionally assumed (in cosmology) expansion of our Universe. Quite on the contrary, this equation shows that a

large part or a whole of our Universe could expand only if a tremendous amount of energy would be transferred into it. However, this would break the conservation-energy rule and therefore it is for myself a strong argument against the expansion hypothesis. Also the experimental observations (like the „microvawe-background“ radiation and the red shift of the spectra of far galaxies), considered to be a confirmation of such a „global“ expansion, can be explained quite simply in another way through our unified physics.

Similarly, I think that the presently observed separation of the conventional thermodynamics from dynamics and electrodynamics is caused by the unrecognized material dependence of the most important thermodynamical quantity – the temperature.

First of all, I think that the absolute null temperature is as unattainable as the infinite temperature. Therefore, some average level, as our universal field of light (FL), with some specific energy of each quantum of this field, corresponding to certain finite (not too low and not too high) temperature, is the only reasonable starting point to define the temperature itself. (We will calculate this value in section 3.7). For that reason, I assume the following relation between the values of energy »W« and temperature **T**:

$$W = \mu^{-1} k_B T. \qquad (67)$$

The temperature itself can be then defined as a vector

$$\mathbf{T} = \mu^{-1} T_u \hat{} 1 = (\mu/k_B)\psi(\text{»W«}) \qquad (68)$$

and the Boltzmann „constant“, $^{\circ}k_B$, as a scalar

$$^{\circ}k_B = \mu^4 k_{Bu}. \qquad (69)$$

We see that the „constant“ (69) should be regarded as the Boltzmann factor, rather than a constant, because of its dependence on the material factor μ^4. Only the universal value k_{Bu} of this factor is truly constant. Therefore, in our

unified physics, only the universal value of the Boltzmann factor (69) is called the Boltzmann constant. Its exact value will be also discussed, together with the universal temperatur T_u, in section 3.7.

Now, the right time has come, in order to make you alertly for one of the most exciting discoveries of Naturics. Actually we have already introduced this discovery here, although hardly anyone has probably become conscious of its meaning. It is about the new sense of the concept of energy.

As well as the Planck's Eq.(48) also the Einstein's Eq.(50) determines the same property of energy, which we have already observed in the definition of the unified family in Fig.2. Namely, energy is not a scalar but a bivector.

From the traditional point of view, a scalar energy cannot be a carrier of any advanced information. The single information of a scalar is its value, nothing more. On the contrary, the unified bivector of energy carries in addition also its own, precisely oriented circulation. We can say that the unified quanta of energy have spin, analogous to the spin of the traditional photons.

It makes a colossal difference of the new concept of energy in comparison with the traditional point of view. We don't need any specific carriers for the quanta of energy in our unified physics. We can say that the energy quanta are theirs own carriers. They carry over not only the value of energy but also other properties of a circulating photon, they carry over the physical information.

At the end of section 3.3, we have said that we can imagine an energy transfer across the FL in two ways. Either one fluctuon surrenders its superfluous quantum of energy to an adjacent fluctuon or a quantum of the „excitation“ energy has been carried across the field by a corresponding photon. Now we are able to unify these two pictures again and say that in both cases the energy quantum changes its place of stay. It is just our convenience, if we treat this quantum as a parcel given over, from one fluctuon to the neighboring one, or if we treat this quantum as a postman, who carries the quantum information by himself.

I hope that it becomes clear now, why it is enough to consider the energy transfer as the unique fundamental interaction of Nature; Naturics does it so.

3. 6. Quantum spectrum of matter

Let us now consider a possible natural order, according to which the fluctuons from different material levels, that is, the fluctuons differing in the material factor μ^{lev}, combine together to form the material objects around us. In the present section we introduce such an order in a form of quantum spectrum of matter. The spectrum is graphically displayed in Fig.3. In order to correctly understand the scheme, let us note the following facts.

As we already know from Fig.2 , all physical quantities can be divided into classes, depending on the exponential index „lev" of the material factor μ^{lev} . Most of the physical quantities belong to classes with $|lev| <= 4$ .The classes where $|lev| > 4$ are represented only twice in the table (it is the gravitational factor **G** and the electric dipole moment **qr**, both belong to the class $|lev| = 5$).

Now, each physical quantity has unambiguously attached to it its universal value. We see these values also in Fig.2. For example, we read there that the universal speed of light is c_u = 25812.81 m/s and the universal size of a matter quantum is r_u = 5.073575 nm. These both physical quantities belong to the material class $|lev| = 1$. In our example, this means that $c_u/c = r/r_u = \mu$ for an arbitrary value of μ. If we choose the universal value as a corresponding reference value for each of these physical quantities (here for **c** and **r**), than we see that these both physical quantities change their values with the same steps along a scale of all possible states of matter. Exactly those steps are shown in the third column of Fig.3; it is the column of the class $|lev| = 1$, where the material dependence mean a proportionality of the actual values to μ (= μ^1). In other words, all physical quantities belonging to the same power $|lev|$ show identical material dependence.

Such a material dependence for twenty physical quantities belonging to five classes $|lev| < 5$, but applicable to any physical quantity of these classes, has been shown in Fig.3. The left column of this figure also presents (in some approximate ranges of values of the material-level index μ) a systematic order of all possible fluctuons forming all experimentally observed levels of matter complexity, i.e., the complete spectrum of matter.

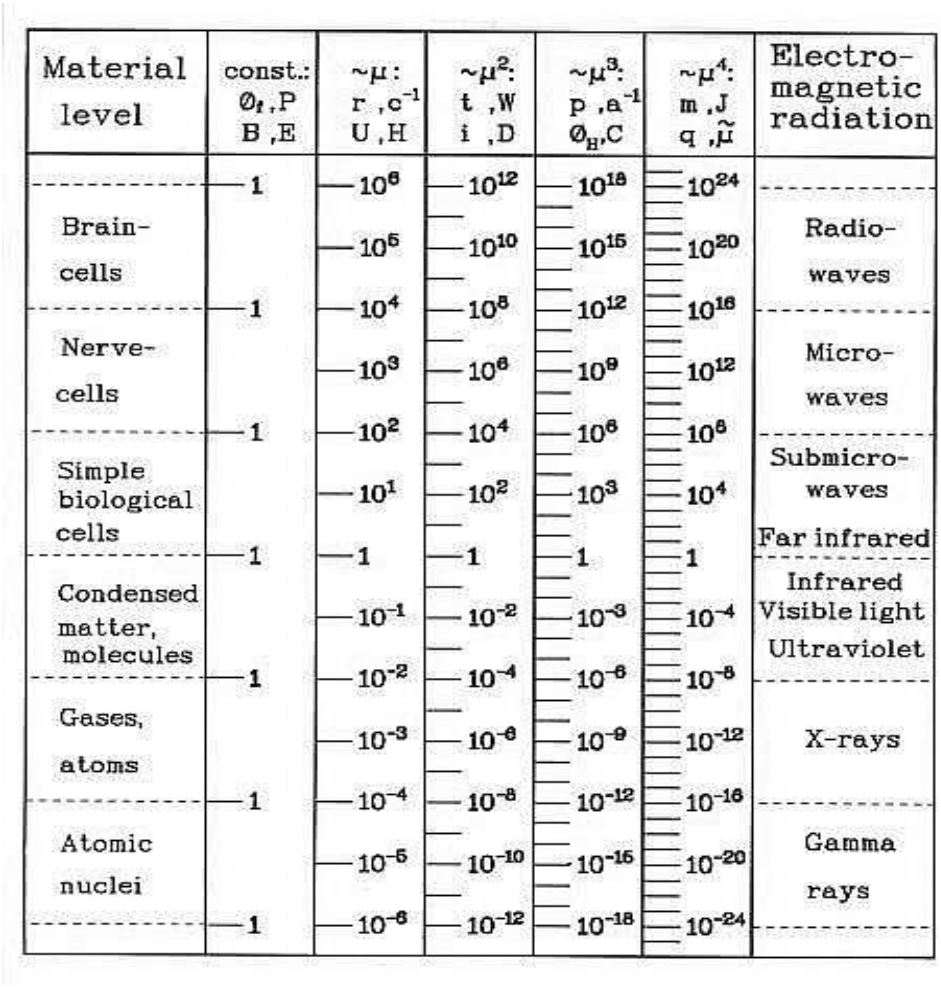


Figure 3. The relative quantum spectrum of matter

The relative values of twenty physical quantities (in relation to their universal values from Fig.2) in five material „classes“ depending on the power of the quantities material-level factor μ. A comparison with the classical electromagnetic spectrum in vacuum is given on the right.

This spectrum contains the fundamental field of light, FL, at μ = 1, all states of

the inanimate matter with $\mu < 1$, and all states of the animated matter, with $\mu > 1$. We call this spectrum the quantum spectrum of matter in its relative form or shortly the relative spectrum of matter. Its another form, the absolute spectrum of matter, presenting directly the absolute values of each physical quantity in all possible states of matter, will be discussed in section 4.2.

For a comparison, the right column of Fig.3 gives the corresponding ranges of the traditional electromagnetic spectrum in „vacuum“, ordered after the frequencies ($f = 1/t$) of the waves in „vacuum“.

Let us briefly study the values of Fig.3. We can see, for example, that the size **r** of a largest fluctuon in the brain substance – belonging to the material-levels range of $\sim 10^4 < \mu < \sim 10^6$ – can reach a pretty large dimension of a few millimeters, whereas the smallest stable natural fluctuons are the smallest atomic nuclei of about one millionth of the universal size, what means the value of only few fm (10^{-15}m), the size of a single proton.

The corresponding minimal speed of light c for the largest brain fluctuon is as low as only a few millimeters per second, about ten orders of magnitude lower than the „vacuum“ speed of light. However, as we already know from the preceding sections, the specific „vacuum“ speed of light, so much honored in the traditional theory of relativity and in conventional physics, is just the specific speed of light on the material-level boundary between the extremely attenuated gases of neutral atoms, on the one side, and a plasma of ionized atoms and atomic nuclei, on the other, i.e., the upper limit of the nuclear matter.

This „pure“ μ_{vacuum}-level of matter is well approximated by the terrestrial „vacuum“ created in some physical experiments, or by the extraterrestrial, interplanetary space of our Solar System. This is the reason why the maximal speed of light, experimentally measured in a macroscopic „vacuum“ volume, on or near the Earth, really approaches the specific value of c_{vacuum}. Nevertheless, our unified physics gives us no support to assume that this specific speed of light should be the obligatory value for each part of our huge Universe, with its enormous variety of physical conditions, very often strongly different from our most comfortable conditions in the immediate neighborhood of the Sun.

On the other hand, as is also shown in Fig.3, the speed of light inside atomic nuclei or in a condensed nuclear plasma can be hundreds times higher than c_{vacuum}, reaching the value of 3×10^{10} m/s. I think this disguised range of the possible values of the speed of light is able to explain some of the failures of the conventional nucler and plasma physics. It is enough to note here that despite the extremely high energy density of the nuclear quanta, their masses and electric charges are up to 24 orders of magnitude lower than the standard values of m_u and e, commonly accepted for them in the traditional physics.

The number of experimental examples confirming the proposed spectrum of matter was already very large fourteen years ago, when the foundations of the unified physics was published for the first time. Today, there are so many domains of our scientific knowledge, where the unified physics can be (and in some cases already had been) successfully applied to solve the technological and scientific problems, that we have to discuss not the individual values of the matter spectrum but the whole new domains of science first of all. Two of the most important technological domains are the meanwhile world-wide established nanotechnology and biotechnology. Any further serious, economically and environmentally justified development of these domains without our unified physics is simply unthinkable.

The unified physics is also the „natural“ language of the most exciting new branch of science, the life-science, with its special domains as the brain physics and the bioresonance physics. Analogously to the just above mentioned necessity to redefine our physical definition of the nuclear matter, we have also to redefine the very foundations of physics of the brain matter. The brain matter can only become understood if we realize that the brain substance is a separate step of matter complexity, quite different from any „computer-like“ aggregate of the individual nerve cells.

Our spectrum of matter contains the necessary physical values of any thinkable properties of materials interesting for scientists and technologists of the 21st century, working in nanotechnology, biotechnology, lifesciences, or nuclear physics.

3. 7. Calculation of some physical constants

Let us now discuss some examples of the commonly used physical constants. In accordance with the starting assumptions of the unified physics, it should be possible to define all physical constants exclusively by Planck's constant h and the elementary electric charge e.

As the first example, let us consider the quantized Hall resistance R_H. In the unified physics, the electric resistance of a material is equivalent to the velocity of light, characteristic for the fluctuons transferring energy across the material. This gives

$$R_u = c_u = r_u^4/t_u r_u^3 = h/e^2 = R_H = 2.581281 \times 10^4\ \Omega. \quad (70)$$

This result would alone suffice as a support for our starting assumptions, because German physicist Klaus von Klitzing has recieved 1985 his Nobel price for his experimental discovery of exactly this step of quantization of the Hall resistance. My observation of this value appearing in the unified family of all physical quantities was an additional motivation to further development of the unified physics.

As a second example we now consider the fine-structure constant of the traditional atomic physics. This constant appears there as a result of the absolute limit assumed for the speed of light $c_0 = c_{vacuum}$ = 299 792 458 m/s. The corresponding medium, called „vacuum“, is then assumed to have the magnetic permeability $\mu_{0(traditional)} = 4\pi/10^7$ N/A^2 and the dielectric permittivity $\varepsilon_{0(traditional)} = 1/\mu_{0(traditional)}c_0^2$. Our material-level index μ for that specific level of matter (an extremely attenuated gas), is defined as $\mu_{vacuum} = c_u/c_{vacuum}$. After an extraction of the dimensionless factor $\mu_{0(traditional)}$ from μ_{vacuum} (and accounting for our unified-units relation N = A^2), there remains another dimensionless factor, being just the reversion of twice the fine-structure constant α (compare the above values of c_0 and c_u from Eq.(70)):

$$\mu_{vacuum} = c_u/c_{vacuum} = (4\pi/10^7)/2\alpha = 2\pi/10^7\alpha \quad (71)$$

in accordance with Eq.(52). Also this definition (71) of the fine-structure constant can easily be shown to be identical with the traditional definition of α:

$$\alpha = (2\pi/10^7)c_0/c_u = e^2/2\varepsilon_0 hc_0 = 1/137.03599. \qquad (72)$$

We start our discussion of the next example, the Boltzmann's constant, with the additional assumption that the thermodynamical temperature is equivalent to a specific electrical potential, so that the Boltzmann's constant k_{Bu} is just the universal charge e multiplied by the material-level index μ_{vacuum} of the traditional „vacuum“:

$$k_{Bu} = \mu_{vacuum}\, e = 1.3795108^{x}10^{-23}\ \mathrm{C}. \qquad (73)$$

The material-dependent Boltzmann factor °k_B, defined by Eq.(69), is then the thermodynamical quantity directly equivalent to the electric charge °q,

$$°k_B = \mu_{vacuum}°q, \qquad (74)$$

and indirectly, to the mass °m (compare for example Eq.(45) or Chapter 2).

The value of temperature **T** of a μ-level fluctuon „producing“ current »i« and voltage **U** can be obtained from the following scalar relations (compare Eq.(67) and Fig.2):

$$T = \mu W/k_B = (c_{vacuum}/\mu^3)i = (1/\mu_{vacuum}\mu^2)U. \qquad (75)$$

Exactly this last relation (75) leads to our unconventional relation of units, setting that Kelvin equals Volt, K = V. Now, the universal temperature of our Universe can be calculated from Eqs.(75) and (73),

$$T_u = W_u/k_{Bu} = c_{vacuum}i_u = U_u/\mu_{vacuum} = 244.3726\ \mathrm{K}, \qquad (76)$$

where the remaining necessary universal values are to be found in Fig.2. The above value of the universal temperature coincides very well with one of the main ideas of the unified physics, concerning the conditions, which life, as we know it, needs to exist and develop.

As the next example, we discuss Avogadro's number N_0. From Fig.2 we can obtain the value of pressure **p**, being a force **F** acting on the area »A«, by using the relation

$$p = F/A = c. \qquad (77)$$

Using now our definitions of volume **V** and density **n**, we can write that on our universal level of matter this relation gives:

$$W_u = k_{Bu}T_u = p_uV_u = p_u/n_u, \qquad (78)$$

where $p_u = c_u = 2.5813 \times 10^4$ Pa.

Eq.(78), known as the ideal-gas law for a mole of substance, leads to

$$k_{Bu} = p_u/T_un_u = p_0/T_0n_0, \qquad (79)$$

connecting our universal level characteristics, p_u, T_u, and n_u, with the traditionally used so-called „normal“ conditions of p_0, T_0, and n_0. Here, the „normal“ pressure is $p_0 = 1.013 \times 10^5$ Pa, and the „normal“ temperature is $T_0 = 273.2$ K. Now, we calculate the „normal“ density n_0 of the ideal gas from Eq.(79). Multiplying the density by the volume of 0.02241 m^3, defining the mole of an ideal gas, that is, the volume occupied by one mole of gas under the „normal“ conditions p_0, and T_0, we immediately obtain the number of gas „particles“ (or our fluctuons) in the mole of gas, that is, Avogadro's number:

$$N_0 = 0.02241p_0T_un_u/p_uT_0 = 6.024 \times 10^{23} \text{ „particles“/mole} . \qquad (80)$$

As the last example here, let us discuss Newton's gravitational constant $\mathbf{G}_N$. This constant is traditionally defined as a proportionality factor in the expression for Newton's force of gravity, $\mathbf{F}_N$, acting between two masses of 1 kg at distance of 1 m,

$$\mathbf{F}_N = \mathbf{G}_N(1 \text{ kg} \times 1 \text{ kg})/1\text{m}^2. \qquad (81)$$

In the unified physics the corresponding proportionality factor is the material-dependent vector **G**. Its universal value can be calculated (compare Fig.2) as

$$G_u = f_u^3 r_u = c_u^2 r_u / m_u = h^2 / m_u^2 e^2.$$

This means that

$$F_u = m_u a_u = m_u c_u^2 / r_u = G_u m_u^2 / r_u^2. \qquad (82)$$

We now assume that as a result of the historical development of the traditional physics, these two values of G_N and G_u are related to each other with a pure exponential factor of 10^{-40}, that is,

$$G_N = 10^{-40} G_u = 6.6815536 \times 10^{-11}\ \mathrm{Nm^2/kg^2}. \qquad (83)$$

The last assumption is equivalent to the assumption that Newton's gravity has been defined by the traditional physics exactly 40 orders of magnitude weaker than the universal interaction on the FL-level: $F_N = 10^{-40} F_u$.

As we have seen in the above examples, we traditionally interpret most of the important physical constants incorrectly. They are not independent constants at all. All of them, unless demanded by some additional condition (for example, by a restriction to the specific state of „vacuum"), can be expressed exclusively by our standard values of h and e. On the other hand, it is very encouraging to see that the postulated reduction of number of the standard parameters to just two explains more of the old problems of physics rather than initiates new problems.

Chapter 4. Scientific and technological applications of Naturics

4. 1. What is Naturics?

We people want to understand the world around us. The ability to realize this healthy wish distinguishes us from animals. We want to understand the natural phenomena and processes in order to be able to make them useful for us. However, although we diligent observe the Nature since millions of years, we are still far from to reach our goal.

What does make the fulfilment of this natural wish so difficult? It is the really primitive tool that we are still using in solving this exacting task. The traditional description of the natural phenomena is still highly incomplete. Instead to unify its best parts, the traditional science became more and more splitted into very narrow domains, making any creative overview practically impossible. It is true that the whole science has made an enormous progress in the previous century. Accepting the classical physics of the former epochs, 20^{th}-century physicists have included also the quantum physics and the relativity theory into their description of Nature. However, a global unification of our understanding of Nature (called the *grand unified theory* - *GUT*) has not yet been made possible with it.

Naturics is a completely new, unified description of all natural phenomena. It is a consistent expansion of all useful partial descriptions known until today. It joins the achievements of the traditional physics, chemistry, biophysics, geophysics and astrophysics, including the quantum physics and the relativity theory, into a precise, clear construction of the quantum spectrum of matter. The quantum spectrum of matter is a universal scale of quanta of all possible states of matter. Naturics agrees with all experimental results of the natural phenomena known up to now.

The source of the wide success of Naturics in description of so many aspects of Nature is the unified physics introduced in two previous chapters. Therefore, we can say that Naturics is based on a new, completely independent foundation of physics. I have developed this new theory directly for the purpose of a unified description of Nature between the years 1972 and 1992. In addition, the unified physics represents also a really new foundation of each science and

technology. For example, Naturics is advantageous particularly in such areas of science and technology where the traditional physics is no longer directly applicable, as in the finest materials of the nano- and biotechnology.

The most important theoretical advantage of Naturics is that it defines the relativistic quanta of matter in one and the same manner for all possible states of matter. It makes possible a simple gradation of each description of the natural events along the scale of the quantum spectrum (by means of an arbitrary material-dependent physical quantity), from the smallest quanta of the atomic nuclei, over the atoms, molecules, membranes of the average, universal field of light, up, through the simplest biological cells and nerve cells, to the biggest brain cells, and reversely.

The most important practical and technical advantage of Naturics is that we now need to know only a single value of a single physical quantity, in order to fully define the current state of the material under consideration.

4. 2. The absolute quantum spectrum of matter

In section 3.6, we have introduced our quantum spectrum of matter, the unified scale of all possible states of matter. The possible quanta of matter differ in their material factor μ. In other words, we can also say that the quantum spectrum of matter is a natural order of all physical characteristics of the relativistic quanta of matter, at all possible levels of the matter complexity.

In section 3.6, we have discussed the relative form of the spectrum of matter, in which all values of the chosen physical quantities characterizing a given state of matter are given always in relation to the corresponding universal values of the chosen quantities. In Table 3 below, we present the absolute form of the spectrum of matter. It shows the absolute values of some chosen physical quantities for some chosen values of the material parameter μ. In order to underline the universal applicability of our unified quantum spectrum, we also include in this table the states of matter lying today on the upper and lower limit of the practically observable natural states of the matter organization.

The upper boundary of the natural range of all possible states of matter could be named the levels of a superbrain. Its observations are still rather sporadical, though we can be quite sure that the smallest such states will be reach during further evolution of human being. It doesn't sound crazy at all for me, to suppose that some of the so-called „para-normal“ phenomena are just the forerunner of the future capability of such a superbrain. However, it is also sure for me that our individual brain will never reach the level of the largest superbrain quanta, with their mass of over 500 kg (compare Tab.3).

The lower boundary of the presented spectrum of matter was already introduced by the elementary particle physicists, and treated as the building blocks of the more stable elementary particles. Quite on the contrary, our point of view orders the quarks on the highest excited levels of matter that we are able to produce today (although only for a very short time) by means of our high-energy-physics machines.

Table 3. Numerical values of seven physical quantities for chosen values of the material parameter μ, covering the whole spectrum of matter

(Note that the chosen values of μ are exact powers of ten for clearness only; the μ-order means the power of μ in the actual material dependence in Fig.2; the universal values can be seen at the field of light level, where μ = 1.0).

class of material	**sub-class**	**chosen value of μ**	quantity	**r**	**f**	**c**	**m**	**U**	**i**	**T**
			μ-power	**-1**	**-2**	**-1**	**4**	**1**	**2**	**-1**
			unit	**m**	**1/s**	**m/s**	**kg**	**V**	**A**	**K**
			mantissa	**5.07**	**5.09**	**2.58**	**5.06**	**2.10**	**8.15**	**2.44**
super-brains	large	10^{8}	-	10^{-1}	10^{-4}	10^{-4}	10^{2}	10^{6}	10^{9}	10^{-6}
	small	10^{7}	-	10^{-2}	10^{-2}	10^{-3}	10^{-2}	10^{5}	10^{7}	10^{-5}
brains	large	10^{6}	-	10^{-3}	10^{0}	10^{-2}	10^{-6}	10^{4}	10^{5}	10^{-4}
	small	10^{5}	-	10^{-4}	10^{2}	10^{-1}	10^{-10}	10^{3}	10^{3}	10^{-3}

class of material	sub-class	chosen value of μ	quantity	r	f	c	m	U	i	T
			μ-power	-1	-2	-1	4	1	2	-1
			unit	m	1/s	m/s	kg	V	A	K
			mantissa	5.07	5.09	2.58	5.06	2.10	8.15	2.44
nerves	large	10^{4}	-	10^{-5}	10^{4}	10^{0}	10^{-14}	10^{2}	10^{1}	10^{-2}
	small	10^{3}	-	10^{-6}	10^{6}	10^{1}	10^{-18}	10^{1}	10^{-1}	10^{-1}
cells	large	10^{2}	-	10^{-7}	10^{8}	10^{2}	10^{-22}	10^{0}	10^{-3}	10^{0}
	small	10^{1}	-	10^{-8}	10^{10}	10^{3}	10^{-26}	10^{-1}	10^{-5}	10^{1}
field of light	mem-bra-nes	10^{0}	-	10^{-9}	10^{12}	10^{4}	10^{-30}	10^{-2}	10^{-7}	10^{2}
mole-cules	large	10^{-1}	-	10^{-10}	10^{14}	10^{5}	10^{-34}	10^{-3}	10^{-9}	10^{3}
	small	10^{-2}	-	10^{-11}	10^{16}	10^{6}	10^{-38}	10^{-4}	10^{-11}	10^{4}
atoms	large	10^{-3}	-	10^{-12}	10^{18}	10^{7}	10^{-42}	10^{-5}	10^{-13}	10^{5}
	small	10^{-4}	-	10^{-13}	10^{20}	10^{8}	10^{-46}	10^{-6}	10^{-15}	10^{6}
atomic nuclei	large	10^{-5}	-	10^{-14}	10^{22}	10^{9}	10^{-50}	10^{-7}	10^{-17}	10^{7}
	small	10^{-6}	-	10^{-15}	10^{24}	10^{10}	10^{-54}	10^{-8}	10^{-19}	10^{8}
quarks	large	10^{-7}	-	10^{-16}	10^{26}	10^{11}	10^{-58}	10^{-9}	10^{-21}	10^{9}
	small	10^{-8}	-	10^{-17}	10^{28}	10^{12}	10^{-62}	10^{-10}	10^{-23}	10^{10}

How should we "read" the quantum spectrum of matter? Let us deeper consider one level from this table. Just for the simplicity of this first example, we choose as the value of the material factor μ one value directly shown in the above table. Let us look at the material class of small nerve cells with μ equal to one thousand, $\mu = 10^{3}$. *(It should be clear that all the levels between μ of about 500 and μ of about 5000 are also possible levels of some small nerve cells).* The corresponding row of the above table looks like that:

class of material	sub-class	chosen value of μ	quantity	r	f	c	m	U	i	T
			μ-power	**-1**	**-2**	**-1**	**4**	**1**	**2**	**-1**
			unit	**m**	**1/s**	**m/s**	**kg**	**V**	**A**	**K**
			mantissa	**5.07**	**5.09**	**2.58**	**5.06**	**2.10**	**8.15**	**2.44**
nerves	small	10^3	-	10^{-6}	10^6	10^1	10^{-18}	10^1	10^{-1}	10^{-1}

The corresponding values of the seven arbitrarily chosen physical quantities of the above table are directly obtainable from it by muliplying the corresponding mantissa with the corresponding power of ten (in the single row of the table). For example, the characteristic dimension r of a quantum in the small nerve matter is $r = 5.07^{x}10^{-6}$ m. Its characteristic frequency is $f = 5.09^{x}10^{6}$ Hz, its corresponding speed of light is $c = 25.8$ m/s, and so on.

What can we practically learn from this specific example about this particular level of the nerve cells? We see that:

- any nerve „conductor“ of this level has to have its diameter of the order of 5 micrometer in order to allow the corresponding energy transfer along it;
- the best „communication“, by using this nerve level will be reached with the frequency of 5.09 MHz;
- the signals will be transferred with the speed of 25.8 m/s;
- such nerve quantum has mass of $5.06^{x}10^{-18}$ kg (this means also the energy density of 25,8 J/m^3);
- the characteristic electric potential of this „conductor“ is 21.0 V;
- the electric current, that will flow during the signal transfer, is 0.815 A;
- the necessary temperature at which such nerve should be kept without loss of its function ability, if isolated from the body, is as low as 0.244 K.

In that way we obtain already a pretty large portion of information, as you see. Of course, we can extend this information upon any other desired physical quantity using the unified family of all physical quantities.

For your exercise, let us compare yet another example from the above spectrum Table 3. Let us take this time the quanta of matter belonging to the material class of large molecules:

class of material	**sub-class**	**chosen value of μ**	quantity	**r**	**f**	**c**	**m**	**U**	**i**	**T**
			μ-power	**-1**	**-2**	**-1**	**4**	**1**	**2**	**-1**
			unit	**m**	**1/s**	**m/s**	**kg**	**V**	**A**	**K**
			mantissa	**5.07**	**5.09**	**2.58**	**5.06**	**2.10**	**8.15**	**2.44**
molecules	large	10^{-1}	-	10^{-10}	10^{14}	10^{5}	10^{-34}	10^{-3}	10^{-9}	10^{3}

What can we see in that case? We see that:

- the (middle) large molecules, the quanta of matter on this particular level of matter with μ = 0.1, like the air-gas molecules, have diameter of 0.507 nm;
- the best „communication“ frequency with such molecules is 510 THz (which lies about the middle of the visible-light spectrum in the air);
- the energetic signals inside this matter (but not outside the molecules) will be transferred with the speed of 258 km/s;
- each molecular quantum at this level of matter has the mass of 5.06×10^{-34} kg (what already lies below the traditionally accepted mass of a single electron; an observation showing the necessity to examine also the classical definition of the molecular mass, not only that of the speed of light);
- the characteristic electric potential of these molecules is 2.10 mV;
- the corresponding electric current is 8.15 nA;
- the characteristic temperature at which such molecules could be kept, if isolated, without loss of their individuality is about 2440 K.

I think, it has been said enough to this point. For a more extended interpretation of the quantum spectrum of matter, let us see the following section.

4. 3. Towards the single-quantum electronics

Basing on our previous definition (in chapter 3) of the material dependence and our quantum spectrum of matter, we present now a generalization of the traditional spectrum of the electromagnetic radiation in „vacuum“ and we show the necessary change in its interpretation as pre-condition for its application in the single-quantum electronics.

Recently, an increasing number of scientists think again that Einstein may have been right in his persistent claiming that the quantum theory of his times was incomplete. An important aspect of the discussion what quantum theory means, for example, is the nature of light and its interaction with matter. It's no my aim here to discuss any complicated, philosophical aspects of the classical quantum theory. Nevertheless, we have to learn from our past errors, in order to avoid similar errors in the future.

The lasting interpretational problems of the classical quantum theory, on the one side, and the great scientific success of this theory, on the other side, advise us that it is not reasonable to try to clarify all interpretational nuances of any new theory before we have earned enough applicational experience with it. Only after the practical experience is large enough, and the applicational possibilities seem to be interesting enough for us and many other users, comes the right time to finally clarify the theory interpretation, down to its deepest elements. *(For to avoid any misunderstanding here: we are speaking about the interpretational nuances of a new theory; it is obvious that the theory itself has to be completed before any application of it could be realized at all).* As for me, for example, it is no problem to accept the achievements of the classical quantum theory, which have very profoundly changed our science and our life in the twentieth century, though I still do not understand the Bohr's complementarity principle and some other points of the „traditional“ interpretation of this theory.

Two of the most important new concepts of Naturics are the quantum speed of the energy transfer and the natural electromagnetic properties of matter. These are the concepts we are going to interpret in the following points.

Our main problem with quantum physics has its roots much deeper in the foundation of physics than commonly envisaged. In my opinion, the main problem, from the practical point of view, is that the „vacuum“ spectrum of the electromagnetic radiation, which is commonly used to interprete the electromagnetic properties of the whole matter, is not universal at all. This spectrum is exclusively defined for the unique medium called „vacuum". Practically, „vacuum“ means an extremely attenuated gas or gaseous plasma, just a single specific state of matter. I think, it is the prevailing enthusiasm about the guiding idea of the special relativity theory (that the speed of light in this „vacuum“ is a universal constant of Nature) that gives cause for many groundless applications of the conventional electromagnetic spectrum.

The characteristic speed for all electromagnetic phenomena is the speed of light, indeed. In that version, the fundamental assumption of the special relativity theory is quite acceptable. However, the speed of light is not an absolute constant of Nature. It is a „regular“ physical quantity, which depends, for example, on the medium density, a relation known since Foucault's time. In Naturics, we put thus the following hypothesis: The speed of light in a homogeneous material is to be treated as a characteristic, quantum-relativistic speed of the energy transfer through this material, i.e., the speed corresponding to a characteristic, precisely defined quantum of matter of this material. The quantum of matter depends of course on the actual state of the material. Therefore, the corresponding speed of light is also a material dependent quantity; its value changes from state to state of the material.

Our above hypothesis concerning the speed of light means that we believe that the electromagnetic properties of a given homogeneous medium are clearly defined by means of a characteristic electromagnetic wave that could be emitted by or absorbed in that medium. Such electromagnetic wave has its unambiguous speed **c** , frequency »f«, wavelength **r** (where $r = c/f$), etc.

We try to consider the material medium in a particular state as being composed of specific quanta of matter of exactly the same electrodynamical parameters as those of the corresponding, characteristic electromagnetic wave. The only difference is that the quanta of matter are not movable relative to the medium, in opposition to photons of the characteristic electromagnetic wave.

It is perhaps worth emphasizing, especially for those of us still treating the radio waves as a continuous, non-quantum phenomenon, that today, almost one century after the quantum theory was born, we have to accept without any doubt the relativistic and quantum nature of matter in all its states. This necessity is recognizable in the best way in micro- and nanoelectronics. The inability of technology to control individually the quanta of energy and matter is the most pervasive limit of any modern technology. I think that this observed „resistance“ of some electronic limitations to technological treatment is the most evident sign for theoretical physicists that the single-quantum level has been already reached in the electronic technology. It is the quantum theory of matter on the nanometer scale which should be improved in the first step, and the corresponding technology only in the second step.

Let us return to the electromagnetic spectrum. In a given medium, we can try to generate a whole spectrum of the electromagnetic waves. However, it is not always possible. One medium promising a success is the interplanetary space of our Solar System. The Earth's atmosphere, with its water vapour, is a worse example. Some wavelength ranges will be completely cut off from the spectrum; the radioastronomy can demonstrate that exactly. Still worse is the situation inside a piece of metal. Only the low-frequency waves are accessible in it. Nevertheless, the corresponding frequencies and the wavelengths will always fulfil the following medium-dependent relation:

»f« · **r** = **c** = constant = speed of light in that particular state of the medium.

(We could treat the above statement as the old, exciting idea of the light-speed constancy in the special theory of relativity, but now redefined for each particular state of matter separately).

When the accessible frequency range overlaps the visible frequency range of the human eyes, we call the medium as being completely transparent (like the dry air). Otherwise, the medium is only partly transparent (like the optical filters) or opaque (like the most of other materials).

By the way, it is very surprising for me that the electromagnetic spectrum is exclusively known for the single medium, the „vacuum“, where the speed of

light, c_{vacuum}, has been „ministerially“ fixed at the value of 299792458 m/s (alleged with no error!). The risk by using this „vacuum“ spectrum to interprete the electromagnetic phenomena is the danger to forget that this spectrum „works“ exclusively in that single medium. It means, for example, that only in that „vacuum", the wavelengths of the visible light lie in the range of 400 nm to 800 nm, and simultaneously the corresponding frequencies lie in the range of 800 THz to 400 THz. In a medium of higher density, where the speed of light is lower than c_{vacuum}, the corresponding ranges of wavelengths and frequencies of the visible light are obviously different.

The above is probably the true reason why the light observed in astrophysics as coming from the most remote galaxies shows the largest red-shift of its spectrum in comparison with the terrestrial or „vacuum“ standards. That light has to pass on its way to us, on an average, the largest regions of the Universe with the mass density higher than the „vacuum“ density of our solar neighborhood (a higher mass density corresponds with lower speed of light; compare Fig.2).

Whatever the frequency of an electromagnetic wave, there is always one state among all possible states of matter, which is a natural „generator“ of the given electromagnetic wave. The point is to know precisely enough which electro-magnetic wave is the characteristic wave for the given state of matter. It is commonly known that gamma rays are generated in nuclear matter, x-rays are generated in atomic matter, and the so-called thermic radiation (UV, visible, and IR light) - in molecular matter. On the other end of the spectrum scale we have radio waves. We have learned to „artificially“ produce, transmit and detect such waves. However, which domain of the states of matter is the natural „generator“ of such waves, we do not know this exactly. The worst is the situation with the extremely long electromagnetic waves.

Let us look, which frequencies of the electromagnetic waves are observed in Nature. There are all frequencies between 10^{25} Hz and some few Hz, i.e., from the „hard“ gamma rays, through x-rays, thermic rays, microwaves, short and long radiowaves, to the „acoustic“, broadcasting frequencies. It makes about 24 orders of magnitude for the observable frequency range. According to our

hypothesis about the characteristic quanta of matter, this wide range of frequency must be correlated with a proper wide range of the natural states of matter, which are able to generate the complete electromagnetic spectrum. We have thus to identify a proper range of natural dimensions of the quanta of matter, and, for example, a proper range of the corresponding energies of those quanta, or what is easier to control, the corresponding temperatures. In the conventional picture, we define this temperature T as given by $T = hf/k_B$, where h is Planck's constant and k_B is Boltzmann's constant (compare Eq.(73)).

In the table below, we have collected some observable values of frequencies, dimensions, and temperatures for such states of matter, which seem to be composed of quanta of matter of a single kind. We call the corresponding states as „pure“ states of matter, in contradiction to the prevailing „mixed“ states, with sometimes a very wide spectrum of the material quanta constituting a single object. In this sense, our human body is surely the most complicated natural object. It consists of the material quanta of all possible levels of matter, from atomic nuclei, through atoms, molecules, macromolecules and membranes, ordinary biological cells, nerve cells, to the presently largest natural quanta of matter - the brain cells.

Tabele 4. The values observed in Nature for frequencies of the electromagnetic waves and for the characteristic dimensions and temperatures of the "pure" states of matter *(in logarithmic scale)*

Range limits	**Range description**
Frequency f [Hz]	
10^1 -- 10^4	sound frequencies (NF)
10^4 -- 10^6	long radio waves (LW)
10^6 -- 10^{10}	short radio waves (SW)
10^{10} -- 10^{12}	microwaves
10^{12} -- 4×10^{14}	infrared light (IR)

Range limits	Range description
4×10^{14} -- 8×10^{14}	visible light (V)
8×10^{14} -- 10^{17}	ultraviolet light (UV)
10^{17} -- 10^{20}	x-rays (X)
10^{20} -- 10^{25}	gamma rays (gamma)
Length r [m]	
10^{-3} -- 10^{-4}	large neurons
10^{-4} -- 10^{-6}	diameter of axons
5×10^{-5} -- 5×10^{-6}	plant, animal cells
10^{-6} -- 3×10^{-7}	bacteria, mitochondria
3×10^{-7} -- 10^{-8}	viruses, small intracellular structures
10^{-8} -- 10^{-9}	protein molecules
10^{-10}	the smallest molecule
5×10^{-11}	Bohr radius of atom
2×10^{-12}	Compton wavelength of electron
10^{-13} -- 10^{-14}	atomic nuclei
4×10^{-15}	proton diameter
Temperature T [K]	
10^{-2}	superconducting tungsten
4×10^{-1}	superconducting titan
4×10^{0}	helium boils

Range limits	Range description
4×10^1	Pluto's surface
2×10^2	Mars' surface
4×10^2	water boils
6×10^3	Sun's surface
10^4 -- 10^5	molecules dissociate to atoms
10^5 -- 10^6	atoms ionize
3×10^6	solar corona
10^7 -- 10^8	solar interior
10^9	the hotest stars

It is very instructive to compare now the above values with the traditional electromagnetic spectrum of radiation and with our unified, quantum spectrum of matter. In the left part of the following table, we find the traditional electromagnetic spectrum. This spectrum joins the cherished speed of light in „vacuum", c_{vacuum}, with all possible frequencies f of the electromagnetic waves and with the traditionallly defined wavelength, $r_{tr} = c_{vacuum}/f$, as well as temperatures, $T_{tr} = hf/k_B$. The values lying outside the natural observable ranges of the above table are marked with the exclamation mark, **!**. (Remember that our material parameter μ equals unity for the universal values of $f_u = 5.0877 \times 10^{12}$ Hz, $r_u = 5.0736 \times 10^{-9}$ m, and $T_u = 244.37$ K).

Table 5 below shows very convincingly that only one half of the wavelengths and temperatures commonly used in our traditional description of the electromagnetic properties of matter has been really „accepted" in Nature. This means, that to the range of 24 orders of magnitude of the observable frequencies, we can attach in a natural way only two times smaller ranges of 12 orders of magnitude of the corresponding wavelengths, temperatures, and also the values of other quantities (for example, the speed of light).

Table 5. The traditional electromagnetic spectrum versus the unified quantum spectrum of matter

Frequency		Tradit. spectrum		Quantum spectrum of matter			
range	**f [Hz]**	**$r_{tr} = c_V/f$ [m]**	**$T_{tr} = hf/k_B$ [K]**	**$\mu = (f_u/f)^{1/2}$**	**$r = \mu r_u$ [m]**	**$T = T_u/\mu$ [K]**	**Material class**
	10^1	$3^{x}10^{7}$!	$5^{x}10^{-10}$!	$7.13^{x}10^{5}$	$3.6^{x}10^{-3}$	$3.4^{x}10^{-4}$	Brain cells
Sound frequency	10^2	$3^{x}10^{6}$!	$5^{x}10^{-9}$!	$2.26^{x}10^{5}$	$1.1^{x}10^{-3}$	$1.1^{x}10^{-3}$	
	10^3	$3^{x}10^{5}$!	$5^{x}10^{-8}$!	$7.13^{x}10^{4}$	$3.6^{x}10^{-4}$	$3.4^{x}10^{-3}$	
	10^4	$3^{x}10^{4}$!	$5^{x}10^{-7}$!	$2.26^{x}10^{4}$	$1.1^{x}10^{-4}$	$1.1^{x}10^{-2}$	
Long waves	10^5	$3^{x}10^{3}$!	$5^{x}10^{-6}$!	$7.13^{x}10^{3}$	$3.6^{x}10^{-5}$	$3.4^{x}10^{-2}$	Nerve cells
	10^6	$3^{x}10^{2}$!	$5^{x}10^{-5}$!	$2.26^{x}10^{3}$	$1.1^{x}10^{-5}$	$1.1^{x}10^{-1}$	
Short waves	10^7	$3^{x}10^{1}$!	$5^{x}10^{-4}$	$7.13^{x}10^{2}$	$3.6^{x}10^{-6}$	$3.4^{x}10^{-1}$	
	10^8	$3^{x}10^{0}$!	$5^{x}10^{-3}$	$2.26^{x}10^{2}$	$1.1^{x}10^{-6}$	$1.1^{x}10^{0}$	
	10^9	$3^{x}10^{-1}$!	$5^{x}10^{-2}$	$7.13^{x}10^{1}$	$3.6^{x}10^{-7}$	$3.4^{x}10^{0}$	Simple
Micro-waves	10^{10}	$3^{x}10^{-2}$!	$5^{x}10^{-1}$	$2.26^{x}10^{1}$	$1.1^{x}10^{-7}$	$1.1^{x}10^{1}$	cells
	10^{11}	$3^{x}10^{-3}$	$5^{x}10^{0}$	$7.13^{x}10^{0}$	$3.6^{x}10^{-8}$	$3.4^{x}10^{1}$	
Infra-red	10^{12}	$3^{x}10^{-4}$	$5^{x}10^{1}$	$2.26^{x}10^{0}$	$1.1^{x}10^{-8}$	$1.1^{x}10^{2}$	Membranes
	10^{13}	$3^{x}10^{-5}$	$5^{x}10^{2}$	$7.13^{x}10^{-1}$	$3.6^{x}10^{-9}$	$3.4^{x}10^{2}$	
Visible	10^{14}	$3^{x}10^{-6}$	$5^{x}10^{3}$	$2.26^{x}10^{-1}$	$1.1^{x}10^{-9}$	$1.1^{x}10^{3}$	Molecules
Ultra-violet	10^{15}	$3^{x}10^{-7}$	$5^{x}10^{4}$	$7.13^{x}10^{-2}$	$3.6^{x}10^{-10}$	$3.4^{x}10^{3}$	Molecules
	10^{16}	$3^{x}10^{-8}$	$5^{x}10^{5}$	$2.26^{x}10^{-2}$	$1.1^{x}10^{-10}$	$1.1^{x}10^{4}$	

Frequency		**Tradit. spectrum**		**Quantum spectrum of matter**			
	10^{17}	$3^{x}10^{-9}$	$5^{x}10^{6}$	$7.13^{x}10^{-3}$	$3.6^{x}10^{-11}$	$3.4^{x}10^{4}$	Atoms
X- rays	10^{18}	$3^{x}10^{-10}$	$5^{x}10^{7}$	$2.26^{x}10^{-3}$	$1.1^{x}10^{-11}$	$1.1^{x}10^{5}$	
	10^{19}	$3^{x}10^{-11}$	$5^{x}10^{8}$	$7.13^{x}10^{-4}$	$3.6^{x}10^{-12}$	$3.4^{x}10^{5}$	
	10^{20}	$3^{x}10^{-12}$	$5^{x}10^{9}$**!**	$2.26^{x}10^{-4}$	$1.1^{x}10^{-12}$	$1.1^{x}10^{6}$	
	10^{21}	$3^{x}10^{-13}$	$5^{x}10^{10}$**!**	$7.13^{x}10^{-5}$	$3.6^{x}10^{-13}$	$3.4^{x}10^{6}$	Atomic nuclei
Gamma rays	10^{22}	$3^{x}10^{-14}$	$5^{x}10^{11}$**!**	$2.26^{x}10^{-5}$	$1.1^{x}10^{-13}$	$1.1^{x}10^{7}$	
	10^{23}	$3^{x}10^{-15}$	$5^{x}10^{12}$**!**	$7.13^{x}10^{-6}$	$3.6^{x}10^{-14}$	$3.4^{x}10^{7}$	
	10^{24}	$3^{x}10^{-16}$**!**	$5^{x}10^{13}$**!**	$2.26^{x}10^{-6}$	$1.1^{x}10^{-14}$	$1.1^{x}10^{8}$	
	10^{25}	$3^{x}10^{-17}$**!**	$5^{x}10^{14}$**!**	$7.13^{x}10^{-7}$	$3.6^{x}10^{-15}$	$3.4^{x}10^{8}$	

The above tables demonstrates also the correctness of our quantum spectrum, which is able to exactly correlate any characteristic electromagnetic wave, generated in a „pure“ state of matter, with the proper quantum of matter of that particular state. In that simple way, our quantum spectrum of matter joins the light and matter aspects of the quantum theory.

The proposed scaling rule for the material dependence is urgently needed in all modern technologies working with the individual quanta of matter. One of these modern technologies is nanoelectronics. As we have seen, Naturics with its quantum spectrum of matter opens a new perspective also for this most modern electronics, working in a single-quantum regime.

4. 4. Cosmological Planck's scale

Most of the people reading such books like the present one are also interested in the fundamental questions of cosmology. One of the common tools of the traditional cosmology - where I mean the cosmology based on the traditional physics – is a scale of three specific constants developed by Max Planck about hundred years ago, and therefore referred to as Planck's scale.

This scale combines three traditional „constants" of physics: Planck's constant h, Newton's gravitational constant G_N, and the speed of light in „vacuum", c_0, into a trio of another physical units, interesting for cosmology and also for some other domains of the "extremal" physics, like the elementary particle physics. These units are: Planck' length L_P, Planck's time T_P, and Planck's mass M_P, considered by Planck as being the "fundamental units of measurements" in our Universe. Planck's original scale gives the following values of these units:

$$L_P = (G_N h/2\pi c_0^3)^{1/2} = 1.62^{\times}10^{-38} \text{ m}, \qquad (84)$$

$$T_P = (G_N h/2\pi c_0^5)^{1/2} = 5.39^{\times}10^{-44} \text{ s}, \qquad (85)$$

$$M_P = (hc_0/2\pi G_N)^{1/2} = 2.18^{\times}10^{-8} \text{ kg}. \qquad (86)$$

Comparing the Planck's length and time (or its reversed, the frequency of about 10^{44} Hz) with the natural values of Table 4, we see that these completely theoretical values are extremely inadequate for any terrestrial application. Also the Planck's mass is extremely inadequate for all aspects of any fundamental physics. It is impossible to find a single „building block" of matter with such big mass. Our previous Table 3 shows us that we need about one million of the largest nerve cells collected together in order to reach the Planck's mass.

From that reason the original Planck's scale has been applied till now in only few theoretical considerations of some extremely exotic, hypothetic, completely unobservable states of matter. One example of such an exotic state should be

the state of some hypothetical precursor of our Universe immediatelly after the so-called Big-Bang. Immediately means in that case from time zero until just the Planck's time (Eq.(85)) after that. The traditional cosmology declares this extremely short time as „unexplainable" and try to explain the development of our Universe during all the remaining time since then to our times. I am not going to comment this extravagant hypothesis here. However, I am forced to say to the traditional physicists using the Planck's scale that their tool is simply faul. It has nothing in common with the Nature as I understand it.

The problem with the original Planck's scale lies not in the theoretical calculations leading to the expressions of Eqs.(84) to (86). There are the numerical values of the physical constants used by Planck, in order to calculate his length, time and mass, which are so much problematic. The specific values of these physical „constants" at Planck's disposal have not been connected with any specific state of matter. The Planck's relations (84) to (86) rewritten in the language of our unified physics are following:

$$r = (GJ/c^3)^{1/2} = \mu r_u = \mu(G_u h/c_u^3)^{1/2}, \qquad (87)$$

$$t = (GJ/c^5)^{1/2} = \mu^2 t_u = \mu^2(G_u h/c_u^5)^{1/2}, \qquad (88)$$

$$m = (Jc/G)^{1/2} = \mu^4 m_u = \mu^4(hc_u/G_u)^{1/2}. \qquad (89)$$

These relations are valid for each natural state of matter, with an arbitrary value of μ from the whole range of the Table 3 or 5. However, any trial to find out a single state corresponding to the original values of the Planck's scale cannot be successful. This scale left us with a really very strange combination of three completely different states of matter. The Planck's length L_P could be reached for a state with $\mu_L = 3.20^{\times}10^{-27}$, the Planck's time T_P would be reach for $\mu_T = 5.23^{\times}10^{-16}$, and the Planck's mass M_P for $\mu_M = 2.56^{\times}10^{5}$. No solution of this dilemma could be ever possible. Therefore, no serious science should be argumented with the original Planck's scale.

4. 5. New quantum definition of the electromagnetic spectrum

We know today that energy can be radiated and absorbed only in the form of quanta. One of the traditionally defined carriers of the energy are the electromagnetic waves or photons. The energy of such traditional quantum is given by the Planck's equation (compare Eg.(48)):

$$»W« = °J»f« = \mu^4 h»f«,$$

where the Planck's constant $h = 6.626*10^{-34}$ Js is the universal quantum of action °J. In sections 3.5 and 4.3, we have discussed to which extension the traditional version of this equation, $W = hf_{quantum}$, is correct.

The spectrum of the electromagnetic radiation is traditionally presented for a single state of matter, the „vacuum“, where the speed of light has been estimated to the value of c_{vacuum} = 299792458 m/s. Whilst the range of the quantum frequency, $f_{quantum}$, of this radiation extends over 24 orders of magnitude, from the lowest frequencies of about 10 Hz for the longest broadcast radio waves up to the hardest gamma rays of 10^{25} Hz, the traditional definition of the electromagnetic wavelength, $r_{vacuum} = c_{vacuum} / f_{quantum}$, leads to values of the wavelengths restricted only to a single state of matter, the „vacuum“. Consequently, this „vacuum“ wavelength is reversely dependent on the first power of the quantum frequency, $f_{quantum}$.

Similarly, the relation of the traditional quantum energy to the thermodynamical temperature, T_B, is defined by means of the Boltzmann's constant, $k_{Bu} = 1.38^{x}10^{-23}$ J/K (compare Eq.(73)), in the following way: $T_B = hf_{quantum} / k_B$. This relation suggests that the temperature of a material, as represented through the thermodynamical temperature, T_B, linearly depends on the quantum frequency, $f_{quantum}$. Unfortunately, this relation is not applicable in the quantum and relativistic world. Nature seems to respect some other relation between the characteristic temperature of a quantum of matter and the characteristic

quantum frequency. I think, this is the main, or even the only reason, why the practical applications of the classical thermodynamics to quantum devices and processes leave us often dissatisfied.

How unrealistic is the above traditional presentation of the obviously quantum spectrum of the electromagnetic radiation, can be conveniently discussed on an example of a diagram showing the spectral distribution of the Sun, our most „prominent" radiating body. In the diagram below, we see the so-called „black-body" spectra of the Sun (the widest one, at about 6000 K), together with the similar spectra of the Earth (at about 273 K), the outermost regions of our Solar System (Kuiper's Belt, at about 40 K) and the traditional, so-called Microwave Background Radiation of the Universe (at about 3 K). (*Note that for our present purpose the most important are the positions of these spectra on the „spectral axis"; the shapes of these curves are approximately presented and normalized to the strongest solar spectrum.)*

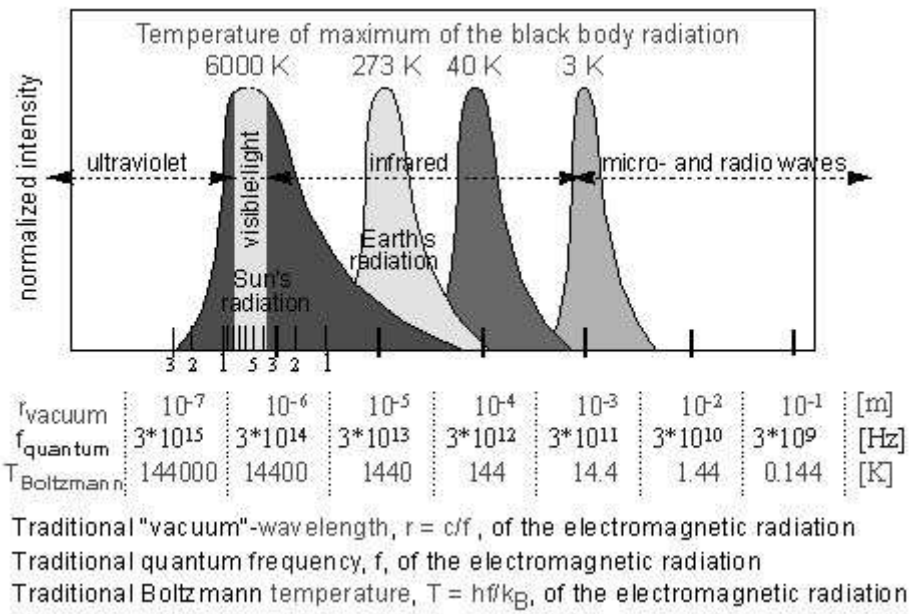


Figure 4. The traditional „black-body" spectrum at various temperatures

The convenient traditional expressions for the relation between the temperature of a black-body and the frequency (or wavelength) at which most of the energy is emitted are:

$$f_{quantum}(maximum) = 10^{11} \times T \text{ [Hz]} \qquad (90)$$

and

$$r_{vacuum}(maximum) \times T = 0.003 \text{ [mK]}; \qquad (91)$$

the second relation being known as Wien's displacement law.

As we see in the table under Fig.4, the three axes of wavelength, r_{vacuum}, frequency, $f_{quantum}$, and temperature, $T_{Boltzmann}$, are not compatible to each other. Positioning the spectra on the frequency axis, for example, places them in quite false temperature ranges, and vice versa. It is because these spectra are located on the frequency axis in accordance with the (traditional) relation (90) (see also the table below), whereas the Boltzmann-temperature definition (the last column of the table below) gives the frequency values 4.8 times lower than the former case.

Table 6. Two different locations of the „black-body“ spectrum

For temperature:	According to a): $f = 10^{11} \times T$	According to b): $f = k_B \times T / h$
T = 6000 K	$f = 6 \times 10^{14}$ Hz	$f = 1.25 \times 10^{14}$ Hz
T = 273 K	$f = 2.73 \times 10^{13}$ Hz	$f = 5.69 \times 10^{12}$ Hz
T = 40 K	$f = 4 \times 10^{12}$ Hz	$f = 8.33 \times 10^{11}$ Hz
T = 3 K	$f = 3 \times 10^{11}$ Hz	$f = 6.25 \times 10^{10}$ Hz

The numerical coefficient of 4.8 (or more exactly 4.96511) is traditionally accepted in Wien's displacement law. It is, however, nothing more than an

auxiliary parameter of the traditional theory correlating the two non-compatible axes of the quantum frequency and the thermodynamical temperature.

It is also difficult to see in that traditional picture, which objects should be understood as the radiators of the corresponding wavelengths. Let us see once more the table directly under the Fig.4. Which should be, for example, the quantum objects with dimensions of about 1 micrometer, responsible for the Sun's radiation? Or which quantum objects about 10 micrometer large could be responsible for the Earth's radiation?

In that context, it is also interesting to consider the following diagram, showing the transparency of the Earth's atmosphere for the electromagnetic waves in the frequency range between 10^9Hz and 10^{16}Hz.

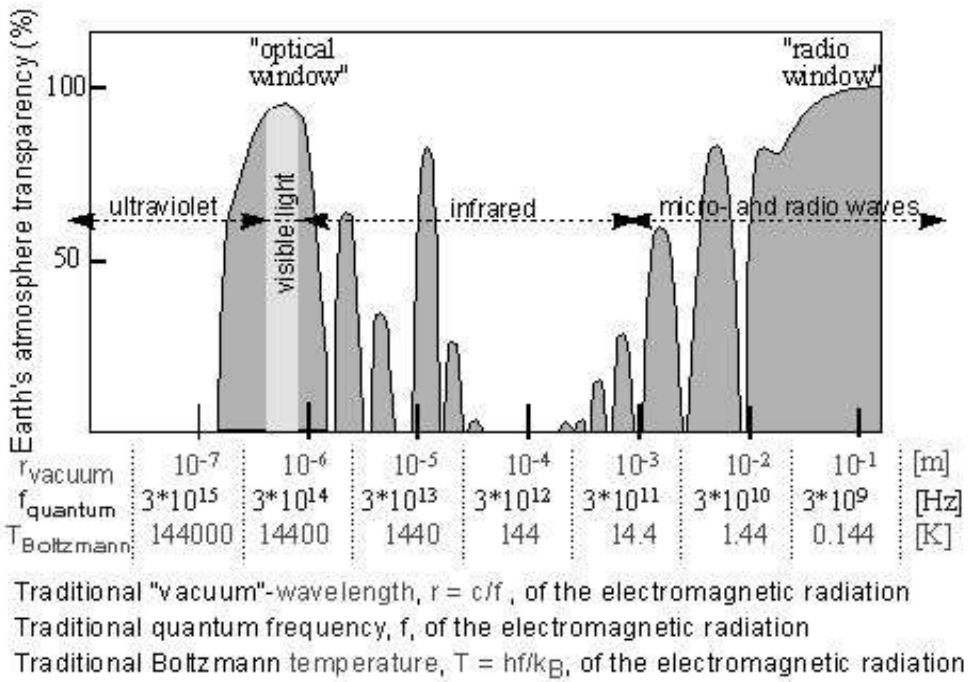


Figure 5. Earth-atmosphere transparency for the electromagnetic waves

As we see in Fig.5, there are two windows allowing the solar light and the radio waves to reach the Earth and to escape it. The frequencies lying between these windows are absorbed mainly through the atmospheric water, while those higher than the optical range are mainly absorbed through the atmospheric oxygen. The above discussed traditional relations of the quantum frequency, $f_{quantum}$, to the wavelength, $r_{vacuum} = c_{vacuum} / f_{quantum}$, and to the temperature, $T_B = hf_{quantum} / k_B$, are shown once more below the diagram.

We are used to treat the wavelengths r_{vacuum} and the temperatures T_B as the characteristic values describing some specific states of matter. Unfortunately, we are wrong in doing so! All these values of r_{vacuum} and T_B correspond to one and the same state of matter, the „vacuum". They have nothing in common with the absorption mechanisms in the atmosphere. There are no centimeter large objects in the Earth's amosphere absorbing the electromagnetic waves of GHz frequency. Similarly, there are no extremely hot (144000 K), 0.1 micrometer large objects absorbing the frequencies of $3^{x}10^{15}$ Hz, and so on.

Our unified physics allows us a much more realistic version of the electromagnetic spectrum presentation, as is shown in the next diagram. It is the quantum spectrum of the electromagnetic radiation, relevant to the quantum spectrum of matter. As we have already mentioned many times, in the unified theory, all physical quantities and relations between them (i.e., all physical laws) depend on a single, dimensionless material parameter, scaling the whole observable spectrum of matter. The quantum values, $r_{quantum}$ and $T_{quantum}$, corresponding to the discussed range of the quantum frequency, $f_{quantum}$, are shown in the following table.

Table 7. Quantum values corresponding to the quantum frequency

$f_{quantum}$	$3^{x}10^{15}$	$3^{x}10^{14}$	$3^{x}10^{13}$	$3^{x}10^{12}$	$3^{x}10^{11}$	$3^{x}10^{10}$	$3^{x}10^{9}$	[Hz]
$r_{quantum}$	0.21	0.66	2.1	6.6	21	66	209	[nm]
$T_{quantum}$	5900	1900	590	190	59	19	5.9	[K]

We observe a complete compatibility of the three axes of $f_{quantum}$, $r_{quantum}$, and $T_{quantum}$ to each other. This universality of the quantum description of the electromagnetic radiation can be also demonstrated in the following diagram, where additionally the more exact maximal temperatures of the theory have also been introduced for three higher of the spectra.

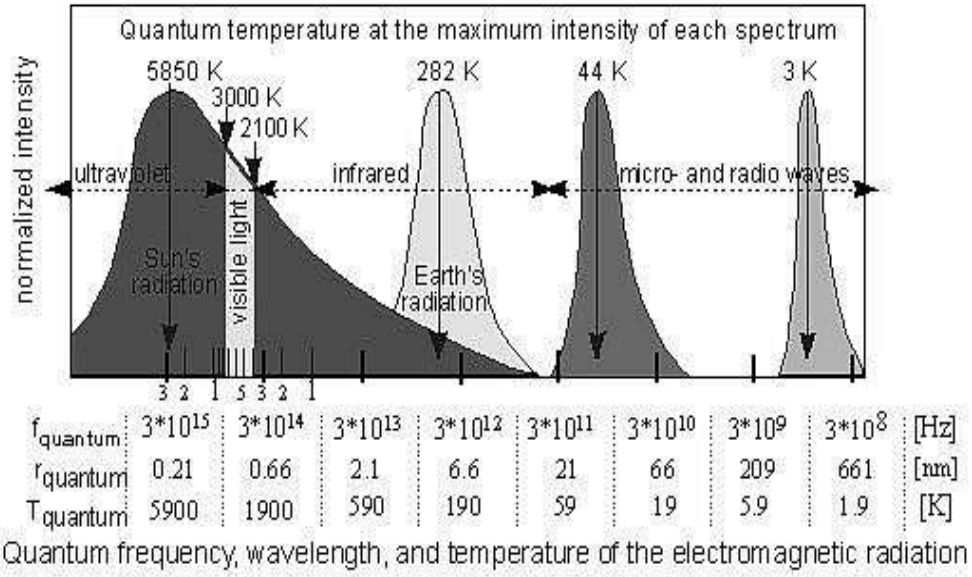


Figure 6. Universal quantum description of the electromagnetic radiation

We can see that the quantum values of all physical quantities correspond to the true states of the atmospheric gases much more realistically than the former traditional values could ever reach.

In order to compare once more, how unrealistic are the traditional, „vacuum“ values of the electromagnetic wavelength in application to the atmospheric gases, could be also seen in the following table. In this table we cite in the upper row the traditional values of the wavelengths of the electromagnetic solar spectrum as given under the Fig.4 or 5. In two lower rows of this table, we give the true unified values of the quantum frequency and the quantum temperature

belonging to those traditional wavelengths in „vacuum“. As we see, the result is catastrophal indeed.

Table 8. The quantum values corresponding to the „vacuum“ wavelength

r_{vacuum}	100	1000	10^4	10^5	10^6	10^7	10^8	[nm]
$f_{quantum}$	1.3^x10^{10}	1.3^x10^8	1.3^x10^6	1.3^x10^4	131	1.31	0.0131	[Hz]
$T_{quantum}$	12.4	1.24	0.124	0.0124	0.00124	1.2^{-4}	1.2^{-5}	[K]

The temperatures corresponding to the above wavelength values have nothing in common with the absorption of the electromagnetic radiation in the Earth's atmosphere. The „vacuum“ values of all physical quantities have really the only sense if related to their „own“ state, the „vacuum“, and no elsewhere!

In conclusion, let us therefore say directly that we cannot neglect the Naturics suggestion to re-define the traditional definition of the solar-radiation spectrum. Because of the importance of the proper interpretation of the spectrum, not only for astrophysics, but also for the entire physics of the quantum materials and devices, including nanotechnologies and biotechnologies, it would be helpful for all of us to start just now a serious scientific discussion concerning the suggested quantum presentation of the spectrum of electromagnetic radiation. The starting point could be the above discussed discrepance between the traditional and the quantum positions of the spectrum maximum. I think, we should take into consideration the following important points.

- The traditional definition of the solar radiation spectrum approximating a solid black or gray body with an effective temperature of 5770 K is much older than the ultraviolet and X-ray astronomy. The wave range from 3^x10^{15} Hz to 3^x10^{17} Hz remains relatively unexplored even today because it is not easy to construct an efficient telescope; most materials are strongly absorbant for normal incidence optics at these frequencies.
- We don't describe here the spectrum of the solar radiation reaching the Earth's surface but rather the spectrum of the solar radiation leaving the Sun (with its own, complicated „atmosphere“).

- The frequencies between 10^{15} Hz and 10^{18} Hz are the mostly absorbed ones in the Earth's atmosphere from the entire shown frequency range. The absorption maximum is reached at the frequencies of about 10^{16} Hz, to which the atmosphere is not transparent even 150 km above sea level. As we have seen above, these are exactly the quantum frequencies corresponding to the maximal intensity of the solar radiation.
- I think, we should even expect this last coincidency effect from the evolutionary point of view alone. The range of the most intense solar radiation should be blocked off first of all in the evolving atmosphere in order to produce the safe conditions necessary for the life evolution beneath.
- On the contrary, the traditionally accepted spectrum of the solar radiation, with its maximum in the middle of the visible light range, does not fulfil such (still speculative at the moment) evolutionary pre-condition *(unless we accept some „super-anthropic" cosmological principle and conclude that the Sun's spectrum is adjusted to the sensitivity range of our human eyes; I strongly prefer the reversed inference)*.

From the present theory point of view, the electromagnetic spectrum of radiation is completely compatible with the quantum spectrum of matter, if the reliable unified quantum description is used for the presentation of both the spectra.

4. 6. The quantum systems of nano- and biotechnology

The most important concept from the scientific-technical vocabulary of the 20th Century is certainly the concept of the „modern technologies". All modern technologies are divided traditionally into nanotechnologies of the inanimate matter and biotechnologies of the animated matter. To the nanotechnologies belong (among others): nanoelectronics, optoelectronics, high-temperature superconductors, storage technology, nanowires, quantum dots, surface engineering, molecular engineering, and hydrogen fuel cells. To the biotechnologies

belong (among others): tissue engineering, genomics, human genomics, gene technology, implantation technology, neurotechnology, and bionano-sensing systems.

The rich nations are capable to spend a lot of money for the relatively fast development of the modern technologies. But the bigger part of this money gets lost without the right physics guiding this development. The poor nations, on the other side, do not have enough money either for their own research in the nanoscience or for the - because of the ineffectual research - overcharged products of the rich nations. This situation is unsatisfying for the whole world.

The present book has been written, on the one side, in order to accelerate the spread of the necessary new nanoscience over the whole world, and, on the other side, in order to guarantee all nations a comparable start-potential for the development of the modern nanotechnologies. Exclusively the application of Naturics, the really reliable nanoscience, is capable to keep the unavoidable risks of the new technologies on a minimal level, simultaneously ensuring their maximal usefulness.

At the moment, all nations of the world have got the same probability to reach the top position in the theoretical development of the new technologies on the basis of our nanoscience. I would like to know which of the nations will become the winner in the race for the scientific and technological hegemony over the nanoscale world during the next ten years. I still have no personal favorite for this race.

The conceptual change in the treament of the material physics and technologies can be seen on the exapmle of the space research since the Apollo-program. Still in seventies of the last century, it was no problem to develop a new technology based on the traditional physics as the technology theoretical-guide. The field-transistors or the micro-chips are typical examples of such a traditional development. The two Voyager spacecraft, which NASA have launched 1977 into the interplanetary space of the Solar System, were constructed with such traditional technologies. Their hardware, including the board computers, was still constructed on the well understood principles of the „classical“ microelectronics. This microelectronics referred in principle

exclusively to the traditional electrodynamics of the 19th Century. This solid technological basis of the spacecraft construction was the foundation of the extraordinary success of the Voyager-Mission (they have visited all gaseous planets of the Solar System, Jupiter, Saturn, Uranus, and Neptune, during the next twelve years, and they are still „alive" today).

Although planned not for more than a few years originally, the mission was often extended during the flight. The very robust hardware of the spacecraft has made it possible. The natural tolerance-range of all technological parameters was still relatively wide at that time. It was wide enough to keep the board computers being capable, after many years in space, to successfully react to the commands from the far Earth and rewrite their own programs. The electro-mechanical and optical equipment of these spacecraft was then also able to follow these renewed programs.

Unfortunately, a similarly successful mission based on our „modern" technologies seems to be impossible today. Firstly, it is not true, what all aerospace-engineers have learned till today, that the physical properties of a piece of material are the same everywhere in the Universe. These properties change during a flight, for example, across the Solar System, with the changing distance of the spacecraft to the center of mass of the Solar System.

Secondly, in the recent years, engineers have tried to construct their modern spacecraft by using increasingly the nanoscale hardware. Unfortunately, they have understood their constructions merely as size-reduced versions of the robust devices of the Voyager era. As a consequence of these two misunderstandings, they had had to accept the numerous failures of those modern missions. The statistics of the unsuccessful Mars missions of the last decades is the best example of this problem.

Therefore, I am sure that the space research, which should be based on the nanoscale technologies, is one of the domains necessitating our new nanoscience very urgently. Only when applying the real nanoscience, one can hope on a prolongation of the wide national and international support for this fascinating domain of the scientific research.

One of the fundamental statements of Naturics expresses the certainty that the whole Nature, with all her objects and processes, is quantized. The traditional quantum physics has of course principally also said something like this, but the traditional version of this statement was never accepted for the really whole Nature. For example, I have never heard previously that the planetary systems, like our Solar System, are also natural quantum systems. Also nothing like this about a cup of tea on my table. However, according to Naturics - they surely are quantum systems.

If the whole Nature is quantized, then each ambitious description of Nature has to be quantized too, in all its aspects. This means for us that also all physical quantities of our unified family have to be considered as quantized. Including the mass, for example. In my previous book (*„The cosmic carousel of life“*), I have already briefly discussed the quantization of mass of the cosmic bodies, mostly moons, belonging to our own planetary system. Here we are interested in similar processes of formation of the natural quanta of mass, but taking place on quite different scale of nanometer rather than of astronomic sizes.

If one observes under a simple optic microscope the hot air above a burning candle, one can see the dark soot particles appearing as from „nothing“ in a specific distance above the flame. If we carry out a corresponding experiment with an electric arc, we are able to produce two other forms of carbonaceous particles, either the spheric fullerenes („bucky-balls“) or the lengthy nanotubes.

We can ask, where come the soot particles or the fullerenes and nanotubes from? The traditional physics would try to answer something like that. There are carbon atoms in the burning material. They come together, exactly sixty of them for a typical „bucky-ball“ (C_{60}) or hundreds for a simple nanotube, organize themselves spontaneously into a corresponding perfect structure, and the wonderful nanoparticle is ready. Which higher physical or natural „sense“ should drive the „self-organization“ (or clustering), is however unknown until today. The traditional physics remains perplexed in view of such natural phenomena. Nobody is even trying (as far, as I know) to observe with some powerful ultra-high-speed camera (or microscope) the dynamical process of such speedy collecting of atoms into their perfect 3-dimensional structure. Why not? Whether the traditional physicists do not really believe their own theory?

In Naturics we have quite different explanation for such phenomena. There are no individual carbon-atoms at all which participate in a formation of nano-particles. The universal field of light (FL) is the direct source of all material particles (or fluctuons - the quantized fluctuations of this field). The burning candle or electric arc are the specific sources of energy delivered to the burning part of their material. This additional energy concentrate the material energy to higher density in the burning part of this material, shifting its quanta from the „colder", starting level of the condensed material toward the next (according to the applied temperature) molecular, „hotter" level, with some higher characteristic density of energy in each quantum of matter. These molecular quanta of matter (supposedly also with a closed rather than open surface) are evidently transparent for the visible light, but they have to be observable in some shorter electromagnetic waves, probably UV between 1 nm and 0.1 nm, I suppose.

When these smaller, molecular quanta come into an experimental region with a lower temperature, nearer to the room temperature, they join together into larger quanta again, like the smaller water drops in the clouds on our sky unify themselves into larger drops by falling down temperature. The larger molecular quanta become now opaque, so we are able to see them directly.

By the way, the really atomic sub-structure of these drops or our exemplary carbon-molecules will never be reach, as long as the „burning" temperature is lower than about one hundred thousand Kelvin (compare, for example, table 3). We are surely able to „warm up" the ready nanoparticles to such high quantum temperatures again, for example, irradiating them with x rays, in order to study their atomic sub-structure. However, after such „high-energetic" observation, the nanoparticles return onto their stable (say, room-temperature) level again. On this level, the individual atoms are not more existing in them.

Similarly, also the „sub-clusters" of the C_{60}-molecules, with all structures „containing" (in the traditional language) less than sixty atoms, and being reported about from observations with time-of-flight mass spectrometers, cannot be any separate carbonaceous nanoparticles. The observed signals are rather a result of the internal vibrations or just nonstabilities of the forming fullerenes, because of the „overheating" during the experiment. The C_{60}-peak

can be enhanced relative to the other peaks (clusters), if one reduces the average energy per quantum (cluster) during the experiment.

In one of the previous sections (section 4.3), you have read some remarks about our new understanding of the attractive single-quantum electronics. Also the above example of the carbonaceous nanoparticles has been considered in the traditional physics as a possible „entrance“ into such electronics. One consider, for example, to use some smaller fragments of fullerenes for the development of the new generation of electronic nano-devices, such as quantum-dot laser, a single-electron transistor or a single-electron memory unit. The main obstacle for this perspective is the still unknown mechanism of the (supposed) fragmentation of the fullerenes.

Although I have not studied this problem in detail, my spontaneous advice for the nanotechnologists clearly corresponds with the general philosophy of Naturics: The proper, stable quanta of matter for the single-quantum electronics should be to find in the range of the dimensions larger than the universal length of 5.07 nm rather than below that value. Therefore we have to consider a reversed process of formation of some larger fullerenes rather then the fragmentation of the standard „bucky-balls“. The price would be, however, the necessity to cool the single-quantum electronic devices below the room temperature.

The space research is a leading non-military application of the modern technologies. But also the other domains of science, like the medical science, with its economically most important branch – the pharmacology, meets the same problem today. The new technological developments are very often carried out also there without the necessary theoretical support of a modern nanoscience.

One of the most fatal misunderstandings of the traditional biotechnology is the assumption that our genes lodge a design of our construction-plan, according to which our body should behave in the future. Naturics philosophy supports rather a quite different point of view. The genes mirror our actual biophysical state and our history rather than our future behavior. By manipulating the gene in one or only few biological cells, we cannot influence our future state strongly.

The descendants of living creatures show many characteristics of their parents. One names this passing of the own characteristics on the children as heredity. The traditional genetics, the science of the heredity, immediately stands here in front of its first puzzle. In the traditional picture, only a tiny (in human being – about 0.2mm large) ovum of the mother, coalesced with a sperm-cell (0.06mm long) of the father, can be considered as the link between parents and children. Outside the fertilized ovum is traditionally nothing but the „vacuum".

The puzzle is called then: How is it possible that the single fertilized ovum can contain the complete piece of information for the development, the construction and the life-characteristics of the future organism? With this traditional way of thinking, one is forced then to assume that this complete genetic information is stored in the ovum itself, in form of the independent units of heredity, the genes.

The problem is clearly less mysterious in the uniform way of thinking according to Naturics. In this case, not only the fertilized ovum itself, but also the whole surroundings in the universal state of matter (the FL), is responsible for the storage and transfer of the necessary genetic information. The situation is very similar like during the manufacturing of a homeopathic drug. The surrounding FL always plays an important role at the boundary between the inanimate and the animated matter. This field is existing, in our example, in the amnion fluid, in the uterus and other organs of the nascent mother. Then, one needs no longer the questionable traditional assumption that for example, the smoking of a cigarette during the first minutes of the pregnancy can caused the change of the genes in the tiny ovum. It is enough that some cells of the uterus or the amnion fluid are damaged by it. This damage can be transferred indirectly - and not necessarily immediately - to the embryo.

As we see, also the genetics must reconsider its bases again. It seems that the world is ready now for Naturics, our extremely reliable nano- and bio-science. As a practical example of the reliability and simplicity, let us see just the following table of the useful physical values characterizing the nanoscale-materials. All these values are simply calculable by using the corresponding definitions and the universal values of these physical quantities, as given in Fig.2.

Table. 9. Some chosen physical properties of the nanoscale materials

Size	Material factor μ	Period	Potential	Resistance per particle	Magnetic field	Tempe-rature
1 nm	0.197	7.64 fs	4.15 mV	131 kΩ	31.7 A/m	1240 K
5 nm	0.986	191 fs	20.7 mV	26.2 kΩ	158 A/m	248 K
10 nm	1.97	764 fs	41.5 mV	13.1 kΩ	317 A/m	124 K
20 nm	3.94	3.06 ps	82.9 mV	6.55 kΩ	633 A/m	62.0 K
30 nm	5.91	6.87 ps	124 mV	4.37 kΩ	950 A/m	41.3 K
40 nm	7.88	12.2 ps	166 mV	3.28 kΩ	1.27 kA/m	31.0 K
50 nm	9.86	19.1 ps	207 mV	2.62 kΩ	1.58 kA/m	24.8 K
100 nm	19.7	76.4 ps	415 mV	1.31 kΩ	3.17 kA/m	12.4 K

The characteristic temperature can be calculated from its definition (68) and the universal value (76).

4. 7. The bioresonances in our body

In the last decades, the scientific specialization has reached such depths, by which practically no more scientist exist, who dares itself to rely on his own healthy mind. With each problem that oversteps the narrow borders of the own specialization, one feels itself forced to immediately consult another specialist. The healthy human mind is however, like the human being himself, a product of Nature. In order to be able to apply it meaningfully, we only need to „out-crawl“ from the holes of our specializations, back on the natural surface of the knowledge, from where we have started many years ago „to dig“ our specializations.

The physicists' dream of the complete unification of our scientific knowledge is not the first of such dreams of the educated people. If the physicists and other

natural scientists would have already seen earlier, what the holistic medicine had already discovered and understood, we would be much further advanced in our unified physical description of Nature today. Our Naturics has partly by chance and partly intentionally accepted some similar „holistic“ ideas.

The most important common idea of the functional medicine and Naturics is the idea of the matrix or the basic-system in our bodies. Other used names of this matrix are interstitial connective tissue or mesenchyme. The holistic medicine understands the connective tissue not only as one mechanically connecting but simultaneously as an organic, vital medium. The medicine already recognizes that the nerves and vessels touch the working cells at no position of the body directly but that the connective substance play the role of the mediating limb, the bearer of the nervous- and nutritional-stream. Only the interstitial connective substance touches all components of the body directly. And the interaction goes everywhere through it. But which type the intercession of the connecting substance by this interaction is, no clues were available yet. The precise physical properties of our field of light would be surely helpful by the understanding of this universal vital medium.

As we have already indicated with our definition of the quantum spectrum of matter, the universal medium is the first stage of a forming itself, alive organism, and also the last stage of a dying organism. All biological cells, in the final effect including also the nerve cells and the brain cells, arise from this basic substance and disintegrate into it again.

Another, until now unsolved problem of the life sciences are our bioresonances, i.e., the internal vibrations anchored in the universal medium, inside and outside of our body.

It is known to us since many thousands of years that our biological life is very narrowly interconnected with different rhythms of Nature. Regardless of this realization and regardless of our changing personal constitution, our occupation and the everyday tasks force us more and more to execute a certain activity at a certain time and at a certain place. Therefore, we work against the natural rhythms more and more frequently. That makes worse our performance and makes us sick earlier or later.

One of the new realizations of Naturics is that it is impossible to have a natural, spatial structure, that practice no characteristic, nonstop movements (so-called own-vibrations). And turned back, no natural vibration, no natural rhythm can exist without a spatially restricted material body that generates or re-transmites this vibration. If one of the possible generators of the vibrating body is located in an outer electromagnetic field transferring some electromagnetic waves, a resonance would occur, if the body own frequencies are the same as the outer frequencies. In a case of the biological generators (in living bodies), one speaks about the bioresonances.

Naturics has yet one further point, common with the functional medicine, in the knowledge about the bioresonances. One needs to develop no new technologies or appliances for this branch of medicine. One must merely modify the previous interpretation of the biofrequencies. Through the better understanding for the natural cycles in our body, one reaches a better effect of each therapy, which is based on the bioresonances.

The common knowledge-point is that all possible resonances of a given body are always hierarchically organized to each other. The resonances with shorter periods (higher frequencies) are sub-ordered to the next, hierarchically higher resonances (with longer periods or lower frequencies).

Of course, the ancient practical medicine was able to use only those bioresonances, which were known in science of those ancient times. The most evident and the longest of the natural periods was then a period of one year, the duration of a single revolution of the Earth around the Sun. Months and weeks were just subperiods of the year. The second natural period, evidently governing the life on Earth, was one day, the duration of a single rotation of the Earth around its own axis. Hours, minutes, and seconds were also simply subperiods of the day.

Naturics has allowed us to understand the whole Cosmic Hierarchy of our Sun and our Solar System. Very detailed information about this fundamental cosmic connexion of the terrestrial life can be found in my previous book, „*The cosmic carousel of life*“. Here we need only a small part of this information allowing us to understand the following figure.

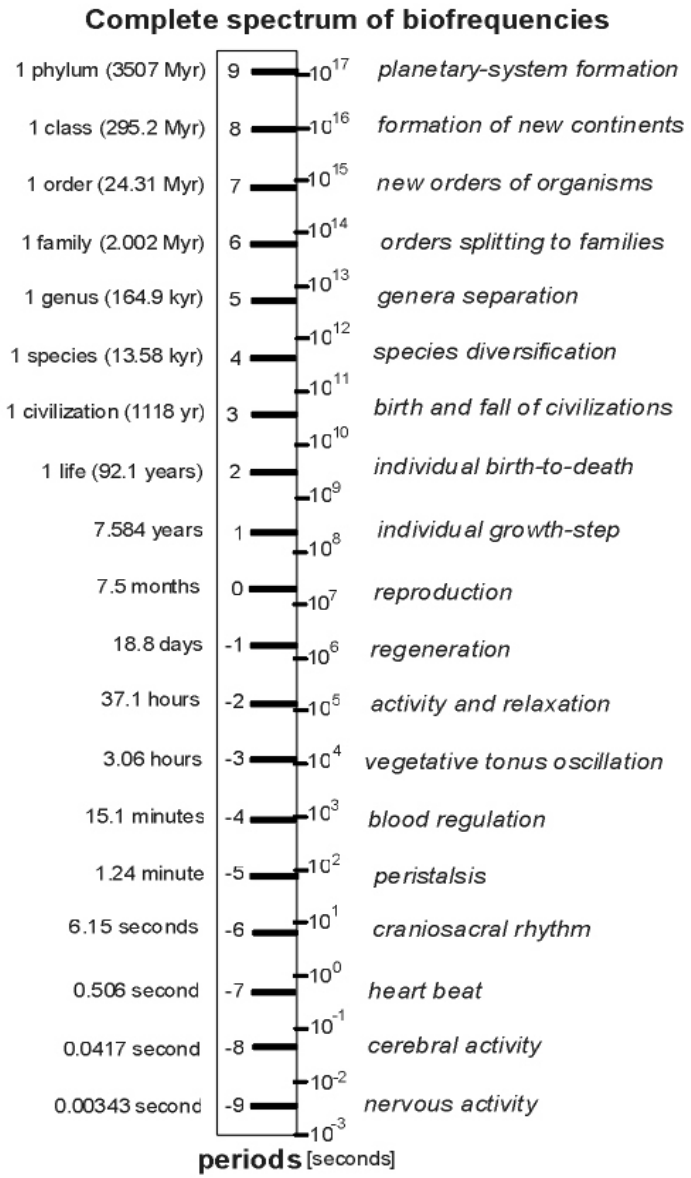


Figure 7. Complete spectrum of biofrequencies based on the Cosmic Hierarchy of our Solar System

In the upper part of Fig.7, we see just the corresponding part of the information, relevant to our present consideration of all possible natural periods influencing life of all organisms on the Earth. This part of the spectrum extends from the formation-period of such stellar systems as our own one, through shorter hierarchical periods, all scaled with the same single quantum number of 12.1428, down to the duration period (life expectation) of a single civilization, and down to the life expectation of a typical terrestrial organism.

In the lower part of Fig.7, we have extended this cosmic spectrum of periods on the natural periods observed in the living functions of individual organisms. The most commonly known oscillations inside our own organisms, and corresponding to each hierarchy step, are shown in the lower right half of the figure. They should be treated as examples of such natural oscillations, underlying the direct influence of our Cosmic Hierarchy. They are probably not the unique examples of such oscillations in all terrestrial organisms.

What is unique in our complete spectrum, however, it is the precisely scaled periods (their presented times or their not shown corresponding frequencies) of the possible resonances of the living organisms with their cosmic environment.

As we see, neither the „ancient“ periods of one year nor that of one day (and their sub-periods) appeare in this spectrum. It is because both these periods are connected only with the individual motion of the Earth, they are not universal periods of the life that is (theoretically) possible in every place in our Universe (or at least inside of our huge Cosmic Hierarchy). It is clear, that the terrestrial day-night oscillation and the annual seasons have an immense influence on the behaviour of all organisms living on the Earth. But they are not the primary, cosmic bioresonances.

Any new discovery needs some time to be understood in all its details. So is also the complete spectrum of our bioresonances still too „young“ in order to obtain its final scientific interpretation. Nevertheless, two helpful observations can be immediately made.

At first, all the bioresonances seem to be correlated in groups of three of them, showing some similar properties. Three shortest of them (levels -9, -8, and -7)

means „brain waves“, observable in electroencephalography. We can call them as nervous rhythmic. Next three (levels -6, -5, and -4) can be recieved in organs of individual organisms. These „organ waves“ are responsible for the tissue rhythmic. The next three of the bioresonances can be ordered as „body waves“ and considered as responsible for the nutritive (or metabolic) rhythmic. The „universal wave“ of the FL-level is the transition-level from individual to multiple organisms, therefore responsible for reproduction. The levels 1, 2, and 3 can be named as „civilizing (or maybe cultural) waves“ responsible for social-life rhythmic. The next levels (4, 5, and 6) could be named „evolutionary waves“, being responsible for the right rhythmic in the evolution of particular species of organisms. Finally, the highest levels of the spectrum, the levels 7, 8, and 9, should be named „planetary waves“, because they are responsible for the formation and reconstruction of the entire planets as the astro- and geophysical base of the evolution of the higher developed life. Fig.8, on the next page, gives this preliminary analysis in a grapical form.

Secondly, the spectrum of all biofrequencies allows us also to draw the following interesting analogy to the traditional spectrum of radio waves. It can be productive to consider every lower-level wave (with correspondingly higher frequency) to be a carrier (beam) wave for the information carried over through the next higher-level wave (with correspondingly lower frequency). The beam amplitude is modulated with the lower frequency of the „informative“ wave, like music or spoken frequencies modulate the standard carrying radio waves. For example, the „thoughts waves“ of the level -7 modulate the „beam“ of the nervous-activity waves (-8 or -9). We can also say that the nerve-wave is a carrier of the brain-wave or the brain information (thought, idea). Similarly, the biological wave of the „ordinary“ cells is a carrier of the nerve-wave (signal).

We have still a long path to go until we will be really able to say that we understand the way how our brain works. Our brain is not a simple „from-stimulation-to-reaction“ machine. The most important new knowledge of Naturics is that brain matter is the highest level of all possible levels of the natural organization of matter. A whole quantity of nerve cells and other cells in brain must work together in order to reach this level of organization. Some specialists say that understanding of the brain matter is much more complex than the genom to decode. I am no brain researcher, but I agree to this.

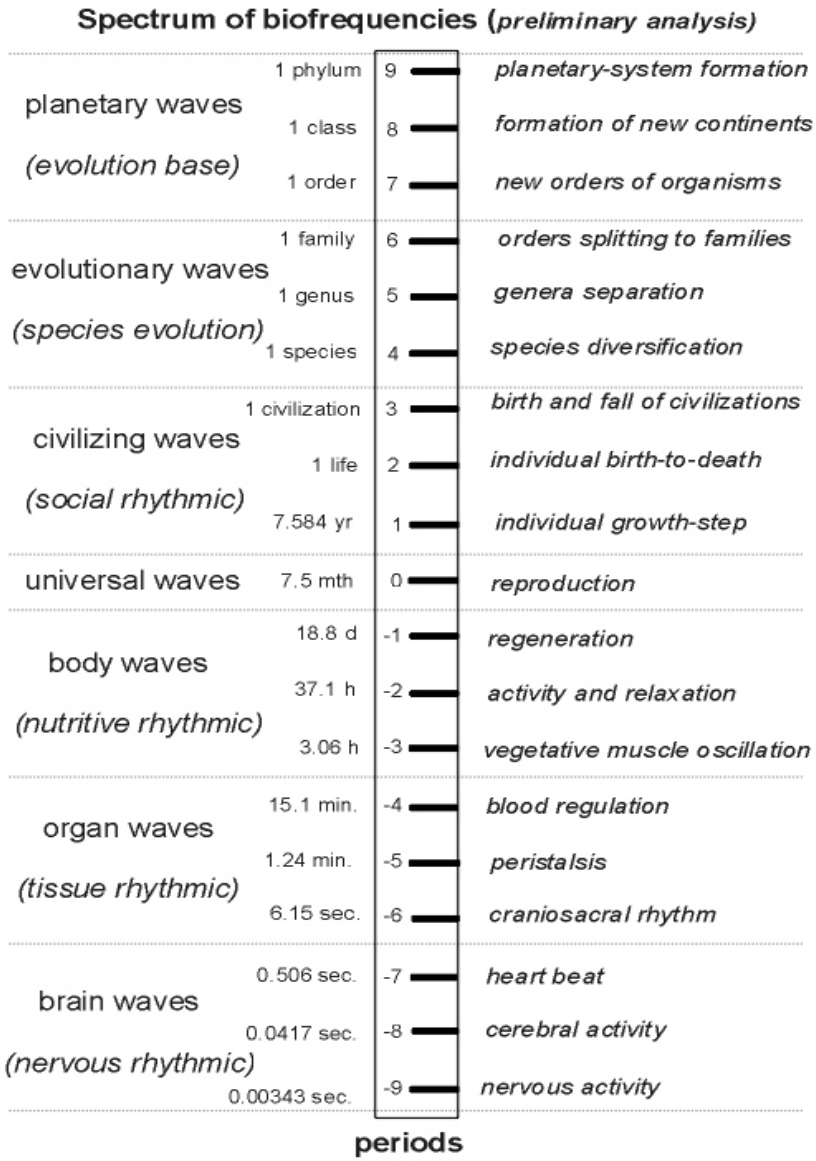


Figure 8. The functional groups of the bioresonances
(a proposal of the spectrum interpretation)

4. 8. The never noticed stellar companion of our Sun

The most evident things are often the most difficult to see. Let us consider a cloud of cosmic dust (the universal state of matter) collapsing under the interaction of the common gravitational interaction. Every cosmic cloud, collapsing or not, is always in motion. As it is known from the fundamental mathematical physics, each natural motion of a free mass consists theoretically always of two components, the linear motion and the circular motion (compare section 2.1). Each collapsing cosmic cloud can be therefore understood as a whirl, a vortex of the cosmic mass, wandering on its specific path through the Universe.

We have learned after Newton that gravitation is a central force. This means that the gravitation force collects all the reachable masses in its own center, the center of mass. This conclusion is reversible. If there exists only one center of mass inside of a cosmic cloud, the gravitation force will collect all the surrounding mass, the mass of the whole cloud, around this single centrum. In such a case no mass will be left for a formation of any other cosmic objects, neither stellar nor planetary. Let us call this single-vortex as the case of the "undisturbed accretion" (compare Fig.9.)

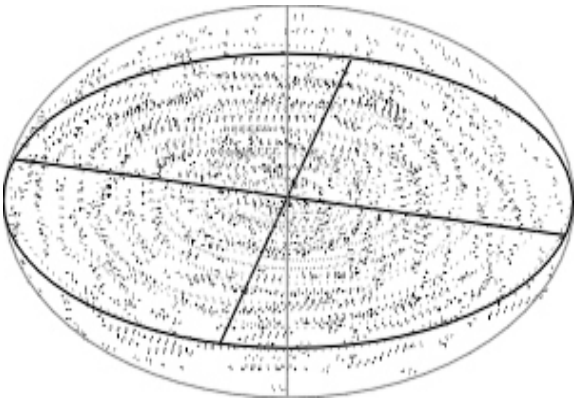


Figure 9. Ideal case of an undisturbed accretion of a cosmic-dust cloud; all mass, rotating around a single center of mass, is falling into this center; a lonely star, without any planetary system, is the result in such a case.

Only in those cases, when the above ideal accretion become disturbed because of whichever interaction with the environment of the collapsing cloud, one or more additional whirls could be formed inside of the cloud. The additional center (or centers) of rotation becomes also the additional center (or centers) of mass. Some part of the whole mass will be now attracted not to the „main“ center of mass but to the additional center (or centers). The most probable is the case when only one additional vortex, one additional center of mass appears during the accretion process.

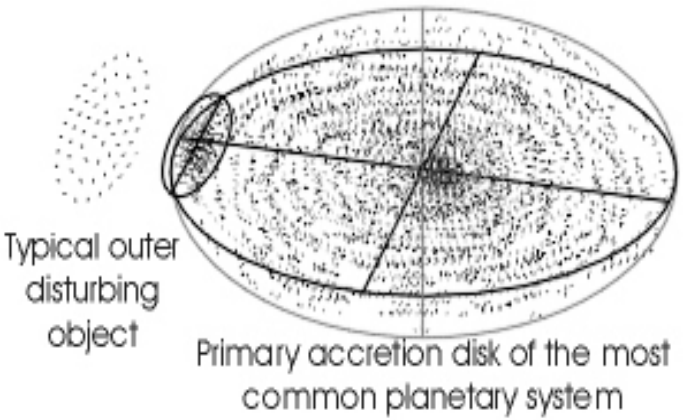


Figure 10. The most probable case of a collapsing cosmic-dust cloud; some outer, larger or smaller disturbance influences the cloud accretion; an additional center of rotation becomes an additional center of mass.

Of course, not each arbitrary disturbance results in a stable vortex and consequently in a new center of mass inside the collapsing cloud. The most of such vortices vanish again after some time. In order to remain stable, the motion of the new vortex has to be able to isolate itself from the main rotation of the accretion disk. The best chance to reach such an isolaton has the vortex rotating in the plane exactly perpendicular to the main rotation (compare Fig.10)

Therefore, the double-star configuration, with a larger central star and its smaller stellar companion, located at the edge of the collapsing cloud, and rotating in the plane perpendicular to the plane of accretion of the main mass, should be

the most probable case for the whole Universum. And this case is really the most frequently detected one in the observational astrophysics. Consequently, we can be sure that only in such a „disturbed“ case of the cosmic accretion, a planetary system can be formed around one or both the stars (compare Fig.11).

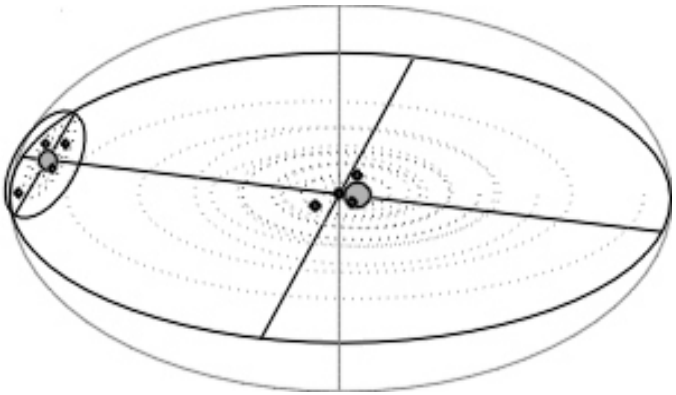


Figure 11. The most typical case of star formation in our Universe; the central star is formed nearby the center of mass of the whole system (but not directly in that center) and the smaller (dwarf) star at the edge of the accretion disk. If enough mass is remaining, four planets can be formed around each of the stars (circulating the stars in two perpendicular planes).

Our Solar System has formed its planets, therefore it had had to be „born“ as a double-star system. We can be surprised or amazed at this discovery, however we can ignore it never more. Even this simple discovery alone is a good enough reason for the introduction of Naturics in our physical description of Nature.

The detailed explanation to our Cosmic Hierarchy and to the Sun's companion has been also given in my previous book (*„The cosmic carousel of life“*). Nevertheless, let us include also here some remarks concerning the typical relations and dimensions of a double-star system. They can help us to better understand the present uniqueness of our Solar System and its „accoucheur“ role in the evolution of our own species, *Homo Sapiens sapiens „modernus“*, not elsewhere but exactly on the Earth.

Let's compare the Earth's mass with that of a home-cat. Then the greatest planet of the Solar System, Jupiter, weighs so much like a private car. The Sun weighs however so much in the same comparison, as together all cars on a gigantic parking place with 1050 positions. A typical second star, a stellar companion of the central star of a multiple system, weighs then normally so much as the cars from a single row of the parking place (approximately 20 to 30 cars). Since such a small star cannot develop the full brightness of our Sun, one calls such stars brown dwarfs. The companion of our Sun was also a typical brown dwarf.

Our second remark involves the dimensions of a multiple stellar system. The second star originates normally in a distance of approximately 40 astronomic units from the center of the cloud (1 AU = distance Earth-Sun). The four planets of the central star, admitted through the quantum rules, and having approximately the size and mass of the Earth, must circulate relatively densely around the central star, not further than only up to 10% of the distance to the second star (therefore below 4 AU). Otherwise they would be „catched“ by the common center of mass of the entire system (lying somewhere between the both stars, in a position depending on their mass relation) and destroyed after a relatively short time because of the competitive gravitational attraction of the both stars.

Also four smaller planets originate around the brown dwarf. Also they must circle dense around this dwarf star. They are then of course much lighter and colder than the planets of the central star. So far from the center of the accretion cloud, the small planets could find only the light elements like water-ice for their construction.

In our emerging Solar System, the mass relation between the central star and the outer brown dwarf was about 50:1, what means that the mass of the Sun's companion was only about 2 per cent of the solar mass. The global center of mass of the whole system was therefore located near the Sun (about 2% of 40 AU, giving 0.72 AU). Because of the tight motion of the four terrestrial planets about the Sun, one of these planets was in a natural way formed exactly in that point of the global center of mass. Today we call this specific planet as Venus.

All real motions of the members of the Solar System, including the Sun itself,

have of course to accept the actual position of the global center of mass. It is the next important discovery of Naturics, the statement that in reality it is not Venus that revolves the Sun but that the Sun (together with all other members of the system) circulates around the position of Venus, the global center of mass (compare Fig.12).

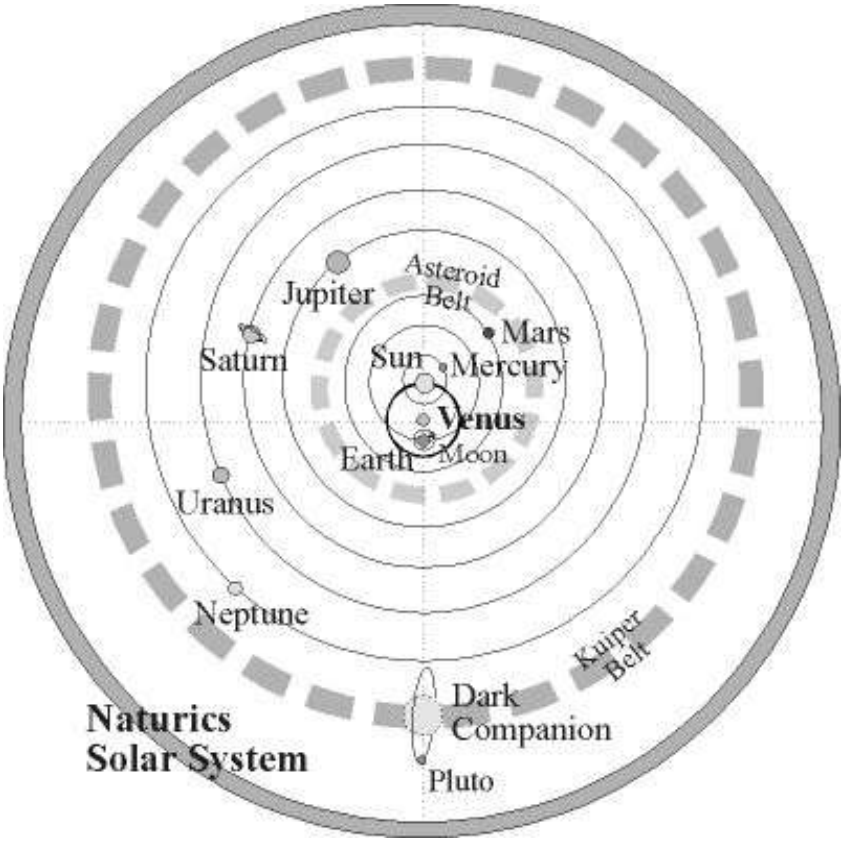


Figure 12. Venus in the global center of mass of the Solar System; in reality, Sun and other members of the system circulate around this center of mass; Mercury is the single rudimentary planet of the Sun; the local center of mass of the Sun's dark companion, holding Pluto as its rudimentary planet, revolves also Venus once in 247.19 years.

Under these circumstances it is clear that also the real orbit of the Earth in our Solar System cannot be a simple ellipse of the traditional astrophysics. The Earth has to simultaneously revolve the Sun and the global center of mass, Venus. The resulting orbit is the wonderful rosette shown in figure 13. During eight terrestrial years, the Sun revolves Venus thirteen times and the Earth five times; only two solar rotations have been followed on Fig.13. This rosette is for me one of the most impressive discoveries of Naturics.

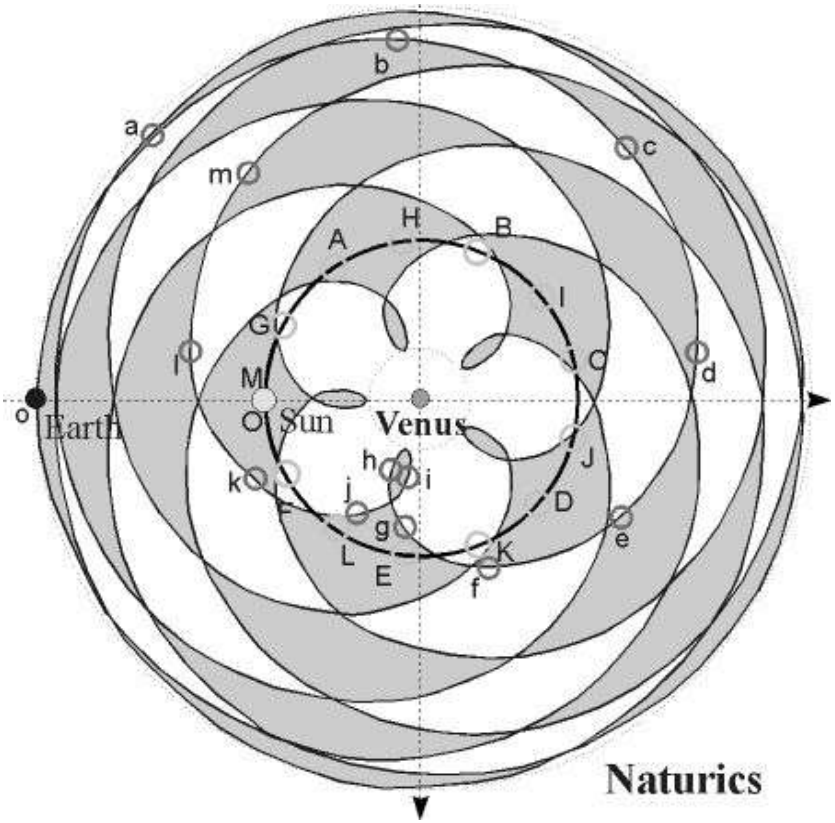


Figure 13. The true orbit of the Earth around the Sun and Venus during every eight years. At the period beginning the Earth is in „o“ and the Sun in „O“. The chosen consequtive Earth's positions a, b, ..., correspond to solar positions A, B, ... The distance Earth-Sun remains always the same, but our distance to Venus changes periodicaly, exactly five times during each 8-year period.

In this moment, we can wonder of course what has happened to the companion of the Sun? Why do we see no brown dwarf in our Solar System today? A very much shortened answer from the quoted book is as follows. Before 3.5 billion years, in a huge collision of our original solar system with another system, our brown dwarf was exploded in pieces. Its dismembered bulk, that can therefore shine no longer, still orbits the center of the entire Solar System at the edge of the system (today, one names this area as Kuiper's Belt), and still influences the movement of all other members of the Solar System. Jupiter has originated from the rests of the kernel of the brown dwarf. The other remains, and presumably also the remains of the aggressor, have formed the remaining gaseous planets, Saturn, Uranus and Neptune.

In these tumultuous events, it has come also to the formation of our Moon and to the impulse of the Proto-Earth in direction of the Sun. The Earth (together with the Moon) has approached slowly at the Sun for those 3.5 billion years. The middle temperature of the Earth has risen through it from barely -32°C at the beginning to +8.4°C today. Exactly this continuous increase of the global Earth's temperature is the driving motor of evolution of the ever higher developed life on the Earth. A second factor that influences this evolution strongly, is the plate tectonics, the fading away movement of the Earth's crust after the collision 3.5 billion years ago.

That is the most important to the problem of the invisible companion of our Sun. Let's heed however that this short explanation can be no substitute for the entire, prior book of course. It should indicate you only the right way of thinking about our cosmic home and about other possible applications of Naturics, the unifed description of Nature. The reason for the ultimate importance of this discovery is the enormous and unique influence of our Solar System upon our life on the Earth. Only as a direct consequence of the completed structure of our planetary system, including the presently widely distributed mass of the Sun's stellar companion, we are able to understand the Cosmic Hierarchy of the Solar System. This hierarchy is a source of the precise geological, paleontological, and climatological scale of time (as described in my previous book), and a source of our own bioresonances (as described above).

Chapter 5. What have we yet to learn?

5. What have we yet to learn?

5. 1. What have we yet to learn?

In this last but one chapter of the book, we leave the certain ground of the precise, mathematically controllable definition of the unified physics for a while. To a description of Nature belongs namely, beside the mathematical basis, also a plausible interpretation of all natural processes, that can result from the basis. Unfortunately, such an interpretation can never be unambiguous and unique, and it cannot be calculated. It can therefore take several years and several attempts, until one has found the best possible interpretation of such processes.

My actual experience with Naturics is still too short for a wide discussion of many different possibilities of such open, interpretational problems. Therefore I give here below just three examples of such problems, in order to stimulate you, to develop your own interpretation of those problems, which you meet in your scientific, technical or technological work. Of course, you can simply wait, until someone else will become successful with his own interpretation of a similar problem. You can also try to contact the present author, if you are not sure which way should you prefer for you.

5. 2. What about our spirit?

We have already accepted that all our descriptions of Nature cannot be perfect. In spite of this certainty, with our description, we always try to approach the original better and better. Why, however, should this approach remain unsuccessful for ever? Is there indeed some missing link between our physics and Nature, some insurmountable gap between them? I am confident that the right answer is: yes.

This answer sounds for us (using today and in the future the unified physics of Naturics) much stronger than for the traditional physicists of the 20^{th} century.

On the contrary to the traditional physics, our unified physics considers the animated matter exactly the same way as the inanimate matter. By it, we have arrived so densely at the border between the Nature and her physical description, like still nobody before us. We are so near the missing link that we can clearly recognize it. It is the human spirit.

In section 3.3 I have generally stated that no scientist becomes ever capable to create his own universe. What do I mean exactly with it? Our physical description of Nature try to explain the material construction of our Universe. We are pretty successful in our task, as the examples in the previous chapter have shown. However, I have still no idea what the human spirit could be. I even cannot say, how stupid it could be, to ask about some physical or materiell basis of that spirit. The human spirit is for me much more abstract than consciousness, mind, or intellect.

I am only able to know what my spirit is not. It is surely not a construction of the universal field of light, i.e., my spirit cannot be found on the quantum spectrum of matter. As I have declared in the introduction to this book, we are not going here to study the nature of spirit, soul, or ghost. Nevertheless, we have still a lot to do on our materiell side of the physical description of Nature. We can even try to clone the materiell copy of ourselves. However, the spirit of our cloned duplicate will never be the same as our own spirit.

5. 3. What holds the world together?

The unified physics is better than the traditional one. We are now convinced of it, aren't we? However, we still have discussed not much about the „true force“ which holds our Universe together. Nevertheless, we are already able to put some observations together.

For exsample, we can say that our Universe is not expanding. The red-shifting of the spectra of almost all galaxies can be surely explained in a quite different and elegant way, if we take into account the Cosmic Hierarchy of our Solar System and the revised interpretation of the electromagnetic spectrum of

radiation (compare section 4.5). As we have also seen previously (in section 2.5), as long as the rotation of the „cosmic carousel“ goes with a uniform frequency, there is no reaction of the universal field changing this motion. This means, there is no natural necessity to hold the macroscopic „world“ together, because there are also no natural force driving this „world“ apart.

And what can we say about the microscopic „world“ of the individual quanta of matter? We have shortly explained (in section 4.6) the formation of the soot particles over a burning candle. In our language, the same procedure of natural formation of dust particles, the universal building blocks of a material, should be always observable, when the material evaporates or sublimes. The water-steam over a pot with boiling water is only one of the most obvious examples. There are no individual molecules over a natural surface of water. The smallest naturally emerging quanta of water are always at least few nanometer in size. And some of them are always contained even also in the air over Sahara, beside the other dust particles of sand and stones.

The same applies also to all other materials. There is no reason to ask, what a „clue“ holds together the quanta of these materials. It is the very nature of a quantum of matter that it is always an entity, a unit of matter, not composed of something smaller, more fundamental. The rule of conservation of circulation, mentioned above, applies of course also in the „microworld“.

My personally prefered practical way of thinking about the common interaction between the dust particles (for example, collecting themselves together in a collapsing cosmic cloud) is some kind of the residual electromagnetic interaction known in the traditional molecular physics as the van der Waals interaction. It is at the moment, according to my feeling, my best interpretation of gravitation. However, I am not going to prove it mathematically. As you know, in my theoretical basis of Naturics, I have accepted for the whole Nature the much more universal interaction of the energy transfer. Its physical properties can be precisely calculated by means of our unified family of all physical quantities. But do we already really understand all aspects of the universal energy transfer? This is probably the most difficult question of all open questions of our unified physics, to which we should try to find a plausible answer.

5. 4. What is the universal energy transfer?

Our preliminary explanation to this question, as given in section 3.5, has to be extended of course. However, I think that we need some years of experience in advanced application of the universal physics to different technical and technological problems, probably first of all concerning the processes of energy transportation and communication in general, before we will be ready to answer it.

As an additional answer to this question, let us consider a picture compatible with my personal present knowledge and my experience with the unified physics. I imagine for myself each massive object in the universal field of light like a piece of cork swimming on a surface of an immense ocean, and every quantum of energy as a soliton-wave traveling from one point to another in this ocean. The corks cannot travel across the ocean.

The only difference to the simplest, traditional version of this picture is the steady rotational motion of each of such cork-pieces. However, it is not just a simple, synchronous rotation of all corks around one center of rotation. Each piece of cork, each quantum of matter, belongs always a particular hierarchical „carousel“ of such rotational motions, according to its own place in the material structure. One simple consequence of such hierarchical rotation are the unavoidable periodical collisions of the „corks“ (quanta of matter) belonging to different levels of the hierarchical „carousel“. Those collisions are the driving force of the permanent reorganization (destruction and reconstruction) in our Universe.

But what does mean the energy transfer in this picture? Let us begin with a quite simple example. Imagine a toy gun shooting the individual quanta of matter. Without any additional energy, the projectile (our exemplary quantum of matter) rests on its place in the gun-barrel. But it is important to realize that in our unified physics, we do not assume that there are nothing but „vacuum“ aside of the gun and the projectile in it. On the contrary, there are other quanta of matter everywhere inside and outside the gun. There are „metallic-quanta“ in the gun-body, there are the „explosive-quanta“ behind the projectile, and there are the „air-quanta“ in and outside the gun-barrel.

For a simplicity, we consider as our parcel of the transferred energy only that part of the energy of the explosive material that will move the projectile after the shot and outside the gun. We forget at it all other aspects of the shot procedure (like the gun recoil and warming, and the projectile deformation, warming, and friction).

In the traditional way of thinking, the massive projectile moves to the target, carrying the shot-energy to the target, where the energy can be used, for example, to drill a hole.

In our unified physics, only the energy will be moved. Our quantum projectile became excited with the transferred energy, and has reached a corresponding new energetical state. Let us call the new energy parcel as the exciton energy. You know, that this energy is not the same as the traditional, scalar energy of a traditional exciton. Our „unified exciton“ is a bivector, possesing all additional informations of our unified quantum of energy, like the oriented circulation (spin), and a speed of light directed towards the target.

After a single period, characteristic for the exciton, the whole parcel of the exciton energy will be transferred to the next adjacent quantum of the air along the „shot-path“. This particular quantum of air become the new exciton and the quantum behind it, the „old“ exciton become a quantum of air again, as before the shot (as you remember, in this simple example, we have neglected any friction and turbulence effects). After the next characteristic period of the exciton, the third consecutive quantum of air becomes the „new“ exciton and the recent exciton-quantum become the air-quantum again.

In the language of the traditional physics, the described situation can be approximatelly compared with a shot without any projectile at all. Only the wave of condensed air moves after the shot towards the target. If the distance to the target is considered as extremely short, we can imagine that the traveling wave can be almost the same as in the former case with a metallic projectile. The condensed-air wave will be also able to drill a hole in the target.

As we see, no massive carriers are necessary for the energy transfer. No mass and no electric charge has to be moved for this purpose.

Our Moon is one rather big „piece of cork“ circulating in his own carousel around the Earth, and with it around the higher centers of rotation of our Cosmic Hierarchy. If the Moon recives a single quantum of the visible-light energy, for example, from the Sun, there is almost no difference between the Moon-states before and after the quantum-reception. Only one of the dust particles on the Moon's surface will be little warmer than before.

However, if a larger parcel of energy, after a hypothetical (in the traditional cosmology) explosion of our Sun as a future supernova, should reach the Moon's surface, then Moon's quanta of matter could be too few, in order to peacefully transfer this huge energy-portion to the Moon's surroundings. The Moon's body would be then disintegrated or even exploded. But even in such a drastic event, the total mass of the Solar System would not be moved. The center of mass would remain continuously in the center of Venus (although the Venus-body alone would be immediately evaporated in such an event).

However, we do not need to be afraid because of this dramatic perspective. The traditional cosmologists think that our Sun will be peacefully shining still about five billion years. In order to be fair, I have to replace this fanciful statement with our precisely calculated end of the present cycle of the solar peaceful life. The Sun will be disintegrated, together with the whole Solar System, not so late as in five billion years, but already in 77.897 million years (compare my previous book). But I hope, it makes exactly so small difference for you as for myself.

Chapter 6. Summary

6. Summary

6. 1. Conclusions

If the unified physics of Naturics is correct (and as far as a scientist could be sure about something, I am sure, it is correct), we have to rethink all our physics and also the physical basis of all our scientific knowledge. First of all, we have to adapt our fundamental physical principles to the new situation, where our cosmic home is a double-star system. This means a much more drastic change to our physics than only an addition of a new star to the celestial picture over our heads. This is a mathematically calculable, precisely predictable change in our thinking not only about the gravity, but also about the quantization, relativity and unification.

As we have seen in the present book, today we have to say that the Earth and the terrestrial life is a product of the Cosmic Hierarchy of our Solar System, and the acceptance of the existence of the stellar companion of our Sun is the key to this hierarchy. Although the companion star is mostly destructed today, and only some debris of its mass are visible on the sky, we have to say that as long as one has not accepted the obvious fact of the existence of this mainly dark mass at the edge of our Solar System (in Kuiper's Belt), it does make no sense to explore scientifically for something new in astrophysics, in space science or cosmology, or to finance such exploration. It is also dangerous to plan any manned missions to Mars or elsewhere in our planetary system.

I was never an enthusiast of the mathematical physics. I have intuitively felt how dangerous the exaggerated confidence in pure mathematical solutions of the physical problems could be. And my scientific practice has confirmed very drastically that I was right. For hundred fifty years long, we have used a false solution of Maxwell's equations, because nobody has ever supposed that some different solution could be better.

On the other side, for the sake of fairness, I have to admit that it was extremely profitable to apply the multivector algebra for the problem solution. Without

the clear and doubtless statements of this branch of mathematical physics, it seems to be impossible to define our unified family of all physical quantities. And this family is the mathematical basis of the whole unified physics.

Now we have to wait until a large enough part of the scientific community will have recognized the necessity and the adantage of the practical application of the unified physics of Naturics in solution of their own problems. I suppose that the new paradigma will become established first of all not because of its scientific attractivity but because of its economic indispensability, especially in the most modern technologies.

6. 2 Summary for non-physicists

Our unified physics contains a basic knowledge not only for physicists but also for engineers, technologists, and even for deciding people of our social life. From this reason, I am going to summarize the present book in several short statements which should help the non-physicists to resume the new informations of the book.

New assumptions

1) The traditional solution of Maxwell's equations is wrong. An alternative solution should replace the traditional one.
2) The traditional separation of the animated matter from the inanimate matter is wrong. The treatment of the inanimate matter and the animated matter should be unified.
3) The traditional Planck's Scale is correctly defined, but it uses false numbers.
4) There exist no space and time without matter.
5) All observable matter in our Universe is a specific structure of the field of light (FL).
6) The fundamental properties of matter are much better understandable in the unified description based on a two-dimensional area and a two-dimensional time, rather than in the traditional description based on a three-dimensional space and a one-dimensional time.

7) Energy transfer it the unique fundamental interaction in our Universe.

New Discoveries

1) The equation of motion in an electromagnetic field arises from the same fundamental equations of the universal field of light (FL) as the electromagnetic field itself.
2) A uniform rotation accompanying any uniform translational motion of a massive object is as natural phenomenon in our Universe as a steady vortex magnetic field accompanying a flow of a steady electric current.
3) Dynamical forces (including gravitation) and electrodynamical forces are one and the same interaction.
4) All possible physical quantities are just suitable modifications of quantum area and quantum time of the FL. We call a common order of these modifications the unified family of all physical quantities.
5) All possible physical equations are just suitable modifications of the mathematical definition of the FL.
6) All observable levels of the natural organization of the inanimate and animated matter originate in the FL. We call a spectrum of these levels the quantum spectrum of matter.
7) The speed of light in „vacuum“ is not a universal constant of Nature. Speed of light is a regular physical quantity.
8) Energy and mass are not interdependent.
9) Energy „belonging“ to the quantum-area of each quantum of matter (the quantum planar energy, or the quantum circulation, sometimes also named as the quantum of rotation) is a natural constant, being the same for all possible quanta of matter.
10) The unified quantum of energy possesses spin, analogous to the spin of the traditional photons.
11) Our Solar System has been formed as a double-star system. The dismembered Sun's companion is still a second important member of the Solar System. Venus has been formed in the global center of mass of the system.
12 Our precise long-term forecast of the global-climatic changes shows a severe cooling in the next centuries. The cooling has already begun in summer 1990 (compare section 6.3).

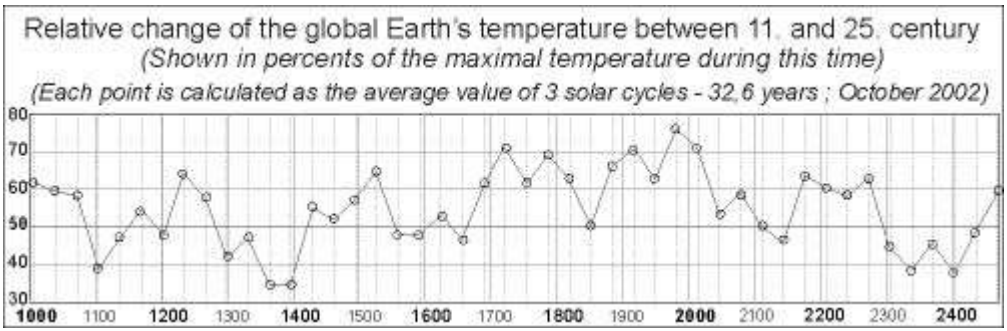
New results

1) The corrected Maxwell's electrodynamics is exactly equivalent to dynamics.
2) The unified description of the whole matter is expressed in the quantum spectrum of matter.
3) The corrected Planck's Scale becomes matter-of-course and is therefore superfluous.
4) Mass is not movable in the FL. Only the energy transfer is observable as a relative motion of the transferring objects.
5) An electric current in the unified physics transports energy, but it transports neither electric charge nor mass.
6) The FL is a place of permanent constitution and destruction of the universal material membranes, the most fundamental building elements of our Universe.
7) The universal membranes consist of fluctuons, the elementary quantized fluctuations of the FL; their physical properties are typical for the natural boundary between the inanimate and animated matter.
8) Quantum force of action can be interpreted as a measure of a temporal expansion of a fluctuon recieving some new portion of energy; quantum force of reaction can correspondingly be a measure of the outcoming energy.
9) We do not need to consider any specific carriers for the energy quanta. The quanta of energy are theirs own carriers.
10) Energy quanta carry over not only the value of energy but also all other properties of a circulating photon; they carry over the physical information.
11) Some form of nuclear energy is driving each working brain.
12) The universal constancy of the quantum circulation could become new powerful calibration tool for the astrophysical observations of rotating objects.
13) Some practical solutions of the problems of clean-water, healthy-food, successful medical therapies, and better, cheeper, and harmless technologies of any kind, seem to be much easier realizable with Naturics than ever.
14) The cosmic energy of an almost arbitrary amount could be considered for the first time as our potential source of energy.

6. 3. A view ahead

It is really not easy to force some new paradigm. In most cases one has to wait until the strongest votaries of the old dogma are dead. Only then the new point of view has a real chance to succeed. One of the most popular recent examples of such a dogged obstinacy is the still lasting debatte about the warming of the global climate. Even some politicians, who had not succeeded in their policy, are trying to fight for the old dogma of the continuation of the real global warming also during the 21st century. Al Gore and Toni Blair are the most prominent examples here. After their exit from the active politics, they try to be popular with this topic, without regard to the fact that the old dogma is already on the point of death.

Our unified physics provides us with the following exact reconstruction and prognosis of the natural changes of the Earth's global temperature; since 1990 the global cooling is not more discutable (compare our long-term prognosis in the picture below).



I am not worring about the output of the „Warming Debate“, the Nature will act independent of all our scientific debates. If we change our physical paradigm, then the „Global Warming“ (or rather „Global Cooling“) becomes more a technical and economic as physical problem. We have still about eighteen years (but not more) time to prepare our world economy for the new „Little Ice Age“. So, our children and grandchildren have to consider this problem more seriously than we have. They have the possibility to prepare themselves,

listening to Naturics, or they can abandon the new physics and wait until the energetic collapse of their world will occur indeed. If this will happen before the younger generations will learn to use the cosmic energy to warm themselves, then ... Sahara coud be the last place for them to live in.

However, meanwhile the younger generations have also to solve some really scientific problems. One of those most urgent is to take on the decission, which of the last two physical quantities, length or time, should be „abandoned“ in the next step of our unification of the physical description of Nature. I propose to use the more natural choice of the length as the last universal physical quantity, expressing time by means of the proper definition of this length.

One can imagine by looking at Fig.2 again, which changes in our physics would happen, if we unify meter with second. The quantum speed of light, for example, becomes dimensionless parameter of the state of matter, like our material-index factor μ in our two-parameter version described in this book. It is probably not difficult for you to suppose that I have already got realized also this next step of the unification. I was forced to see what could be the result, because the Nature surely had developed our Cosmic Hierarchy with the best possible unification at all.

Nevertheless, the ultimate unification to the zero-parameter version is not yet realized till now. It will be a good task for the next generation of physicists. I think that as long as we have not reached a necessary consensus to the second star in our Solar System, we have no right to go so far into the deepest mysteries of Nature.