Theory of everything

The elemental Force of the Universe

$$\hbar \cdot c = \sqrt{10}$$

Halit Eroglu

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Imprint

Theory of everything - The elemental force of the universe

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" The most incomprehensible thing about the universe is basically that we understand it."

Albert Einstein

Foreword

The fascinating thing about the universe is its space with the immense micro- and macrocosm size. Not only in the macrocosm between planets, solar systems and galaxies, but also in the microcosm in the atoms and its components is the "empty space" is the decisive element. Therefore, one must first of all understand the "empty" space of which it mainly consists in order to be able to understand the universe as a whole.

It is known that the "empty" space in fact is not empty but contains virtual particles, ominous dark matter and dark energy.

- However, what are the empty space and thus the entire universe?
- What is energy, mass, charge? What do they consist of?
- Why is the speed of light constant?
- Is it possible to derive the constants of nature?
- Does a Theory of everything exist?

Inter aila, we will have a look on these questions and solve some other mysteries of the universe. Thereby, new questions and new mysteries will arise, but we will see that the universe, made up of space, time and energy is made up in an unprecedented form.

The new world model is a theory which currently is in development, some of the results and the "final formula" hereby is published. In this edition, I am handling the key aspects of the new model of the world. Based on equations derived from fundamental physical constants of nature that play a central role in physics, I will demonstrate that it is possible to explain the entire universe with a brief "final formula". With the aid of the final formula, we also will experience how time works and how the three-dimensional space is created.

Many smart people have tried for a long time to derive all physical properties of the universe from a single formula. However so far, all attempts have failed. It seems that the reason for this failure was the imperfection of the existing theories. Viewing the universe from a different perspective and leaving the assigned paths of the previous theories, we at least reach a world model with a final formula. With this book it is demonstrated how to explain the recent recognitions in physics also from another perspective. Accordingly, modern physics is completed and enhanced.

I have not searched for the final formula, I discovered it by chance, just like Archimedes who discovered buoyancy force in the bathtub or Newton, who discovered the gravitational force under an apple tree. Afterwards, I made some calculations with the final formula and have seen with a great astonishment, that the entire universe can be explained with this formula.

Also some problems with previous theories will be highlighted in this book:

- **Newton** believed that it was gravity which holds together the universe. Even today many people believe in this but no one is able to explain what actually causes gravity. Thanks to the Final formula we are able to solve the mystery of gravity and based on the derived gravitational constant we will be able to learn how it works.

- **Einstein** could not exactly explain space and time although his famous theories were based on it. He summarized these as "Space-time" and assumed that the space bended itself. With the final formula we now can reveal the great secrets of space and time.

- **Planck** discovered the quantum of action and accordingly laid the foundation for quantum physics. However, his quantized quantities do include the gravitational constant and are therefore useless, as we shall see in the appropriate section.

But, dealing with the universe, the more clearly one recognizes the outstanding achievements of the researchers at that times of period. They do not lose at any way authority, on the contrary, only thanks to their intellectual achievements; we are now able to continue their scientific heritage. However, every theory becomes outdated over time through new knowledge, and accordingly, science develops more and more.

The individual chapters and sections in this book are based on each. We will first start with the smallest dimension in the microcosm and, in the penultimate chapter will try to describe some structures in the macrocosm. Since everything in the universe depends on one another, it is inevitable that one can understand much better the new world model and the final formula, after reading the whole book. Because, much more things will be more understandable in the overall context.

Important note:

No original Planck units and their numerical values were used in this book. However, in honor of Max Planck, I have named after him the new quantized sizes. The Planck mass, the Planck length, etc. should therefore not to be confused with the original Planck units.

1. Chapter

In this chapter we will discuss the basis of the new world model. Based on the structure of the quantized space and the final formula, in later Chapters we will gradually explore some features of the new model of the world.

For a better understanding, I will therefore refer to the following sections. The topics build on each other, and only after discussing some principles, we will be able to deal with more details in the later sections.

"It's not only about to see what everyone sees, but to think with what everyone sees, what no one has yet thought of."

Arthur Schopenhauer

1.1. The Ether

The idea of an omnipresent ether as carrier of light, and thus of any electromagnetic wave comes from Aristotle and was later taken up by Newton. Since Newton, the space has been viewed as a "container" in which all physical processes take place. Even if it was not provable, Newton was convinced that there is a substance that permeates the entire universe and connects it with each other. He called this invisible substance "ether" and described it as a living, spiritual element.

Also, James Clerk Maxwell, the founder of the electromagnetic theory believed in ether, calling it *"a material substance that is more subtle than the visible body, and which exists in those areas of space, which appear to be empty."*

The notion of space, however, has changed dramatically in the continued development of physics and at least was challenged by Einstein. Since then, formal properties of mathematical spaces are used for its physical description.

As a seemingly disused physical concept, the ether hardly is treated by a scientific theory today. Although it is still discussed today if it is possible to quantize the space, however even in this matter the space considered as a mathematical or geometric object.

It was failed to prove ether around the turn of the century, and also in several later experiments. Albert Einstein could then solve the difficulty by banishing ether from his equations and replaced it by the speed of light as a universal constant. Thus, the failure of attempts to prove the ether gave Einstein the impetus to develop the theory of relativity.

In one of his speeches, Einstein summarized the former idea of the ether, and he expressed his views in detail about this issue:
" *Recapitulating: we may say that according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists ether.*
According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of measuring rods and clocks, nor therefore any space-time intervals in the physical sense. But this ether may not be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it."

When talking about the subject of ether it is often asserted that Einstein would have abolished it. But how one can see in his speech, he did not abolish the ether, but he has redefined it according to his theory. So, he has modernized the ether concept during that period.

It is interesting to experience what considerations are hidden behind the fact that at the beginning of the last century the debate in relation to ether was brought to an end. Not

just because the fact that it is not provable, but also because there was no theory with which one could equally explain the physical phenomena in the micro and macrocosm explain using the properties of the space. In his speech, Einstein also called attention to the following fact:

"Of course it would be a great advance if we could succeed in comprehending the gravitational field and the electromagnetic field together as one unified conformation. Then for the first time the epoch of theoretical physics founded by Faraday and Maxwell would reach a satisfactory conclusion. The contrast between ether and matter would fade away, and, through the general theory of relativity, the whole of physics would become a complete system of thought, like geometry, kinematics, and the theory of gravitation."

The above quoted speech of Einstein is very interesting for the subject of this book, and therefore it is included in the appendix of the book. In this speech, we get to know the real reasons why the former idea of "material" ether, was abandoned in a justified way.

Why can the ether not be measured?

Since last century, the ether hypothesis is considered dead. In later experiments it also was not possible to prove the ether. In the many discussions on ether at the beginning of the last century and even later, no one seems to have considered that the one thing they were looking for was simply too small to be detected in experiments.

Apparently ether is considered as an element, which is large enough to be proven. However already at the beginning of the last century Max Planck -after the discovery of the quantum of action-, has derived the units which were named after him and has defined a tiny quantized quantity of the space as a Planck length $l_P = 1,616199 \cdot 10^{-35} m$. Latest after this recognition, the researchers should have actually been aware that it is not possible to measure physical effects at these small scales.

For centuries, the ether was defined with different, sometimes even bizarre theories. However, the new world model is not based on the old ideas of space and the ether, so I will not use that term.

In the following chapters we will see that the "empty" space has a structure, which previously was unknown. Even if the properties of the "empty" space can not be detected directly, there is enough evidence for the existence of a " *substance that permeates the entire universe and connects it with each other* " as Newton had described.

1.2. The structure of the quantized space

As with any scientific model, also with the new world model we try to describe the reality with basic elements. In the presented world model, the universe consists of simple components. However, this should not obscure the complexity of reality. An analog clock also consists of simple components, such as of gears, screws, etc. Only the interaction of these basic components according to a specific system brings the clock running. In the universe it is the interactions of the individual components that make the "clockwork" universe running.

In the new world model, the complete space in the universe so the vacuum in its smallest dimension consists of unified, densely interconnected spheres with a strictly periodic structure which I have referred to as "Space Balls" in this book.

Figure: Vacuum filled with space balls
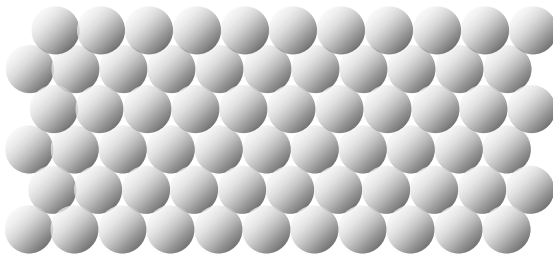
The sphere as a geometric body generally has special properties and for the given volume has the smallest surface area of all possible body. This property is very important in the quantization of the space. Therefore, the new world model is based on these quantized space balls and not on other geometric shapes such as cubes or pyramids.

In three-dimensional space, each space ball is directly connected to 10 adjacent spheres. For uniform structure with the same diameter and the same gravitation between the space balls, there is an interaction with the factor 10 between the space ball in the center and its adjacent spheres.

Figure: Interaction between the space balls
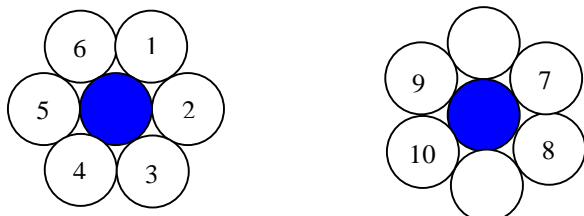
Two-dimensional view
in a plane

View from above

The space balls are magnetic monopoles, and they pull each other. All physical phenomena are the consequences of this primal magnetism in the space balls. As we are going to see, the charge, mass, and thus the basic components of matter, atoms, stars, etc. arise from interactions between these space balls.

For the present, this principle can describe as follows:

Magnetism > Charge > Mass > Particles > Atoms > Stars

I.e. the magnetism causes charges, and these generate mass, which then form particles that accumulate in atoms and thus produce all macroscopic bodies and celestial objects in the universe.

1.3. The base Formula

Many physical phenomena can be explained with the fundamental natural constants of speed of light and the reduced Planck's quantum of action. In the new world model the following context constitutes the base of each physical event in the universe, and it can therefore be defined as a "base formula".

The base Formula:

$$\hbar \cdot c = \sqrt{10} \cdot 10^{-26} \tag{1-1}$$

Speed of light with c=299.792.458 m/s

Reduced Planck constant with $\hbar = \dfrac{h}{2\pi}$.

The reduced Planck quantum of action has been modified by transforming the base formula with:

$$\hbar = \frac{\sqrt{10}}{c} \cdot 10^{-26} = 1{,}05482228647939 \cdot 10^{-34}$$

Planck's quantum of action is determined experimentally, and physical measurements are always associated with measurement errors. Even the most accurate measurement can not provide a precise value. The determination of Planck's quantum of action depends on many factors, so with the above reduced formula of the Planck constant was modified. The absolute deviation from the CODATA value is minimal and amounts: $0{,}00025056114310492 \cdot 10^{-34}$.

The base formula has the dimension of energy times length and thereby constitutes a universal relationship between energy content and length scale. It describes the amount of energy contained in the space balls and here, the quantized length amounts as modified Planck length $l_P = 10^{-26} m$. The dimension of the base formula with the general units eV in nuclear physics is:

$$\frac{\hbar \cdot c}{e} = \frac{\sqrt{10}}{e} \cdot l_P \Rightarrow 197,39208802178700 \text{ MeVfm}$$

Despite to the above modified ℏ, the modified value from the next Chapter was used for the elementary charge e.

The base formula $\hbar \cdot c = \sqrt{10} \cdot 10^{-26}$ **means that the space balls with the diameter of** l_P **contain a certain amount of energy** $\sqrt{10}$ **. The interaction between the space balls is done with the time factor contained in the speed of light and the smallest action ℏ.**

The constant speed of light is used as the time factor in the pulse transmission and therefore, also the quantized action ℏ is constant. When asked which of the two existed at first (Hen-egg problem), we can say with certainty that the time factor which is measured from the speed of light is given, and that ℏ is directly dependent. In the Chapter "derivation of the speed of light," we will continue to discuss the phenomenon of the time factor.

The attraction in the space balls in the form of energy with $\sqrt{10}$ and the universal time factor with the speed of light, are the only basic elements with which the universe is built. The modified Planck quantum of action as the smallest effect also plays a big role, but this quantity directly depends on the speed of light and therefore can be derived from it.

With the "base formula" it is possible to make a clear and unambiguous description of the phenomena observed in nature. The simple formula also allows predictions about new phenomena.

The base formula is harmless and any concerns that zealous scientists could use it to play "God" with it and turn the world upside down, are unfounded. The left side of the formula contains natural constants that have long been known for a long time and are used daily in nuclear physics. My discovery relates to the right side of the formula, and it explains to what the fundamental constants of nature, the speed of light and the Planck constant can be attributed to.

According to the new world model, space and time is quantized in the universe. In addition to the elementary magnitudes such as the Planck mass, the Planck charge etc., also some fundamental constants of nature, and even the speed of light can be derived with the base formula. We also will gain new insights on the nature of time and the three-dimensionality of space.

1.4. The Secrets of the universe

In physics, there are some natural laws, but many scientific theories. There are also rather interpretations, opinions and hypotheses on which these theories are based on.

If we leave aside the theories and the various opinions and interpretations as "man's work", then only the laws of nature will remain. The empirically confirmed and universally valid laws of nature do explain the relationships and interrelationships of physical phenomena. However, there is a problem: they contain partially natural constants that only can be determined by measurement. While describing the processes of nature, one will encounter physical constants, whose values can be measured, but so far no one knows what they are to be attributed to.

The secrets of the universe are thus hidden in the constants of nature. Consequently, many well-known physicists had the desire to derive the number of fundamental constants from a single constant.

There are over a hundred fundamental constants, but only about two dozen of them are elementary, and the rest can be derived from them. After the discovery of the base formula I have therefore derived the basic constants of nature, because it is possible to explain the entire universe with them. The derived constants of nature have been selected after careful consideration, and as we shall see later, even these fundamental constants of nature are based on a single number, namely the elementary constant.

Einstein also was dissatisfied with the constants of nature, and he has described it as follows: *"... I cannot compellingly think of any reasonable and consistent theory that explicitly contains one number which could also have been chosen as another number by the whim of the Creator, where the world qualitatively would have been represented in a different way in its laws. "*

For Einstein, the most elementary constants of nature such as the speed of light, gravitational constant and the Planck quantum of action were not really fundamental, because their value still depends on "conventional" units. Only if it could be succeed to create one quantity from several constants that is a pure numerical value without unit of measurement, then a universal constant would exist according to Einstein's view. However the numerical value of this universal, absolute constant should be determined by the logical basis of the physical theory.

The number $\sqrt{10}$ in the base formula is the universal elementary constant, and we will gradually learn their special characteristics in the following chapters.

The below listed nature constants and some important physical quantities have been derived with the base formula. As we are going to see, all fundamental constants in physics can be attributed to a single number $\sqrt{10}$ as the elementary constant.

$c =$ Speed of light

$h =$ Planck constant

$\hbar =$ reduced Planck constant

$l_P =$ Planck length

$t_P =$ Planck time

$m_P =$ Planck mass

$V_P =$ Planck volume

$m_{PeV} =$ Planck mass in eV

$\lambda_{C(Planck)} =$ Compton wavelength of Planck mass

$E_P =$ Planck energy

$G =$ Gravitational constant

$\alpha =$ Fine structure constant

$g =$ Acceleration due gravity

$Q_P =$ Planck charge

$R_K =$ Von-Klitzing constant

$u =$ Atomic mass unit

$N_A =$ Avogadro constant

$R_m =$ universal gas constant

$k_B =$ Boltzmann constant

Electron

$e =$ Elementary charge

$m_e =$ Electron mass

$r_K =$ Classical electron radius

$O_{rk} =$ Surface of classical electron radius

$V_e =$ Volume of classical electron radius

$\mu_e =$ Magnetic moment of electron

$\lambda_{C(Elektron)} =$ Compton wavelength of electron

$C_e =$ Coulomb force of electron

$g_{FaktorElektron} =$ Electron spin g-factor

$e_{gyro} =$ gyromagnetic ratio of electron

$m_{e(eV)} =$ electron mass in eV

Proton

$m_{Prot} =$ proton mass

$r_{Prot} =$ proton's radius

$V_{Prot} =$ volume of proton

$O_{Prot} =$ surface of proton

$m_{Prot(eV)} =$ proton mass in eV

$\mu_{Prot} =$ magnetic moment of proton

$\lambda_{C(Prot)} =$ Compton wavelength of proton

$C_{Prot} =$ Coulomb force of proton

$g_{Faktor Proton} =$ proton spin g-factor

Neutron

$m_N =$ neutron mass

$r_N =$ neutron's radius

$V_N =$ volume of neutron

$O_N =$ surface of neutron

$m_{N(eV)} =$ neutron mass in eV

$\mu_N =$ magnetic moment of neutron

$\lambda_{C(Neutron)} =$ Compton wavelength

$C_N =$ Coulomb force of neutron

$g_{FaktorNeutron} =$ neutron spin g-factor

2. Chapter

Starting with the Planck length $l_p = 10^{-26} m$, the enormous dimensions in the microcosm provide ample space for particles, charges, photons. These elements, in fact are already formed in the smallest plane in the Planck sphere. Therefore, the microcosm is like an ocean of microscopic particles and radiation.

In the macroscopic length scale in the laboratory we only can study large concentrations of these elements. In experiments, indeed, we observe the existence of tiny particles or radiation seemingly to arise out of nowhere and disappear again. Therefore we call them virtual particles or vacuum fluctuations. However, also these particles are already large collections of quantum objects, which we will discuss in the following chapters.

Note:

In the following chapters, equations are derived to make certain connections clear. Here, the Planck length wasn't used in order to ensure clarity. The multiplication by the number one in the Planck length has no effect on the numerical values. During the comparison of equations derived with CODATA values, however, the Planck length is included in the extension with the orders of ten.

2.1. The quantized magnetism

Magnetism is usually a hidden power. According to the new world model, it forms the elemental force in the universe, and therefore the entire universe is built up electromagnetically.

The magnetic monopoles in the space balls form the origin of electromagnetism. Thus, the electrodynamics observed by us has its origin in the quantized magnetism. Magnetism is therefore not a side-effect of electrodynamics, but it produces the electromagnetic interactions. Magnetic fields are not generated by the time-varying electric fields out of nothing. The effects of the elemental magnetism become apparent from the charge transport.

The cause of electrodynamics is the magnetism, and it brings out the charges as an effect. Until today, this fact has been interpreted in reverse order. Although physics calculations do not change by this order, we are able to better understand the universe from a different perspective and thus gain many new insights.

So far, no magnetic monopoles have been observed. As gravitation in the space balls, the magnetic monopoles show no physical events without external influence which one could be observed. Physical events emerge from the interactions of dipoles which are formed by external influences. Therefore, it is not possible to directly observe magnetic monopoles.
According to the following illustrations we see how the polarity from magnetic monopoles is produced in the space balls.
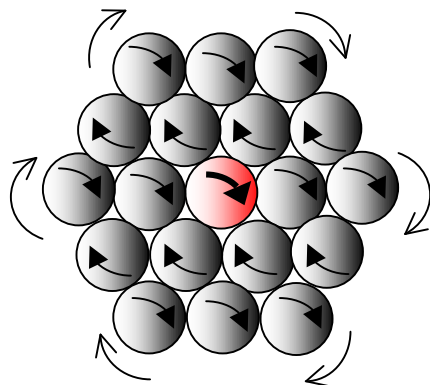
When the ball rotates in the center, it brings the neighboring balls to rotate as well with its gravitation force. The ball in the center, shown in the figure is able to rotate in any direction in the three dimensional space and the directions of rotation of the adjacent balls are dependent on this due to the prevailing gravity.

In the figure, the ball rotates in the center to the right, and therefore, all the balls also rotate to the right. If the direction of rotation is defined as polarity, then the rotation to the right side corresponds e.g. to the positive polarity. This globular cluster in the figure can only interact with other globular clusters with the same polarity, and with opposite polarity they would push each other away.

In the classical description of the polarity, it is assumed the attraction of opposite polarities. To date, however, the question remains, why there is different polarity in nature and what the mutual attraction can be attributed to. Without knowing the cause of the polarity, this classical approach leads to an incorrect interpretation. Many physical phenomena are interpreted without knowledge of their underlying principles. But nature does not depend on our human logic and our interpretations.

With increasing distance from the center, the rotation energy of the globular clusters decreases. The different polarity becomes interesting at the intersection between two globular clusters, as can be seen in the figure below.

Figure: Two globular clusters with different polarity.
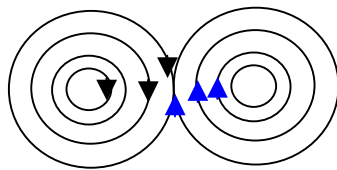
At the intersection points there is interaction with the attractive force between the balls on the one hand and on the other hand, repulsion is seen due to different polarity.

The macroscopic magnetism is the consequence of different polarities of the sub-atomic particles. In addition to the magnetic polarity, there is also a polarity of charge. The relationship between magnetism and charge will be discussed in the following chapter.

The quantized magnetism in space balls has the value of $\sqrt{10}$, and with this elemental power other quantized sizes can be derived.

2.2. The quantized charge

Each space ball exerts an attraction in the form of magnetism on the neighboring space balls. Through external factors, for example by pulse power, the space balls can be brought into rotation, and as we saw in the last Chapter causes the polarity.

The charge of the electron is defined as elementary charge. The electron only carries half the charge in an atom and the other half of the charge s carried by the proton. The correlation between the elementary charge e and the quantized charge Q_P can formulate as follows:

$$Q_P = 2e \qquad (2\text{-}1)$$

$$\Rightarrow \qquad e = \frac{Q_P}{2} \qquad (2\text{-}2)$$

And this corresponds to the following relationship:

$$e = \frac{\sqrt{10}}{\pi^2} \cdot \frac{1}{2}$$
(2-3)

For the quantized charge of a space ball, we get:

$$Q_p = \frac{\sqrt{10}}{\pi^2}$$
(2-4)

And this is equivalent to:

$$Q_P = \frac{\hbar \cdot c}{\pi^2}$$
(2-5)

The charge of an electron as an elementary charge, according to CODATA is: $e = 1,602176565 \cdot 10^{-19}$ C .

With the above equation (2-5) we obtain the value for the elementary charge with $e = 1,602028577669910 \cdot 10^{-19} C$.

The deviation from the CODATA value is $0,000147987330086531 \cdot 10^{-19} C$

In the measurement of the electron elementary charge in the small length scales of up to 10^{-19}, several factors have to be considered. In addition to the influence of the geomagnetic field, the local acceleration and the gravity, the influences of the measuring apparatus on the test object must also be considered.
The primary magnetism in the space balls with disturbance produced by external influences creates charges. Pictorially this can be thought as a dynamo. Every movement of the dynamo causes magnetic interaction with its environment. A rotating space ball makes adjacent balls rotate with its magnetic field and thereby power is spent. This power transmission and energy transfer between the space balls is called Q_P as quantized charge.

In actual fact, magnetism is transmitted in form of magnetic force. In our macroscopic dimension it is possible to move charges with magnetism and the electric current from the wall outlet is due to this principle. Moving charges in turn cause magnetism. Therefore, it is seen that charges are the transport of magnetism.

2.3. The quantized mass

According to the famous formula $E = m \cdot c^2$, the mass is equivalent to energy. And according to the new world model with the base formula $\hbar \cdot c = \sqrt{10} \cdot 10^{-26}$ is also a form of energy. If we equate these two equations and use the Planck mass as rest mass, we obtain:

$$E = m_P \cdot c^2 = \sqrt{10} = \frac{\hbar \cdot c}{l_P} \tag{2-6}$$

Obtained by reshaping the Planck mass m_P:

$$m_P = \frac{\hbar}{c \cdot l_P} \tag{2-7}$$

The Planck's rest mass has the value $m_P = \dfrac{\hbar}{c \cdot l_P} = 3{,}51850841584345 \cdot 10^{-17}\, kg$

The Planck's rest mass is thus the ratio between the smallest effect and the speed of light in the time factor. We will discuss this time factor later.

Using $\hbar = \dfrac{\sqrt{10}}{c}$ in the above equation, we obtain additionally:

$$m_P = \frac{\sqrt{10}}{c^2} \tag{2-8}$$

However, there are still the following relationships:

$$m_P = \frac{1}{c^2 \cdot \sqrt{10}} \tag{2-9}$$

$$m_P = \frac{\hbar^2}{\sqrt{10}} \tag{2-10}$$

$$\frac{1}{m_P} = \frac{c}{\hbar} = c^2 \cdot \sqrt{10} = \frac{\sqrt{10}}{\hbar^2} \tag{2-11}$$

The relationship with the quantized charge $Q_P = \dfrac{\hbar \cdot c}{\pi^2}$ and $m_P = \dfrac{\hbar}{c}$ is:

$$Q_P = \frac{m_P \cdot c^2}{\pi^2} \tag{2-12}$$

And then we obtain for the Planck mass the following:

$$m_P = \frac{Q_P \cdot \pi^2}{c^2} \qquad (2\text{-}13)$$

The Planck mass in eV (m_{PeV}) corresponds to

$$m_{PeV} = 2 \cdot \pi^2 \qquad (2\text{-}14)$$

Transforming the units from kilogram to energy eV, the following factor is used (left site):

$$\frac{c^2}{e} = \frac{2\pi^2}{m_P} \qquad (2\text{-}15)$$

And this is equivalent with the following relation to Einstein's Formula:

$$2\pi^2 = \frac{m_P \cdot c^2}{e} = \frac{E_P}{e} = m_{PeV} \qquad (2\text{-}16)$$

$$\Rightarrow \quad E_P = \sqrt{10} = e \cdot 2\pi^2 \qquad (2\text{-}17)$$

The relationship between the mass and the charge is of great importance for the structure of the universe. Many microscopic and macroscopic physical processes are founded upon the interaction of charge and mass.

One can imagine the quantized mass as follows: In case of failure of the magnetic attraction force by external factors the space balls rotate and they thereby use a force in order to move the adjacent space balls. We have described this power transmission in the previous section as "charge". The resistance of the space balls as a counter force to this movement is the force of inertia, and thus it is the mass of the space balls. The resistance of a body in relation to a change in its rotational movement is generally referred to as the moment of inertia, and the mass of a rotating body is exactly the same moment of inertia.

The magnetic component of the kinetic energy is transmitted by charges and the inertia force is exerted against it with mass. All space balls are interconnected through magnetic attraction and a change in their state by rotation calls forth certain resistance, which appears in the form of mass as inertia.

Thus, each particle with mass also contains a charge and vice versa. Mass and charge can only exist together, and they form the basic properties of all particles. The impulse force that causes the disturbance of magnetism between the space balls and causes charges, also produces mass as a counter force.

Mass and charge are the two sides of the same medal just as the speed of light and Planck's constant of action is interdependent and which represent two sides of the same

medal. The reasons of physical processes are ħ and c, and thereby, the charge and mass is produced as an effect. The magnetism in the space balls generates charge through rotating, which in turn generates a force of inertia mass. This process takes place with the speed of light as time factor and the smallest effect with reduced Planck's quantum ħ.

2.4. The quantized energy

The energy can be defined from different aspects. According to Planck energy is the smallest effect with a given frequency: $E = h \cdot f$

And according to Einstein, energy and mass are equivalent: $E = m \cdot c^2$

According to the new world model we obtain for the quantized energy the value with:

$$E_P = \sqrt{10} \tag{2-18}$$

and it is equivalent to:

$$E_P = m_P \cdot c^2 = \sqrt{10} \tag{2-19}$$

Following relationship is obtained for the quantized energy with the charge power:

$$E_P = Q_P \cdot \pi^2 \tag{2-20}$$

The quantized energy consists of the attraction force in the space balls. It is noticeable on magnetism and thus holds together the whole universe. Therefore the quantized energy and the quantized magnetism are identical.

2.5. The modified Planck-Units

After the discovery of the quantum of action and based on this smallest action element, the famous physicist Max Planck has tried to derive quantized magnitudes. All physical quantities should be derived with the so-called Planck units. However, these Planck units were not applied until today and they were almost forgotten. In fact, in terms of quantized values Planck was on the right track. However, research in the field of quantum physics only broke through a century ago its groundbreaking discovery.

The presented new world model is based on Max Planck's approaches to the quantized values. However, we cannot use the original Planck units, because they are based on gravitation as "primal force". Since Newton, gravity is regarded as a universal force that holds together the entire universe. As we will see later in the related Chapter, this is only half the story. As with the other fundamental forces also Gravitation is only a

modification of magnetism as a primal force, and it shows its effect in larger dimensions and only from a certain particle density.

The gravity only shows its effects in the presence of particles, but the universe mainly consists of "empty" space and particles only create "side effects" of the many dynamic processes in the smallest scales in space. Therefore it is not possible to explain the entire universe with gravity, which describes the interaction of particles with each other. In the next chapters we will discuss this topic in more detail.

At the end of this chapter the previously discussed quantized variables with the corresponding formulas are listed. In honor of Max Planck I have named these as modified Planck units. The remaining physical units can be derived with these quantized sizes as base units. The quantized time has a special shape, and we therefore will discuss these in the 6th chapter after we have analyzed the nature of time.

Length: $l_P = 10^{-26} m$

Mass: $m_p = \dfrac{\hbar}{c \cdot l_P} = 3{,}51850841584345 \cdot 10^{-17} kg$

Charge: $Q_p = \dfrac{\sqrt{10}}{\pi^2} = 3{,}20405715533983 \cdot 10^{-19} Coulomb$

Energy: $E_P = \sqrt{10} = 3{,}16227766016838 \; Joule$

2.6. The units invariance of the base formula

According to international definition all physical units can be attributed to seven base units (meter, kilogram, second, ampere, kelvin, mole and candela.). All others are made up of these basic units.

The base unit of mass, the kilogram, is an arbitrary determination, and for several years international committees are trying to perform a redefinition. It is intended to determine the units kilogram, ampere, kelvin and mole based on the fundamental constants. For example, should ampere be defined by the flow a certain amount of particles of the electron charge per unit time. And the unit of mass with the kilogram shall be defined on the natural constant "Planck's quantum of action".

The kilogram as the unit of mass is a "sub-unit" because it is based on arbitrary determination and not to fundamental constants. While the mass of a body irrespective of its location is always the same, the force of gravity acting on it depends on the acceleration of gravity. In international determination of the mass, however, the heaviness-property of the mass, i.e. the weight is determined. The mass of the "primary kilogram" is de-

fined by the weight force and not the mass of the particles contained in it. The current goal is to determine the mass of the particle masses contained in the kilogram prototype (Avogadro project).

The base formula is not only the basis of the nature constants but also on the physical units. With the elementary constant $\sqrt{10}$ for the energy, besides the fundamental nature constants c and h also the modified Planck sizes can be derived.

The base formula is independent of our arbitrary definition of units. This topic I will illustrate with two examples, the meter and kilogram.

Let's look first at the dependence of the units themselves:
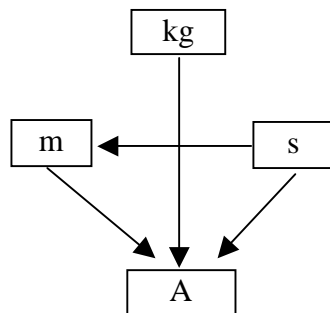
The meter, the kilogram and the second are included in the definition of the ampere.

The base formula with units:
$$\hbar \cdot c = \sqrt{10} \cdot 10^{-26}$$

$$[J \cdot s] \cdot \left[\frac{m}{s}\right] = [J] \cdot [m]$$

$$\left[\frac{kg \cdot m^2}{s^2} \cdot s\right] \cdot \left[\frac{m}{s}\right] = \left[\frac{kg \cdot m^3}{s^2}\right]$$

The base formula at first glance appears to be depend on our arbitrary definition of kilogram, meter and second. However, it must be remembered that the Planck constant quantum of action, meter and second are based on measurements in the quantum dimension. The masses of subatomic particles are not "weighted" but derived through energy measurements. In atomic physics, we therefore use the units of energy (eV), because physical units are interdependent and therefore can be converted one into another.
The base unit for energy is joules and can also be converted into the following units:

$$Joule = N \cdot m = W \cdot s = \frac{kg \cdot m^2}{s^2}$$

Example of changing the meter

If for example the definition of the meter changes, then so does the Joule because it also contains the meter. Thus for the speed of light and reduced Planck's quantum of energy we also would get a different value, but still the basis of the base formula with $\sqrt{10}$ would not change. The reduced Planck's quantum of action, with the base formula directly dependent on the determination of the speed of light with the following equation:

$$\hbar = \frac{\sqrt{10}}{c} \cdot 10^{-26}$$

Example of change of the kilogram

Since for the arbitrary decision of the elementary kilogram there is no defined unique physical property of the mass. The mass is converted in atomic physics on the principle of equivalence of mass and energy through the following formula:

$$E = m \cdot c^2 \Rightarrow m = \frac{E}{c^2} \tag{2-21}$$

As the smallest unit of energy applies the elementary charge and it is calculated the mass of the kilogram in eV to the following:

$$\text{Mass (in kg)} = \frac{\text{Mass (in eV)} \cdot e}{c^2} \tag{2-22}$$

$$\text{Mass (in eV)} = \frac{\text{Mass(in kg)} \cdot c^2}{e} \tag{2-23}$$

Masses in eV of the particles, electrons and protons derived in the next Chapters are based on the conversion formula in atomic physics.

The electron volt (eV) is defined as follows:

$$1\,\text{eV} = 1{,}602176565 \cdot 10^{-19} \ \text{Joule} \rightarrow \frac{\text{kg} \cdot \text{m}^2}{\text{s}^2}$$

$$1\frac{\text{eV}}{\text{c}^2} = 1{,}78249718674393 \cdot 10^{-36} \ \text{kg}$$

"An electron volt is the amount of energy to which the kinetic energy of an electron is increased as it passes through an acceleration voltage of 1 volt."

The Ampere is defined as follows:

"1 ampere is the power of the time-constant electric current which- in a vacuum between two parallel, infinitely long, straight conductors with negligible circular cross-section and the distance of 1 m between these conductors would cause a force of $2 \cdot 10^{-7}$ Newton's per meter of length."

One ampere represents a flow of 1 coulomb per second through the cross section:

$$Ampere = \frac{Coulomb}{Second}$$

"A coulomb is defined as the electric charge, which is transported in one second by the cross section of a wire, in which an electric current of the strength of one ampere flows."

The Volt as a derived unit is defined as follows:

$$1\,\text{Volt} = \frac{J}{C} = \frac{N \cdot m}{A \cdot s} = \frac{kg \cdot m^2}{A \cdot s^3}$$

As it can be seen in these units, they do depend on each other and the change of the meter or the kilogram also leads to the change of electrical quantities such as ampere or volt.

If the definition of the kilogram is changed, which is indeed planned for the future, then the ampere changes because it contains kg. This would, however, also change the value of the electron volt (eV). The following relationships namely depend on the reduced Planck's constant and the mass of the quantized electron charge:

$$\hbar = \frac{m_{PeV} \cdot e}{c} \tag{2-24}$$

$$\Rightarrow \quad m_{PeV} = \frac{\hbar \cdot c}{e} \tag{2-25}$$

(m_{PeV} = Planck mass in eV)

The discrepancy at the Planck mass

Here, I would like to point to a discrepancy: the Planck mass is greater than the mass of subatomic particles. The quantized units are the smallest physical units, but the original Planck mass and also the Planck mass modified with the base formula is greater by several powers of ten.

For comparison with the powers of ten with kg:
Original Planck mass: 10^{-8}
Modified Planck mass: 10^{-17}

Electron mass: 10^{-31}
Proton mass: 10^{-27}

<u>Note:</u>
This discrepancy does not affect the numerical values, but only affects the powers of ten.

I have not yet figured out the reason for this discrepancy. Perhaps something is wrong with the above mentioned conversion between kg and eV. I suppose it's up to the definition of the electric charge (Coulomb) and the electric current (Ampere). The factor in the strength of 10^{-7} in the definition of ampere seems to lead to a discrepancy in the transformation of the mass in kg.

In atomic physics, the unit eV is used for the mass and therefore the experiments and the theoretical calculations are correct. But when compared to the quantized, smallest mass, i.e. the Planck mass, this difference appears.

Nevertheless, in the next chapter, I have derived the masses of subatomic particles in kg, because in this way the property of matter with gravity and inertia can be better analyzed than by conversion to energy units.

3. Chapter

In the last chapter we have discussed the quantized physical quantities, the so-called modified Planck units that even do occur in the smallest dimensions. The mass and charge of which the particles exist in the universe, originate from the smallest dimensions.

In this chapter we will derive some selected important physical parameters and constants of nature, which are based on these quantized sizes, but which comparatively occur in larger dimensions. With the approaches about the new world model which are discussed here, it is also possible to derive more fundamental physical constants and variables.

These derivations demonstrate that the previous findings in physics may also be explained from a different perspective thanks to the new world model. The variables such as the mass of protons, electrons, the gravitational constant etc which are determined in an experimental way can be derived with the new world model, and we will see that it is possible to attribute the macroscopic magnitudes to the quantized elementary elements. Various derivations were performed to obtain information on the internal structures of particles.

The data of the internationally recognized organization CODATA were used as benchmarks for physical measurements.

Since the universe is built up from fundamental components with $\sqrt{10}$ as an attraction force of the space balls and the speed of light as a dynamic component macroscopically measured quantities, such as the mass of sub-atomic particles, can be attributed to these elementary elements. However, in this case the differences in the size scale must be considered and the equations have to be expanded in powers of ten.

This extension is similar to the following facts: The weight of an average apple is determined and then this is compared with one ton of apples of the same sort. Comparing the masses, the mass of an apple, which would be the quantized values from the last chapter, must be expanded with orders of magnitude to reach the mass of this one ton of apples. That would be the mass of the proton.

The principles behind these expansions with powers of ten have not yet been analyzed. But I'm sure that even here yet unknown principles are hidden behind it. When developing the new world model, this issue also must be analyzed.

Mass describes the property of matter, and until today no one knows what causes it. It is contained in many physical units, and with the length and time forms a fundamental quantity.

The quantized Planck mass has been derived in the last chapter and the analysis of particle masses in this chapter is an attempt to explain how mass is formed. All derived equations provide exactly the same result for the mass of particles. Even if the particle mass was derived from several formulas, the most equations only are transformations by substituting other variables.

For clarity reasons, the Planck length was also omitted in the equations primarily in this chapter.

3.1. Derivation of the electron mass

In the electron mass, we obtain the following connection with:

$$m_e = \frac{Q_P}{m_P}$$ (3-1)

And by entering the quantized mass:

$$m_e = Q_P \cdot \frac{c}{\hbar}$$ (3-2)

with the calculated value of $m_e = 9,106293851429520 \cdot 10^{-31} kg$.

According to CODATA, the measured mass of the electron is: $9,10938291 \cdot 10^{-31} kg$. The absolute deviation for CODATA value is $0,003089058570479190 \cdot 10^{-31} kg$.

In contrast to the proton mass, the mass of the electron consists from the ratio of the charge Q_P and the quantized Planck mass m_p. The electron is therefore not an independent particle with its own characteristics, but it is a part of the proton.

The calculated electron mass is in compliance to the Units eV used in the atom physics:

$$m_{eV} = \frac{m_e (\text{in kg}) \cdot c^2}{e} = 0,5108728316179790 \, \text{MeV}$$ (3-3)

According to CODATA the electron mass in eV is $0,510998928 \frac{\text{MeV}}{c^2}$

Despite the electron mass m_e with the unit kg we will analyze the relations of electron mass m_{eV} with the units in eV in he following Chapters.

In my analysis, I have found the following relationships whereby the Planck length has been omitted for clarity.

$$m_e = \frac{c^2}{\pi^2}$$ (3-4)

$$\Rightarrow \quad c = \sqrt{m_e} \cdot \pi \tag{3-5}$$

$$m_e = \left(\frac{\hbar \cdot m_{eV}}{2\pi \cdot c^2} \right)^2 \tag{3-6}$$

$$m_{eV} = \frac{2 \cdot c^2}{m_P} \tag{3-7}$$

$$\Rightarrow \quad 2 \cdot c^2 = m_P \cdot m_{eV} \tag{3-8}$$

(Planck mass times Electron mass in eV)

3.2. Derivation of the proton mass

For protons as core components of atoms gives the mass is obtained through the radius r_{prot} with:

$$m_{prot} = c \cdot h \cdot r_{prot} \tag{3-9}$$

Or by adding $h = \hbar \cdot 2\pi$ in this equation, we do obtain:

$$m_{prot} = c \cdot \hbar \cdot 2\pi \cdot r_{prot} \tag{3-10}$$

With $\hbar \cdot c = \sqrt{10}$ it is obtained

$$m_{prot} = \sqrt{10} \cdot 2\pi \cdot r_{prot} \tag{3-11}$$

With the quantized mass according to the equation $E_P = m_P \cdot c^2 = \sqrt{10}$ it is obtained the following:

$$m_{prot} = m_P \cdot c^2 \cdot 2\pi \cdot r_{prot} \tag{3-12}$$

And with the quantized charge $Q_P = \frac{\hbar \cdot c}{\pi^2}$ we do obtain the following relationship:

$$m_{prot} = Q_P \cdot 2\pi^3 \cdot r_{prot} \tag{3-13}$$

All equations shown above provide the same results for the proton mass.

According to the experiments with muonic hydrogen at the Paul Scherrer Institute (Germany), the radius of the proton is $r_{prot} = 8,4184 \cdot 10^{-18} m$ and for the proton mass with this radius we obtain the value: $m_{prot} = 1,672666757135560 \cdot 10^{-27} kg$

According to CODATA, the mass of the proton is $1,672621777 \cdot 10^{-27} kg$.
The deviation from the experimental determined value therefore is
$-0,00004498013555 \cdot 10^{-27} kg$.

In the next Chapter, we will derive the proton radius and thus calculate the proton mass more accurate.

3.3. The classical electron radius

The "classical electron radius" arose from the analogy with charged macroscopic hollow spheres, and it describes a charged hollow sphere with the distribution of the elementary charge on the sphere surface. The classical electron radius is derived from the context of the capacity of a spherical surface and the rest energy of the electron.

Here, we do not talk about a normal radius of a particle or the electron, but it is described the relationship between the charge distribution on a spherical surface and the self-energy of the electron. The designation of "electron radius" is misleading because it does not concern the actual radius of the "particle" electron.

For the derivation of the proton radius and the proton mass in the next section, we need the classical electron radius.

The equation for the classical electron radius is:

$$r_K = \frac{e^2}{4\pi \cdot \varepsilon_0 \cdot m_e \cdot c^2}$$

Since, for the Maxwell's formula with $\dfrac{1}{4\pi \cdot \varepsilon_0} = c^2$ applies, for the classical electron radius we obtain in abbreviated form:

$$r_K = \frac{e^2}{m_e} \tag{3-14}$$

and this corresponds exactly to the following relationship:

$$\left(\frac{Q_P}{2}\right)^2 = m_e \cdot r_K \tag{3-15}$$

The classical electron radius thus describes the relationship between the interactions of the elementary charge to the mass of the electrons. When we replace the variables with their quantized sizes Q_P and m_P, we do obtain the following:

$$r_K = \frac{e^2}{m_e} = \frac{\left(\frac{Q_P}{2}\right)^2}{\frac{Q_P}{m_P}} = \frac{1}{4}Q_P \cdot m_P \tag{3-16}$$

With this formula we can explain the interaction of the charge distribution on a spherical surface instead of the electron mass with the Planck mass.

In this formula we add the modified elementary charge from Chapter 2.2, with the value $e = 1{,}602028577669910 \cdot 10^{-19}\,C$ and the electron mass derives in the last Chapter is replaced with $m_e = 9{,}106293851429520 \cdot 10^{-31}\,kg$ and we do obtain the classical electron radius kr_e with the following value:

$$r_K = \frac{e^2}{m_e} = 2{,}818375516476650 \cdot 10^{-15}\,m \tag{3-17}$$

Or with $Q_P = \frac{\hbar \cdot c}{\pi^2}$ and $m_P = \frac{\hbar}{c}$ we do obtain:

$$r_K = \frac{\hbar^2}{4\pi^2} \tag{3-18}$$

With the classical electron radius and the quantized sizes we can also calculate the electron charge:

$$e = \sqrt{\frac{Q_P}{m_P} \cdot r_K} \cdot \sqrt{10} \tag{3-19}$$

In my analysis, I have found the following relationships whereby the Planck length has been omitted for clarity.

$$e = \sqrt{10} \cdot c^{2\cdot} \cdot \frac{r_K}{5} \tag{3-20}$$

$$r_K = \frac{\hbar \cdot e}{2 \cdot c} \tag{3-21}$$

3.4. Derivation of the proton radius

A direct correlation between the charge distribution of the electrons and the charge of the protons exists in the atoms. Therefore, the proton radius was derived with the classical electron radius in order to check this relation.

A space ball has the characteristics of charge distribution, which is included in the classical electron radius. We consider the two radii and get the relation:

$$\sqrt{10} \cdot r_K \cdot r_{prot} = \frac{3}{4} \qquad (3\text{-}22)$$

Rearranging this equation, we obtain the proton radius with:

$$r_{prot} = \frac{3}{4 \cdot r_K \cdot \sqrt{10}} \qquad (3\text{-}23)$$

Using $r_K = \frac{1}{4} Q_P \cdot m_P$ in the equation above, we do obtain the relation between the proton radius and the quantized charge and mass with the following formula:

$$r_{prot} = \frac{3}{Q_P \cdot m_P \cdot \sqrt{10}} \qquad (3\text{-}24)$$

We also are able to calculate the proton radius by using the following relation to the quantized magnitudes with the Planck mass and the Planck volume:

$$r_{prot} = \frac{V_P}{m_P} \cdot 1{,}8\pi \qquad (3\text{-}25)$$

The relationship between mass and volume generally shows the proportion of the mass per unit volume as the density. As we shall see later, the reciprocal of the density also is of great importance in physical processes as a specific volume.

Other relations:

$$r_{prot} = 1{,}5 \cdot \frac{c^2}{e} \qquad (3\text{-}26)$$

With the above derived equations for the modified proton radius we do obtain the value:
$r_{prot} = 8{,}415160546424410 \cdot 10^{-18} m$.

According to the experiments with muonic hydrogen at the Paul Scherrer Institute (Germany), the radius of the proton is $r_{prot} = 8{,}4184 \cdot 10^{-18} m$ and with the equations derived we do obtain a slight deviation.

For the proton mass with the modified radius, we finally obtain the value
$$m_{prot} = 1{,}672023104385960 \cdot 10^{-27} \, kg \, .$$

Even from the other now following contexts, it is obtained exactly this value for the proton mass.

Calculation of the Proton Mass

With the classical electron radius, we calculate a spherical volume, which is the interaction of the electron charge to mass of the electron as a distribution in a spherical volume. I.e. instead of the usual hollow sphere, consider a ball filled with the volume:

$$V_e = \frac{4}{3} \pi \cdot r_K^3$$

With the proton radius we calculate a spherical volume, which contains constituents of the proton in the nucleus:

$$V_{prot} = \frac{4}{3} \pi \cdot r_{prot}^3 \, .$$

The Planck volume with half the Planck length as the radius we do obtain without powers of ten:

$$V_P = \frac{4}{3} \pi \cdot \left(\frac{l_P}{2} \right)^3 = \frac{\pi}{6}$$

With this sphere volume for the density of the proton in the nucleus we obtain the following relationship with the Planck magnitudes:

$$\frac{m_{prot}}{V_{prot}} = 48 \frac{V_e \cdot V_P}{m_P} \tag{3-27}$$

The density of protons in the atomic nucleus as the ratio of its mass to its volume is equivalent to the Planck volume V_P and the volume according to the classical electron radius V_e and the ratio to the Planck mass m_P. The factor 48 exists between the proton density and the spatial distribution of the Planck mass with the quantized volume.

Pictorially this can be imagined as follows: The 48-fold ratio of the smallest volume with the most small-mass, which is included in the volume of the classical electron radius, gives the density of the proton. The density of the proton mass multiplied by the quantized mass results in a ball with the magnitude V_e according to the classical electron radius with 48 Planck- globules.

Figure: Relation of the proton density and Planck volume
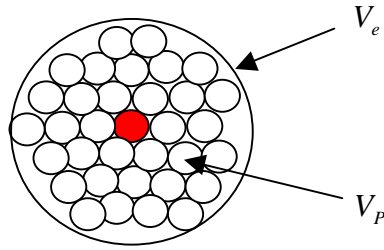
We also can derive the proton mass independently from its radius. We use the equation (Equation 3-11)

$$m_{prot} = \sqrt{10} \cdot 2\pi \cdot r_{prot}$$

the Radius of (Equation 3-25) with $r_{prot} = \dfrac{V_P}{m_P} \cdot 2\pi \cdot 9$ and obtain the mass of the proton with the quantized magnitude as:

$$m_{prot} = \frac{V_P}{m_P} \cdot 4\pi^2 \cdot 9 \cdot \sqrt{10} \qquad (3\text{-}28)$$

Here, the redenominated equation shows us with

$$m_{prot} \cdot m_P = V_P \cdot 4\pi^2 \cdot 9 \cdot \sqrt{10} \qquad (3\text{-}29)$$

that the proton mass gives a particular Planck volume in units of Planck mass.

Since a close relationship is present between the protons and electrons, and their masses are contained in a certain quantized volume, we obtain the following relation:

$$\frac{\sqrt{10}}{m_e} \cdot \frac{\sqrt{10}}{m_{prot}} \cdot V_P = \frac{m_P^2}{36} \qquad (3\text{-}30)$$

The first two terms stand for the rate of the Planck mass for the electron and proton per space ball in the Planck volume V_P. After transformation of this equation we do obtain:

$$m_e \cdot m_{prot} \cdot m_P^2 = 360 \cdot V_P \qquad (3\text{-}31)$$

I.e. the mass of the proton and the electron in proportions of Planck mass results in 360 times the Planck volume.

If we use quantized sizes in the above equation instead of the masses of the proton and electrons then we do obtain with $m_{prot} = Q_P \cdot 2\pi^3 \cdot r_{prot}$ and $m_e = \dfrac{Q_P}{m_P}$:

$$Q_P^2 \cdot 2\pi^3 \cdot r_{prot} = 360 \frac{V_P}{m_P} \tag{3-32}$$

By rearranging we do obtain the proton radius with:

$$r_{prot} = 1{,}8\pi \cdot \frac{V_P}{m_P} \tag{3-33}$$

I.e. the proton radius is derived from a certain ratio between the Planck volume and the Planck mass, which can be defined as a specific density of the proton.

Other relations:

$$m_{\mathrm{Prot}} \cdot e \cdot \frac{m_P}{V_P} = 1{,}8 \tag{3-34}$$

$$m_{\mathrm{Prot}} \cdot 1{,}111111... = \frac{V_P}{r_K} \tag{3-35}$$

$$m_{\mathrm{Prot}} \cdot m_e = 36 \cdot \frac{V_P}{m_P^2} \tag{3-36}$$

$$m_{\mathrm{Prot}} = \frac{1{,}5 \cdot \pi}{r_K} \tag{3-37}$$

$$m_{\mathrm{Prot}} = \frac{6 \cdot \pi}{m_e \cdot m_P^2} \tag{3-38}$$

With the Planck mass in eV (m_{PeV}) we obtain the following relation:

$$m_{\mathrm{Prot}} = 3\pi \cdot m_{PeV} \cdot c^2 \tag{3-39}$$

The mass oft he proton according to the derived equation in eV is:

$$m_{\mathrm{ProtV}} = 938{,}0228573825890 \frac{\mathrm{MeV}}{\mathrm{c}^2}$$

According to CODATA value is: 938,272046 MeV/c^2.

With the proton mass in eV (m_{ProtV}) we obtain the following relation:

$$m_{\mathrm{Prot}} = 1{,}5 \cdot \frac{m_{\mathrm{ProtV}}}{r_{prot}} \tag{3-40}$$

$$m_{\mathrm{Prot}} = 2 \cdot \pi \frac{V_{\mathrm{Prot}}}{m_{\mathrm{ProtV}}} \tag{3-41}$$

$$m_{\mathrm{Pr}otV} = \frac{m_P}{4 \cdot V_e} \qquad (3\text{-}42)$$

$$m_{\mathrm{Pr}ot(eV)} = 1\frac{1}{3} \cdot r_K \cdot V_{\mathrm{Pr}ot} \qquad (3\text{-}43)$$

Summary of the results so far

Based on the quantized sizes we can derive the proton radius and the mass of the proton and electron with the previous equations and directly calculate them from the new Planck units. This way we obtain previously unknown relationships that will be analyzed further in future projects.

The derived equations are fundamental relations, because they are based on quantized values. For example the relation of the electron mass as the ratio between the quantized charge and the quantized mass is even included in the smallest dimension. The expansion factor as a power of ten between the smallest dimension and the dimension in which the value has been determined experimentally shows us that this correlation is noticeable only from certain spatial dimension in our measurements. However, its components and the relations of which it exists do already exist in the smallest dimension. In other words, the experimentally measured subatomic particles are aggregations of smaller particles, and their properties are based on the same context.

The connection between mass and volume, which we call the density for example, exists for an apple just like for the Earth, but in different size dimensions. This fundamental relation of the density does not arise only when the apple has reached a certain size. The apple itself is made of such a context.

The minimal differences in the microscopic size scales between the values measured in the laboratory and the theoretical values of the derivations in addition to technical measurement inaccuracies also are based on even the smallest influence of gravity and the acceleration of gravity, which add up over several size scales.

The measured mass, or to be more specifically, the weight of a particle, and accordingly of the proton, depends on the location. On Earth, gravity and gravitation are not the same at different areas and places. On the earth, depend on the geographic location we would read different values for a mass.

Therefore, in terms of the mass, it must be distinguished between the empirical values under the action of gravity and the actual values. It could be possible to add additional influencing factors to the calculated values, but these influence factors, such as the acceleration of gravity, are also dependent on the location themselves and therefore variable, too. It would be better to indicate the local dependent gravitational acceleration in mass measurements. In the later Chapter we will discuss the direct connection between the proton mass and the acceleration due to gravity.

The components of atoms can be explained by the new world model, but since we only have analyzed the mass and radius, we do not receive sufficient information about the structure and the internal structure of these particles. For a new nuclear model, all the other properties of the atoms also must be taken into account. If we trace back more experimental findings about atoms on the quantized size, we also can get a better picture of the internal structure of atoms. In future projects, we will analyze further correlations using the quantized sizes, it will be possible to obtain a better picture of the internal structure of the atoms.

3.5. Derivation of the fine structure constant

The Sommerfeld fine structure constant α as coupling constant describes the strength of the electromagnetic force between two elementary charges. The formula of the fine structure constant is:

$$\alpha = \frac{1}{4 \cdot \pi \cdot \varepsilon_0} \cdot \frac{e^2}{\hbar \cdot c} \tag{3-44}$$

With the CODATA-value: 0,00729735253594845000 or $\frac{1}{137,03599971}$.

The fine structure constant can also be shown with the quantized quantities. The first term is replaced with c^2 from the Maxwell Formula:

$$c^2 = \frac{1}{\mu_0 \cdot \varepsilon_0} = \frac{1}{4 \cdot \pi \cdot \varepsilon_0}$$

Having $\hbar \cdot c = \sqrt{10}$ we use $e = \frac{\sqrt{10}}{\pi^2} \cdot \frac{1}{2}$ for the elementary charge and obtain:

$$\alpha = \frac{c^2}{\sqrt{10}} \cdot \left(\frac{\sqrt{10}}{2 \cdot \pi^2} \right)^2 \tag{3-45}$$

By transforming, we will obtain:

$$\alpha = c^2 \cdot \frac{\sqrt{10}}{4\pi^4} \tag{3-46}$$

And since it is given $\sqrt{10} = \hbar \cdot c$, we at least obtain:

$$\alpha = \frac{c}{\hbar} \cdot \frac{1}{4\pi^4} \tag{3-47}$$

Accordingly, it is seen that the fine structure constant instead on the elementary charge only depends on the natural constants c and $\hbar$ and has the dimensional value of

$$\alpha = 0,007294271493324960 \text{ or } \frac{1}{137,0938826331190}.$$

The absolute deviation from the CODATA value is only:
0,00000308104262349701.

According to the new world model, the electromagnetic force (α) between electrons and protons is caused by the inverse ratio of the Planck mass $m_P = \frac{\hbar}{c}$ and the geometric generic component.

$$\alpha = \frac{1}{m_P} \cdot \frac{1}{4\pi^4} \tag{3-48}$$

With the quantized charge, we also can formulate the fine structure constant as follows:

$$\alpha = \frac{Q_P^2}{4 \cdot m_P} \tag{3-49}$$

With the quantized charge and the electron mass, we obtain the following relationship:

$$\alpha = \frac{1}{4} Q_P \cdot m_e \tag{3-50}$$

This relationship is quite similar to the derived formula
(3-16) for the classical electron radius from the last Chapter, with the only change in masses:

$$r_K = \frac{1}{4} Q_P \cdot m_P$$

In the above formula (3-50) it can also been seen similarities in the fine structure constant with the gravitational force. At the end of this Chapter we will derive the gravitational constant, and a comparison of the two forces shows that the fine structure constant describes a kind of "gravitational force" in the atoms. The strength of the electromagnetic force between protons and electrons is based on quantized charge just like the gravitational force.

I have found the following relations in analyses I made:

$$\alpha = \frac{m_e \cdot e}{2} \tag{3-51}$$

With the electron mass in eV:

$$m_{\mathrm{Prot}} = \frac{3}{4} \cdot \frac{m_{eV}}{\alpha \cdot \pi} \tag{3-52}$$

3.6. Derivation of the acceleration due to gravity

With the spherical volume V_e of the classical electron radius from the Chapter 3.3, which shows the connection of the charge distribution of the elementary charge in a spherical volume, we can derive the acceleration of gravity as a special density function of the proton::

$$g = \frac{3,33333...}{6,06060...} \cdot \frac{m_{prot}}{V_e} \tag{3-53}$$

The acceleration of gravity results from the relation between the proton mass and the spherical charge distribution in an atom. Moreover, the equation contains a time factor as a coefficient. In Chapter 4 we will discuss the phenomenon with the time factor in the Chapter "The Origin of the time."

The acceleration of gravity or the gravitational acceleration is independent of the mass of the falling body, and therefore all bodies fall equally fast in a vacuum.

The acceleration due to gravity and the acceleration of fall are independent of the mass of the falling body, and therefore all bodies fall equally fast in vacuum. However, the acceleration of fall depends on the density of the attracting matter. On any celestial body there are therefore different gravitational accelerations, and the above derivation relates to the specific density of the attractive matter.

The above equation is equivalent to:

$$g = \frac{3}{6} \cdot \frac{1,11111...}{1,01010...} \cdot \frac{m_{prot}}{V_e} \tag{3-54}$$

And it also can be written as follows:

$$g = \frac{1}{0,181818181...} \cdot \frac{m_{prot}}{V_e} \tag{3-55}$$

In abbreviated form, we finally obtain:

$$g = 5,5 \cdot \frac{m_{prot}}{V_e} \tag{3-56}$$

The numerical value for the acceleration due to gravity is $g = 9,8066298275635$ and according to CODATA is determined with $g = 9,80665$.

Transforming the above equation, the proton mass can also be calculated over the gravity of fall with the following formula:

$$m_{prot} = g \cdot \frac{V_e}{5{,}5}$$ (3-57)

Here it can be seen the direct relation between the proton mass and the acceleration due to gravity, which we have discussed in the derivation of the particle masses.

3.7. Derivation of the gravitational constant

In the previous Chapters we have dealt with the particles in the microcosm. The universe is dominated by gravity in the macrocosm, in the solar systems and galaxies. In contrast to the other fundamental forces the gravitation can not be shielded and only acts attractive.

The gravity is noticeable from certain magnitude dimensions and it is only a modified form of elementary magnetism. It applies since its discovery by Newton as a universal attraction that holds together the entire universe. Here, the magnetism in the space balls is the actual universal force that holds the universe together. Gravitation explains the attraction of mass, and it is not possible to explain the entire universe with it because the universe mainly consists of "empty" space and the observable mass only accounts for 4 percent according to current researches.

In the 2nd Chapter, we have already learned that mass and charge belong together and each particle with mass also includes a charge. This relationship between mass and charge becomes noticeable as of a certain size dimension of the gravitational force. The interaction of charge and mass can be calculated with the following gravitational constant.

$$G = 3\frac{1}{3} \cdot \hbar \cdot c \cdot \frac{1}{4\pi \cdot \mu_0}$$ (3-58)

The gravitational constant G is the ratio between the attraction force $\hbar \cdot c$ in the space balls and the magnetic factor with the vacuum permeability factor on a spherical surface $\frac{1}{4\pi \cdot \mu_0}$ in the form of $\frac{\hbar \cdot c}{4\pi \cdot \mu_0}$.

With the quantized charge $Q_P = \frac{\hbar \cdot c}{\pi^2}$ and the induction constant $\mu_0 = 4\pi$, it is possible to formulate this context as follows:

$$G = 3\frac{1}{3} \cdot \frac{Q_P}{16}$$ (3-59)

The coefficient of 3.333 ...in gravitational constant is a time factor and this topic, we will discuss in the next Chapter.

In summary form we finally obtain the gravitational constant with:

$$G = \frac{Q_P}{48}$$ (3-60)

With the calculated Value of: $G = 6{,}6751190736246400 \cdot 10^{-11}$.
According to CODATA, the gravitational constant is: $G = 6{,}67384 \cdot 10^{-11}$.
The deviation from the CODATA value is $0{,}001279073624637630 \cdot 10^{-11}$.

The measurement of the gravitational constant in different laboratories showed the following values and the average value is very consistent with our calculation:

Laboratory	$G \cdot 10^{11}$
New Zealand MSL	6,6742000
Zürich	6,6749000
Wuppertal	6,6735000
BIPM	6,6830000
Karagioz (Russia)	6,6729000
Luther/Towler 1982	6,6726000
Average	**6,6751833**

In macroscopic length scales, the relation between the quantized charge and the special proton density, makes itself noticeable according to the gravitational acceleration which was derived in the last Chapter. The density as the ratio between the mass and volume knowingly describes how the particulate mass is dispersed in a particular space. The bonding force between the particles ensures the cohesion of the particles, and this is caused by the charge. Accordingly, there is a direct relationship between the gravity of charge and the mass of particles.

The gravitational force between two objects at a distance of r is defined as:

$$F_G = G \cdot \frac{m_1 \cdot m_2}{r^2}$$

We use the derived gravitational constant, and obtain the relationship between the mass and the quantized charge in the gravitational force with:

$$F_G = \frac{Q_P}{48} \cdot \frac{m_1 \cdot m_2}{r^2}$$ (3-61)

The gravitational force thus describes the interaction of the charges and masses between the particles. The charges of the microscopic particles and the resulting mass as inertial

force cause a mutual attraction between the particles and ultimately also between the macroscopic bodies.

The gravitational force is created at the smallest dimensions, but due to their low strength and low particle density other forces do dominate. The quantized charge with their interactions namely dominates the smallest dimension. Only with large dimensions, the immense force of gravity is noticeable, because the volume increases with the material it contains.

The gravity makes itself noticeable in the presence of mass and charge. Like any other power this not an infinite range as previously thought, but it is limited. Nevertheless, its coverage in the macrocosm is enormous. Even the gravitational attraction between the Earth and the Sun over a distance of about 150 million kilometers alone shows its immense macroscopic effect.

The gravity, like all other physical phenomena also has its origin in the Planck level. The principle of the summation causes that even the smallest forces in the smallest dimension do reach unbelievable levels in larger dimensions by summation. However, this only works because the other forces lose their effect as of certain scales because of their short reach.

The magnetism in the space balls that produces charge by interaction with other space balls and brings them into fore as counterforce mass, simultaneously causes gravitation. Intuitively this can be imagined as follows: Due to the charges and the resulting mass smallest particles are created; and between these particles the gravitations acts as a gravitational attraction. Thus, infinitely many tiny particles in a vacuum do exist between the earth and the sun in the smallest dimensions, which combine the particles of earth with the particles of the sun like a pearl necklace by the mutual attraction in the form of gravity.

It is possible to describe these tiny particles as "**dark matter**". Due to their small size, they show little interaction with the macroscopic particles. However, they continue to transmit the gravitational force over long distances. With increasing distance from the Sun in the interstellar medium, the particle density of the "dark matter" becomes smaller in the quantized level and thus, the gravity force increasingly loses its influence.

The futile search for gravitational waves and the principle of action at a distance for the gravity can thus be explained by the new world model. In the later Chapter on the expansion of the universe, we will discuss the limited reach of the gravity.

4. Chapter

This chapter includes some new derivations which I discovered about a year after the first publication of this book.

Just as the physical units are built on each other and can be converted into each other; also the natural constants derived in this book and other basic physical quantities are interdependent from each other and can also be converted into each other.

In my analysis I discovered interesting correlations in the quantum world. The gravity, for example is neglected in quantum theory or it was not previously possible to take into account the gravitation in the microcosm. Gravity, however, was always included in the quantum theory, but it was not recognized. Charges are assigned to subatomic particles and they already contain the gravity:

$$\frac{1}{3}e = 8 \cdot G \quad ; \qquad \frac{2}{3}e = 16 \cdot G \quad ; \qquad \frac{4}{3}e = 32 \cdot G \quad ; \qquad \frac{1}{2}e = 12 \cdot G \quad ; \quad e = 24 \cdot G$$

Despite the many formulas derived, it is not yet possible to create a new model of the atom. However, previous derivations show us some interesting new aspects about the structure of atoms. If the atom constitutes a complex puzzle, then the derived formulas here are to be considered as individual puzzle pieces. When the many puzzle pieces (formulas) are collected, then a puzzle Picture can be created afterwards (atomic model).

Meanwhile, I have some approaches on a new model of the atom and at the moment I do analyze the Particle zoo with the quarks and the emission spectra of atoms. After completion of my work, I will publish the results of a new atomic model.

An overview of all formulas in this book is included in Annex 2.

"The rest of my life I will think about it, what is light!"

Albert Einstein

4.1. The derivation of the neutron mass

According to the following derivation, the neutron as a core building block of atoms contains the proton and the gravitational constant:

$$m_{Neutron} = m_{Prot} \cdot G \cdot 1,5 \qquad (4\text{-}1)$$

With the above derivation, for the neutron we do obtain the mass of:
$$m_{Neutron} = 1,6741429973441700 \cdot 10^{-27} \, kg \ .$$

According to CODATA the neutron has a mass of $1,674927351 \cdot 10^{-27} \, kg$ and the deviation amounts $-6,2964748531709100 \cdot 10^{-31} \, kg$.

The ratio between neutron and proton mass thus corresponds to:

$$\frac{m_{Neutron}}{m_{Prot}} = G \cdot 1,5 \qquad (4\text{-}2)$$

The gravitational constant plays not only an important role in macroscopic scale but also within the atoms and it must therefore be considered in a new atomic model.

When in the above equation we use $G = \dfrac{Q_P}{48}$ (Equation 3-62), then we obtain the following for the mass ratio:

$$\frac{m_{Neutron}}{m_{prot}} = \frac{Q_P}{32} = \frac{e}{16} \qquad (4\text{-}3)$$

and thus it is seen

$$m_{Neutron} = \frac{m_{prot} \cdot e}{16} \qquad \text{or} \qquad \frac{m_{prot} \cdot e}{m_{Neutron}} = 16 \qquad (4\text{-}4)$$

Also the following relationships do exist:

With Planck volume and Planck mass:

$$m_{Neutron} = \frac{V_P}{8,8888... \cdot m_P} \qquad (4\text{-}5)$$

With the gravitational constant, Planck mass and Planck volume

$$G \cdot m_{prot} \cdot m_P = 7,5 \cdot V_P \qquad (4\text{-}6)$$

Other relationships:

$$m_{Neutron} = \frac{r_{\Pr ot}}{16\pi} \tag{4-7}$$

$$m_{Neutron} = \frac{r_{\Pr ot}}{96 \cdot V_P} \tag{4-8}$$

$$m_{Neutron} = \frac{\pi}{6 \cdot 8,8888... \cdot m_P} \tag{4-9}$$

$$m_{Neutron} = \frac{r_{\Pr ot} \cdot m_e \cdot \pi}{16 \cdot c^2} \tag{4-10}$$

$$m_{Neutron} = \frac{r_K \cdot V_{\Pr ot}}{5 \cdot r_{\Pr ot}} \tag{4-11}$$

$$m_{Neutron} = \frac{G \cdot \pi}{r_K \cdot 4,444....} \tag{4-12}$$

$$m_{Neutron} = \frac{m_e \cdot V_P}{e \cdot 2 \cdot 8,8888....} \tag{4-13}$$

$$m_{Neutron} = \frac{c^2}{G} \frac{1}{256\pi} \tag{4-14}$$

$$m_{Neutron} = \frac{c \cdot V_P}{\hbar \cdot 8,8888....} \tag{4-15}$$

$$m_{Neutron} = \frac{V_P}{m_P \cdot \hbar \cdot 8,8888....} \tag{4-16}$$

The neutron mass in eV (V_K = Volume of the classical electron radius) :

$$m_{N(eV)} = \frac{r_K}{32 \cdot V_K} \tag{4-17}$$

$$m_{N(eV)} = 6,6666... \cdot m_{\Pr ot} \cdot r_{\Pr ot} \tag{4-18}$$

With surface proton $O_{\Pr ot}$ and neutron surface O_N

$$m_{N(eV)} = \frac{m_e \cdot O_{\text{Pr}ot}}{2 \cdot 6 \cdot 8 \cdot 8 \cdot O_N} \tag{4-19}$$

(The derivation from the neutron radius for the surface is contained in section 4.5)

4.2. The derivation of the mass ratios

The relationship between the proton and electron mass does not have a random value, but according to the following derivation there is a physical relationship between the two masses:

$$\frac{m_{prot}}{m_e} = \frac{1,5 \cdot \pi}{e^2} \tag{4-20}$$

with the value of 1,836.1181087116900 .

The well-known octet rule for electron configuration in chemistry with the fine structure constant can be attributed to the following relationship:

$$\frac{m_{prot}}{m_e} \cdot \frac{\alpha}{m_{Neutron}} = 8 \tag{4-21}$$

4.3. The derivation of the second

The international definition of the second is as follows:
"A second is 9,192,631,770 times the period duration of the radiation corresponding to the transition between the two hyperfine levels of the ground state of atoms of cesium isotope 133Cs."

A second corresponds to a period of 9,192,631,770 Hz oscillations. A vibration thus lasts:

$$1 \times Second = 9192631770\,\text{Hz} \Rightarrow \frac{1}{Second} = \frac{1}{9192631770} = 1,087827757077670 \cdot 10^{-10}$$

And this corresponds to the following relation with the spin g - factor of the neutron and the electron mass:

$$\frac{1}{Second} = m_e \cdot g_{FaktorNeutron} \cdot 3,1222222... \tag{4-22}$$

$$\Rightarrow \qquad \frac{1}{Second} = m_e \cdot g_{FaktorNeutron} \cdot 2,81 \cdot 1,11 \cdot 1,00100100100... \qquad (4\text{-}23)$$

$$\Rightarrow \qquad Second = \frac{1}{m_e \cdot g_{FaktorNeutron} \cdot 2,81 \cdot 1,1111111...} = 9192631770 \qquad (4\text{-}24)$$

The spin g-factor of the neutron will be derived in the next section.

Before the above mentioned atomic second was established internationally, the second was based on the ephemeris second as a fraction of the orbital period of the Earth around the Sun. The vibration frequency of 9,192,631,770 Hz was thus chosen in a way that the atomic second is adapted to the previously applicable ephemeris second. The number 2.81 in the above formula is a consequence of this adaptation and therefore has no further physical meaning, at least I was not able to determine a physical relationship.

In addition to the speed of light, the second belongs to one of the most precise measurable physical quantities. As one can see above, with the derived electron mass we can obtain an exact match with the period of the second.

4.4. The derivation of the spin g-factors

In QED (quantum electrodynamics) the spin g-factor belongs to the most accurately measurable physical quantities and in the last chapter we have used the g-factor from the neutron for the derivation of the second.

Neutron

$$g_{FaktorNeutron} = \frac{1}{m_e \cdot 9192631770 \cdot 2,81 \cdot 1,1111111...} \qquad (4\text{-}25)$$

The spin g-factor of the neutron according to CODATA is -3.82608545 and with the above formula, we obtain a more precise value of $g_{FaktorNeutron} = 3,826085450369120..$

Proton

$$g_{Faktor\,Proton} = \frac{1}{4,68 \cdot g_{FaktorNeutron}} \qquad (4\text{-}26)$$

or

$$g_{Faktor\,Proton} \cdot g_{FaktorNeutron} = \frac{1}{4,68} \qquad (4\text{-}27)$$

With the Planck 's quantum of action, we do obtain:

$$\frac{\left(g_{Faktor\,Pr\,oton} \cdot g_{FaktorNeutron}\right)^2}{h} = 6,88888....$$ (4-28)

The spin g-factor of the proton according to CODATA is 5.585694713 and with the above formula, we obtain a more precise value of $g_{Faktor\,Pr\,oton} = 5,584695283128080$.

Electron

According to quantum electrodynamics, the theoretical value of the spin g-factor of the electron is $g_{FaktorElektron} = 2,0023193048$ and the measured value is more accurate and according to CODATA is $g_{FaktorElektron} = 2,00231930436153$.

The derived value of the spin g-factor in the electron is:

$$g_{FaktorElektron} = \frac{1,48 \cdot c}{g_{FaktorNeutron}}$$ (4-29)

The factor 1.48 results from the following relationship :

$$1,48 = 1,11 * 1\frac{1}{3} = \frac{1,11}{7,5}$$ (4-30)

$$g_{FaktorElektron} = \frac{1,11 \cdot c}{7,5 * g_{FaktorNeutron}}$$ (4-31)

According to the calculation scheme in quantum electrodynamics, we obtain:

$$2 + 2 \cdot g_{FaktorElektron} = 2,0023193043835300$$

The deviation from the CODATA value is: 1.0000000000109900

The relationship between the determination of the second and the spin g factor of the atom components being dependent to each other, becomes clear if one considers the measurement from the second, and the experiments with the spin g factors. An explanation of these complicated experiments is beyond the scope and the objective of this book.

The spin g-factors serve as a test for quantum theories, because with the very precise experimental values it is possible to control the theoretical predictions. Besides the many derived variables in this book also for the spin g-factors a great match can be seen between the derived formulas and the experimental values

An overview of all formulas and with other derivations in this book is included in Annex 2.

5. Chapter

In the previous chapters we have determined quantized sizes, the modified Planck units with the new world model, and with the help of these have derived experimentally measured quantities such as the proton mass and the gravitational constant with equations. They were lead back to the quantized sizes with $\sqrt{10}$ and the speed of light. In this chapter, we will now analyze these two fundamental elements of the universe.

"I want to know how God created this world. I am not interested in this or that phenomenon, in the spectrum of this or that element. I want to know His thoughts; the rest are details."

Albert Einstein

5.1. Derivation of the speed of light

The base formula $\hbar \cdot c = \sqrt{10} \cdot 10^{-26}$ consists of a few elements. The modified Planck constant can be derived from the speed of light, and the attraction of the space balls, which holds together the entire universe, is static. Thus, the speed of light as a time factor is the basic dynamic element in the universe.

In the universe a universal quantized time is ticking at a constant time rate. This time factor is hidden in the constant speed of light and all physical quantum events follow this time factor. There is no absolute time in the universe, but every event in the smallest dimension occurs with the speed of light and thus follows the time factor in this fundamental constant of nature. This time factor is somewhat of a parameter, which allows to adjust the distribution of the quantized energy and the dynamics of the universe.

All physical processes in the universe are energy conversions, and the laws of nature do explain the underlying dynamics. Changing the value of the speed of light produces a universe with different physical laws, even with the same attraction force in the space balls.

The laws of nature are therefore based on this universal time factor. In the universe, the time factor is adjusted with the speed of light in order to generate the quantized action $\hbar$. And all physical processes are based on the transmission of this action in the space.
The speed of light is defined as a natural constant, and it serves as a time factor in quantum occurrences. However, the light itself is not the universal time in form of a "light clock", but the speed of light is formed from a timer, and includes the universal time factor in itself.

How does the time factor work with the speed of light? Therefore, we do break down the value of c to its constituents and obtain the following equation:

$$c = \frac{3}{\left(\dfrac{10}{9,99}\right)} \cdot 10^8 + \frac{9}{10} \cdot Q_P^2 \cdot 10^6 + \frac{9}{10} \cdot \frac{10}{9,99} \cdot 2 \cdot Q_P \cdot 10^3 \cdot \sum_{n=1}^{26} \frac{1}{10^n} \qquad (5\text{-}1)$$

$\underbrace{\qquad\qquad}$ $\underbrace{\qquad}$ $\underbrace{\qquad\qquad\qquad}$

Space dimension and time factor   Charge interaction   Sum of the charge interaction and time factor

$$\Rightarrow \quad c = \frac{3}{1,00100100...} \cdot 10^8 + 36 \cdot e^2 \cdot 10^{42} + 36 \cdot e \cdot 1,00100100... \cdot 1,111111 \cdot 10^{18} \quad (5\text{-}2)$$

<u>With the following terms:</u>

Quantized charge, which we already know: $Q_p = \dfrac{\sqrt{10}}{\pi^2}$

Timing Cycle (explanation follows in the next Chapter: $\dfrac{10}{9,99} = 1,001001001...$

Interaction of the space balls per space dimension:
$$\frac{9}{10} = \frac{1}{1,111111111....}$$

We add the individual members of the equation (5-1) for the speed of light and receive the following values:

n		
	299.700.000,000000000000000	1. term
	92.393,840292159000000	2. term
1	57,730759555672500	Sum
2	5,773075955567250	
3	0,577307595556725	
4	0,057730759555673	
5	0,005773075955567	
6	0,000577307595557	
7	0,000057730759556	
	+	
	299.792.457,98557400000	

Difference to the literature value:
0,014425933361054

For the speed of light we do obtain with an n = 1 to 7, a fairly exact match with the literature value. And as it can be seen, also the light is not able to ever reach the speed of light, but it converges to the value of literature as a limit.

To derive the speed of light with an equation has a profound impact on our physical world system.

All physical quantum events strongly depend on this fundamental constant of nature as a dynamic element. According to this derivation; the physical events in the universe, and thus the universe as a whole, is based on charge interactions and a universal time cycle.

This equation shows us how electromagnetic waves propagate in space and how the interaction of the charges does take place. Here, the equation must be considered from right:

<u>The 3rd Term</u>: The interaction of the quantized charge between two space balls takes place in a given quantized timing.

<u>The 2nd Term</u>: Here, an interaction between the quantized charges and the space balls takes place.

<u>The 1st Term</u>: During these interactions a certain time passes in quantized timing cycle.

What information can we gather from this equation?

- The equation describes the factors on which the speed of light depends namely on the interaction between the charges and the quantized time factor. So, it depends on the space with its three-dimensionality, including charges and from the quantized timing cycle.

- The value of the speed of light converges to the literature as a limit value, because of the infinite sequence of time factor and the sum term. All physical events, which are based on the speed of light, therefore also do converge against a particular value, and have their origin in the smallest level.

- Even though for the speed of light, the distance made is enormous with about 300 million meters, as compared to the time of only 1 second which it requires this distance, it can be seen in this equation that the time factor in the speed of light is actually plays a larger role. The high value of the speed of light occurs because -compared to the quantized time- our second lasts very long.

- The speed of light is based on factors that take place in the smallest dimensions and that sum up, up to our macroscopic level.

- The derived equation confirms the fact which is well-known since two centuries that electromagnetic waves are caused by charge interactions. With light or electromagnetic waves, pulse is transmitted in space, and these are charge interactions as in the atoms caused by electrons. A photon is thus the little brother of the electron.

- With the derivation of these fundamental constants of nature, it is possible to analyze the nature of time.

5.2. The origin of time

When defining the time as the period between two events, then the time, or more specifically, a certain timing cycle, is the actual cause of the events. Without time, physical processes cannot take place, because there would be no "pulse", which could be addressed by the events. The events in the smallest dimensions do namely not take place itself, while time is running alongside, but it is the quantized timing cycle which causes the events with its cycle sequence.

All physical processes depend on a universal timing cycle, whose sum we measure as an ordinary time, describe it as a Time Arrow and on which also the Cause-effect principle is based.

Each dynamic element which provides movement in the space, and thus causes events, therefore also contains a universal timing cycle. Also any kind of force and momentum transfer contains this timing cycle and we've already seen it in the derivation of the acceleration of gravity, the gravitational constant, and finally in the speed of light.

The time occurs in the smallest dimension and develops into the higher dimensions through the summation. Our seconds on a macroscopic scale, is the sum of the quantized timing cycles in the Planck dimension. In the Planck sphere there's plenty of time for the quantum events.

The measured time is therefore dependent on the size scale, and this principle can also be transferred to the macrocosm. While on earth millions of years pass according to our time measurement, for an observer in the quantity of several million light years only some seconds would pass according to his clock.

If an even larger observer would consider the entire universe in the size of a marble, then a ray of light needs several billion years on the way to us in our time measuring, for the great observer only last some fractions of a second according to his time measurement.

As we have seen in the derivation of the speed of light, the motion of the light in space depends on a certain time cycle. The first term in the equation for the speed of light also contains a time factor as an impulse generator:

$$t_C = \frac{10}{9,99} = 1,00100100100....$$ (5-3)

This term for the time cycle can also be written as follows:

$$t_C = \frac{\left(\dfrac{\sqrt{10}}{3}\right)^2}{1,11} = 1,00100100100....$$ (5-4)

By rearranging we get:

$$\left(\frac{\sqrt{10}}{3}\right)^2 = 1,00100100...\cdot 1,11 = 1,1111... \tag{5-5}$$

The interaction of the space balls in the three-dimensional space (left side of the equation 5-1) is equal to the quantized timing cycle by a factor of 1.11.

With further transformations we get:

$$\sqrt{10} = 3\cdot\sqrt{1,00100100...\cdot 1,11} \tag{5-6}$$

$$\sqrt{10} = \sqrt{1,00100100...\cdot 1,11\cdot 3^2} \tag{5-7}$$

From this equation, we again obtain without root terms the original equation (5-3) for the universal timing cycle with $t_C = \dfrac{10}{3^2 \cdot 1,11} = \dfrac{10}{9,99} = 1,00100100100....$, which is also contained in the speed of light.

The energy in the space balls in the form of attractive force with the value of $\sqrt{10}$ consists of three-dimensionality of the space with 3^2 and the universal Space-Time-Quantum with 1.11, which finally brings into fore the quantized timing cycle with 1.00100100100….

The origin of time is thus associated with the emergence of the three-dimensionality of space, which we will now discuss in the next section.

5.3. The origin of spatial dimensions

We live in a three dimensional world, and also the space balls on which our physical world are based on, are three-dimensional. But how does the three-dimensionality of space occur?

In the previous Chapters we have discussed the interactions between space balls and have derived various correlations. To analyze the structure of time and the three-dimensionality of space, now let's look more closely at the space balls.

Geometrically, a point has only one dimension. Several adjacent points at one level provide a surface with two dimensions. Several areas stacked finally create a three dimensional space. The geometric dimensionality is thus based on the addition of points in space.

According to the equation (4-6), the three dimensions of the quantized space are created from the last Chapter by the following relation:

$$\sqrt{10} = \sqrt{1,00100100100... \cdot 1,11 \cdot 3^2}$$

with the factor 3^2, i.e. from the square of our familiar three dimensions.

We describe the three-dimensional space in a general coordinate system with three spatial axes. But with the emergence of the three dimensions by the space balls, from the center there are formed squared spatial axes. In the picture below left, they are shown with dashed and solid lines. Apparently, negative numbers and zero, on which our three-dimensional coordinate system is based, does not exist in nature.
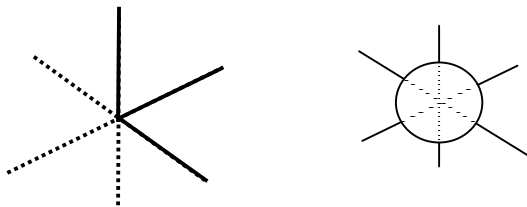
The origin of time is associated with the formation of the three-dimensionality of the space. The energy in the space balls is spread spherical in the room at its formation with the dimension factor of 3^2 (picture above right).

This process does not occur suddenly, but after a certain predetermined quantized unit of 1.11. The universal timing cycle with 1.001001001 ... describes how the energy during the formation of dimension in units of 1.11 is distributed in the three-dimensional space balls.

$$\frac{1,111111...}{1,11} = 1,00100100100...$$

The product of 1.11 x 1.00100100100 ... = 1.11111 ... results in an infinite magical, transcendent number, which represents the infinity of time and energy.

The factor 1.11 ensures the distribution of infinite energy 1.1111 .. in the space balls according to the same portions, and it accordingly creates the universal timing cycle. This factor of 1.11 is a universal **space-time-quantum** and has an absolute magnitude as the fundamental importance. The other fundamental constants of nature, like the speed of light or Planck's quantum of action are merely the products of this space-time-quantum.

Outside the space balls it is possible to explain the physical world with the basic elements of the speed of light, Planck's quantum of action and the energy in the space balls. But as we have seen now, these basic elements arise from the universal timing

cycle in the formation of dimension to the space time quantum 1.11 in accordance universal formula (without l_P):

$$\hbar \cdot c = \sqrt{10} = \sqrt{1,00100100100... \cdot 1,11 \cdot 3^2}$$

The origin of everything in the universe, and thus the space and the time is connected to the three-dimensionality of space. The summation of quantum events, and the quantized timing cycle over several size scales finally brings forth our physical, three-dimensional world.

In the universe there are only three observable space dimensions. The black holes are proof for this. Three-dimensional space is in fact destroyed by them and converted into its original shape. Without these black holes it would be otherwise possible to assume that our three-dimensional world transfers on greater length scales in additional spatial dimensions.

With the speed of light, we are able to explain the universe very well, because, in addition to the space as length unit it also contains the universal timing cycle as a dynamic component. The speed of light contains indeed the universal timing scale in a certain form, as we have seen it in the derivation of the speed of light.

The grand unified theory is based on the universal timing cycle, which is included in the speed of light. With the base formula $\hbar \cdot c = \sqrt{10} \cdot l_P$ we have derived the fundamental quantized elements with which the universe is structured, and they all contain the speed of light as a time factor. The speed of light is the ubiquitous parameter in the equations, and therefore we can describe the overall dynamics of the universe with it (without Planck length):

Quantized energy: $E_P = \hbar \cdot c$

Quantized charge: $Q_P = \dfrac{\hbar \cdot c}{\pi^2}$

Quantized Mass: $m_P = \dfrac{\hbar}{c}$

The attraction in the space balls follows like any other power, the universal timing cycle. The $\hbar$ and c are not the cause of the attraction force in the space balls, but they are formed in the dimension formation with the universal space-time-quantum.

It exceeds our imagination to try to explain the contents of the space balls. They are made of energy, but what does this energy look like?

The space balls are not like solids, such as Metal balls, nor do they consist of some fields. The energy is neither solid nor liquid, most likely it is similar to a gas cloud.

Gases consist of tiny atoms and the energy cloud in the space balls consists of one element that exceeds our imagination. The contents of the space balls, so the energy in its original form will keep us busy for a long time.

Even the space with its three dimensions as a medium in which there is the primordial energy exceeds our imagination and with our analogies and logic we can only explain it approximately. But we know that the space and energy are present, just as we know that we do exist. Being is no illusion, but when we try to describe it, we make our human imagination illusions

To understand the reality and to approach the absolute truth has always been a desire for knowledge of mankind. As long as we are aware of our limited mental capacities, we can avoid fatal illusions and develop ourselves culturally.

We have called the energy in the space balls as an elementary force, which shows itself in the form of attraction. The consequences and the relationships of the attraction force have been explained in the previous Chapters. But it is not possible to physically or philosophically explain; why this attraction exists and shapes our physical world.

5.4. The origin of π

For centuries, people are thinking about the mysterious circle number π. Meanwhile, the computer calculations reach with billion decimal places and in this way it is tried to bleed the secret of this numerical value.

The number π is inter alia defined as the circumference of a circle with the diameter of one.

$$\pi = \frac{Circumference}{Diameter}$$

With the circle diameter of 1 it results $\pi = Circumference$.

The circle number e.g. gives the route of which is covered in a circle when you are connected to the center circle with a rope. The value of π is obtained from a certain attraction force to the center of the circle.

Without this attraction, the value of π would not have the known value. If for example you connected to the circle center with a rubber rope, you will not obtain the value of π for the circumference of a circle. The elementary principle of attraction in the universe gives the circle number π the value it has. Without this elementary principle this π-value would not exist and there would also be no balls, atoms, planets, stars, galaxies etc. The attraction force as elemental force; shapes the entire universe, and it is reflected in the circle number π.

With the base formula it is possible to physically explain the energy and their distribution in the three-dimensional space balls, but in this process also the circular number π is formed, which is necessary for the space geometry. The circle number π is important for the construction of the universe and its numerical value is based on similar principles, as described in the previous Chapters.

The circle number π is a "natural constant" of mathematics and geometry, and we will analyze its origin. Since nature does not make calculations itself nor looks up the π-value from a table, the circle number π must be a product of a particular physical process.

There are different mathematical methods of approximation for π, but we want to analyze the physical process and not mathematically derive the π value.

In a famous mathematical problem known as the "Basel problem" because it were first especially Basel mathematician who dealt with it, the question was whether or not the sum of the reciprocal squares do converge and against which value. The great mathematician Leonhard Euler finally delivered with the solution with:

$$\sum_{n=1}^{\infty}\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+.....+\frac{1}{n^2}=\frac{\pi^2}{6}$$

Through this conversion formula we obtain:

$$\pi^2 = 6\cdot\sum_{n=1}^{\infty}\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+.....+\frac{1}{n^2}$$

The circle number π consists of the sum of the reciprocal square numbers each in six space axes and this formula of Euler describes very well the formation of π.

This result is obtained also with the spherical geometry. The space balls have a diameter of l_P, and for the surface area of the space balls we obtain without powers of ten:

$$O_P = 4\cdot\pi\cdot\left(\frac{1}{2}l_P\right)^2 = \pi\cdot l_P^2 = \pi$$

and the volume of space balls is:

$$V_P = \frac{4}{3}\cdot\pi\cdot\left(\frac{1}{2}l_P\right)^3 = \frac{\pi}{6}\cdot l_P^3 = \frac{\pi}{6}$$

The product of volume and surface area of the space balls gives the limit value of the reciprocal square numbers derived by Euler:

$$V_P\cdot O_P = \frac{\pi}{6}\cdot\pi = \frac{\pi^2}{6}$$

The three-dimensional space develops in this geometric approach as the product of volume and surface area. Several superimposed areas geometrically result in a three-dimensional body. The contents of the space balls as a spherically symmetric body, physically describes the base formula, and the geometrical structure is described by the circular constant π. During the physical origin of the three-dimensional space balls the circle number π is formed too, but it is not the number π which brings forth the three-dimensionality, but it is a product of a physical process. The space-time quantum, which we discussed in the last Chapter, describes the physical process leading to the three-dimensionality of space, and π describes the resulting geometric component.

The universe is electromagnetically structured and all physical phenomena are caused by the interactions of the charge. The quantized charge therefore contains the energy and the circle number π in the following form:

$$Q_p = \frac{\sqrt{10}}{\pi^2}$$

The physical constants of nature are the result of the fundamental, physical relations, and the circle number π occurs as a result of three-dimensionality. The circle number therefore is the result of a physical process, and not the cause, just like the speed of light and the Planck quantum of action are not the cause of the base formula, but their product.

Since antiquity, it is philosophized about the order and harmony in nature. Whether or not this order is based on mathematical principles, all things consist of numbers or emerge, have also always been subject to philosophical debates.

At the base formula and the circular constant π it can be seen that the numbers are not the cause but merely the result of physical processes. With mathematical formalism it is tried to represent reality but therefore, reality actually must exist initially. I.e. without real existing balls there is no π, and without real existing bodies, there are no numbers to count the bodies.

5.5. The origin of the relativistic effect

At high speeds and in the vicinity of gravity it comes to relativistic effects, which are described in the theory of relativity and calculated with the Lorentz transformation.

Lorentz factor:

$$k = \sqrt{1 - \left(\frac{v}{c}\right)^2} \tag{5-8}$$

The Lorentz transformation is based on space geometry and the constant of speed of light. The theory of relativity is based on the constancy of the speed of light, and according to this theory, there is no absolute space. In the general theory of relativity it is even explained the gravity as a geometric property of space.

We will not discuss this comprehensive theory in individual items and will only explain the relativistic effects with the new world model in this Chapter.

The new world model is based on the world's absolute space, and the first signs of Max Planck, to create a basis for the base units with quantized sizes, was implemented with the new world model.

As we have seen in the previous Chapters, the universe is composed of space, time and energy and, if you look at it from a different perspective is built up in an unprecedented form.

According to the new world model, dynamic physical processes depend directly on the time, or more precisely on the universal timing cycle. The time is thus not a neutral measure magnitude that is measured outside the process, but it makes additions itself for the sequence of events according to a determined timing cycle. Besides space, time is also a fundamental quantity. This could be recognized quiet well in the derivation of the speed of light at the beginning of this Chapter. How much space points the light passes during its movement in space is namely defined by a timing cycle.

The origin of the relativistic effects is based on the three-dimensional absolute space and universal timing cycle. The theory of relativity also shows that space and time are very similar. Relativistic effects are directly caused by quantized timing cycle which occurring at high speeds, and which are also included in the gravitational constant.
In the new world model the relativistic effects are based on absolute space and time and the proper time is variable. Speeds are movements in space, and therefore in absolute space, time is variable.

$$Speed = \frac{Way}{Time}$$

Since the space and therefore the route is an absolute quantity, the relativistic effects occur at high speeds, because the change of the relations between distance and time only occurs through the proper time variable, which consists of quantized timing cycles.

high speed:
------------> ------------> ------------> Way
--->   --->   --->   Timing cycles sums

low speed:
------------> ------------> ------------> Way
----->   ----->   ----->   Timing cycles sums

As you can see from this diagram, the space is absolute, and thus the distance is constant. However, depending on the speed the sum of the quantized timing scales do change, that are shown in the picture with different arrow lengths.

The relativistic effects are a consequence of the quantized time cycles, the sum of which results in the measured proper time. Thus, at every event, anywhere in the space there is its own quantized time as proper time. Therefore, we can measure other time sums in the rest frame as in the moving system. Moving clocks run slower, because the "per quantized timing cycles" become lower. Since each physical process can occur by a timing scale, and a movement in space is a physical process, the relationship between distance and time changes at high speed, wherein the path is constant and the proper time is variable.

The speed in this case indicates the events in the absolute space rate of the "per quantized timing cycle". Based on the speed we get to know how much quantized events may take place according to the universal timing cycle. At high speeds, for each section of the space there is less quantized timing scale and the upper speed limit for physical processes is normally the speed of light.

The speed of light determines the possible per quantized timing scale interactions between the space balls. W-We have seen in the relationship of charge interactions and the speed of light in the derivation of the speed of light. The light travels in a vacuum exactly with the possible highest interaction rate and in accordance to the quantized timing cycle. In other media (water, glass, etc.) it has a lower speed, because the interactions slow down the light with the medium.

The time for events measured by us is the sum of the quantized timing cycles, and with our watches we measure the total stroke. Since a moving clock has a speed, and the speed is the ratio between the distance and time, at high speed at an absolute way, this ratio only changes by changing the sum of the timing cycle. And the less time cycles for physical processes are available, the fewer processes can take place.

The measured time as the sum of the timing cycles is a smaller value at high speeds, and accordingly, moving clocks run slower, because the sum of the individual constant timing cycles becomes smaller. This situation is referred to as time dilation, and it can be better described with the variable proper time than the curved space with the absolute time of the speed of light and variable.

As we discussed in the Chapter in the derivation of the gravitational constant, the gravity of the relation between mass and charge is created by a specific timing cycle. Relativistic effects caused by gravity are due to interactions with charges after the universal timing cycle. The gravitational constant contains, as well as any other force that triggers dynamic processes, the universal time factor. By this time factor, the clocks on towers go faster than on Earth's surface. Time dilation has thus directly influence on gravitation.

In direction to the center of gravity of the earth increases, the gravitational force increases, but the quantized timing cycle in the gravitational interaction between the mass and charges decreases in the direction of the center of gravity, and fewer processes per timing cycle take place. I.e. the greater the greater the gravitation, the higher the influence of the time dilation. This effect will be less influent on the earth than for larger masses and the special celestial objects like black holes.

The relativistic mass is strictly speaking, the effects of time dilation on the mass, because the mass is on the time factor in the speed of light through the relation $E = m \cdot c^2$.

The relativistic effects at high speeds, such as the length contraction and relativistic mass increase, are results of varying proper time, and thus a consequence of the time dilation. By high speeds, the proper time, as the sum of the quantized timing cycles is less, because space is absolute. Thus, all relativistic effects in absolute space are caused by universal timing cycle and are based on time dilation. The relativistic effects are basically time effects. Therefore, in measurements of the quantized timing cycle as sums as proper times we obtain different values at high speeds and under gravitational influence.

6. Chapter

In this chapter we will deal with issues that we previously have not discussed for better understanding so far. Before that, we had to learn some principles for us to deal with further details.

" A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it."

Max Planck

6.1. The Planck time

As we have seen in our previous analyzes of the time, it is impossible to define the Planck time. Although the quantized timing cycle with the speed of light is included in every quantized size, the Planck time does not exist in the usual form. There is only the quantized timing cycle and this universal timing cycle produces the events, which we can measure. However, the events take place according to various sums of quantized timing cycles. Therefore there is no absolute time for all events at any location, but each event has its own timing cycle-sum. This issue with the proper time we have discuss in the last Chapter on the analysis of the relativistic effects.

The international definition of the macroscopic second is based on the speed of light, but we cannot use the second for the definition of the quantized time, because itself depends on the quantized timing cycle in the speed of light

The second is the sum of the quantized timing cycles, which we have established as the unit of measurement of the constant time rate in a microscopic event:

"One second is 9,192,631,770 times the period length of the transition between the two hyperfine structure levels of the ground state of the atoms of the radiation corresponding to Cesium isotope 133Cs. "

It is reasonable that the universe is not governed by our definition of time. As we have seen in the last Chapters, the universe has its own time structure. Therefore, instead of the Planck time as a microscopic second with a quantized magnitude, we can define the Planck timing cycle with the value 1.00100100100 ... as an infinite series, which is based on each physical event.

6.2. The universal validity of the base formula

The base formula ought to contain the universal space-time quantum and the universal timing cycle, which we discussed in the previous Chapters. They would then look like this:

$$Space\text{-}time\ \ quantum = \frac{\left(\dfrac{\sqrt{10}}{3}\right)^2}{1,00100100...} = 1,11 \qquad (6\text{-}1)$$

Or as a description of the energy in the space balls:

$$E = \sqrt{10} = \sqrt{1,00100100100... \cdot 1,11 \cdot 3^2} \qquad (6\text{-}2)$$

But I have chosen the form of $\hbar \cdot c = \sqrt{10} \cdot l_P$, because it contains the well-known physical constants with c and $\hbar$.

A grand unified theory has universal validity, and therefore it consists of the number one. If there are extraterrestrial highly developed civilizations, which certainly have a different numbering system and other definitions of length and time, the universal formula is valid also with them in the above form.

The speed of light c and the smallest effect ℏ have the value we know because of our earthly determinations of length and time units. The meter is based on the circumference of the earth and our second on the orbital period of the Earth around the sun, so our earthly years. These measurement units have been clarified in the international determination and now are based on the speed of light.

If other civilizations in the universe, for example inhabit a planet twice as big as our Earth, and attribute their unit length on the perimeter of their planet, they would obtain a different numerical value for the speed of light with their years as a unit of time duration. Thus they would have a different value for the Planck constant, because this constant depends on the definition of the speed of light. Thus, the quantized variables, the so called modified Planck units, are "earthly sizes" because they depend on the definition of the speed of light with our measurement units.

The numerical values of the fundamental constants of nature on the left side of the base formula depend on the length and time definition of individual civilizations; the right side of the base formula, however, is universally valid. In other words: the physics that we operate is "earthy" because it is based on earthy measurement units, and only through transformation with the base formula it can attain universal validity. Each civilization can make physics with its numbering system and its measurement units. But in the entire universe, all physical phenomena are ultimately attributed to the base formula.

The famous physicist Max Planck, in answer to the discovery of the quantum of action, has found the importance of this natural constant, but he could not have guessed that it is only the product of the universal base formula. He defined the Planck units and the following quote gives an indication of the priority given by Planck admitted to these units: *"... retain necessary their significance for all times and for all, also aliens and nonhuman cultures and which therefore can be described as natural Mass units."*

Under their number system, another civilization would receive another numerical value, but the components of the formula with the world timing cycle 1.00100100 ... and the space-time quantum 1,11 are universal valid because they are based on the number 1. Not the number 10 is the foundation of the base formula, but the timing cycle and the space-time quantum, because each number system is based on the number one.

If we were ever to communicate with a highly developed alien civilization, these universal elements of the base formula would form the basis for this. Certainly other cul-

tures have a different numbering system and other characters for the numbers. But the number one is universal and therefore also forms the basis of the Base formula.

6.3. The time factor in the natural constants

In the derivation of the natural constants in the previous Chapters we have described the coefficients in the formulas as a "time factor". The laws of nature explain the relations and interrelationships of physical phenomena based on sizes, and with the time factor, we can explain the dynamics behind these physical processes. According to the new world model, each dynamic element ensuring movement in the space and thus causing events; contains a universal timing cycle. Also any type of power transmission includes this timing cycle, and we will discuss this topic in this Chapter.

Based on the derived formula for the speed of the light, the nature of time has been explained with the universal timing cycle in the last Chapter. Therefore, we will discuss the time factor for the other derived constants of nature.

The time factor in the acceleration of gravity

The time factor in the acceleration of gravity, as we have seen in chapter 3.6 is as the following:

$$t_g = \frac{3,33333...}{6,06060...} = \frac{3}{6} \cdot \frac{1,111111...}{1,010101...} = \frac{0,1}{0,181818...} = 0,55$$

This time factor is connected to the time factor of the gravitational constant, and therefore we will consider both together.

The time factor in the gravitational constant

For the gravitational constant we had obtained the following time factor in the derivation:

$$t_G = 3\frac{1}{3} = 3 \cdot 1,11111.... = 0,55 \cdot 6 \cdot 1,010101.. = 0,55 \cdot 6,060606...$$

The time factor in the gravitational constant includes the time factor of the acceleration of gravity of 0,55. While the acceleration of gravity depends only on the mass density of the attractive celestial body and has a relatively small range; the force of gravity depends on the mass densities of two bodies and it has an enormous reach.

The different range s-is caused by the factor 6.060606... . At acceleration of gravity it is divided by this factor and at gravitation, it is multiplied with it. In other words: For acceleration of gravity, the time factor is directed inward to the center of the attracting

celestial body, and it therefore has a limited range. In contrast, it is directed outwardly at the gravitation, whereby the attraction force attains an enormous range.

The quantized timing cycle is included in the two variables by the value of 1.0101010.... Further analyzes were not performed, but the difference to the universal timing cycle of 1.00100100... apparently is based on the interaction between two bodies.

The timing cycle 1.00100100100... was defined as "universal timing cycle", because the speed of light is the most important physical constant in the universe. Other time cycles, such as discussed above, are modified forms of this universal time cycle.

The unilateral impulse transmission in the space at the speed of light contains the universal timing cycle 1.00100100... with the space time quantum 1.11. The bilateral interaction with the gravitational acceleration and gravitation contains the timing cycle 1.01010101010... with the space-time quantum 1.1. The difference results from the space-time quantum and it is reduced with bilateral interaction.

The laws in this effect have yet to be studied. Apparently, this difference of the timing cycle is based on physical properties at the pulse and power transmission. These two physical effects are caused by different time cycles. The time in the units of the physical variables makes clearly the difference.

$$[g] = \frac{[m]}{[s^2]} \qquad [G] = \frac{[m^3]}{[kg] \cdot [s^2]} \qquad [impuls] = \frac{[m \cdot kg]}{[s]}$$

The time factor in the fine structure constant

In the fine structure constant, the time factor is not explicitly included in the formula. But with the grand unified theory beside the derivation of this fundamental constant, it also can e derived the underlying time factor. The basic principle of the fine structure constant is actually based on the following relationship with the universal time cycle:

$$t_\alpha = \frac{(1,11111...)^2}{1,00100100... \cdot \dfrac{9}{10}} = 1,37037037037... \qquad (6\text{-}3)$$

This is also equivalent to:

$$t_\alpha = (1,111111...)^2 \cdot 1,11 = 1,37037037037... \qquad (6\text{-}4)$$

The numerical value of this fundamental constant results from the overlaying of this time factor with the interactions taking place, which are described with the fine structure constant.

Summary of results so far

The base formula, in terms of the natural constants tells us principles of dynamics which were previously unknown. Previously, the physical constants only could be determined by measurement, and it was not known what they are attributed to. As we have seen in the derivations of these fundamental constants, in addition to the quantized values also the time factor is responsible for the dynamics of the natural constants.

The time factor in the constants of nature determines how the pulse, and the power is diverted in quantized form. Not only the physical parameters such as mass, charge, etc., are quantized, but also the time. This fact is logically comprehensible when it is considers that the time cannot run continuously when the quantities involved are quantized. The interactions between the quantized sizes take place in accordance to the quantized timing cycle.

As we have seen in the derivation of the speed of light, in the analysis of time and now also in the analysis of time factors in the constant of nature, the time is not a neutral measure which is measured outside the process, but it makes provision for the sequence of events according to a determined cycle. In addition to the fundamental Planck magnitudes, the time is responsible for the dynamics of the universe.

The functioning of the time can be explained physically approximately from these aspects. The possibility of quantizing the world has far reaching impact on our world view. With the base formula, we can attribute anything to the quantized elementary elements, namely space, time and energy.

7. Chapter

In this chapter we will discuss the macrocosm. We started with the smallest dimension, with the Planck length, and in the last Chapter, we learned that each dimension plane builds on the other in the universe. However, here we do not speak about exact copies or simple enlargement of the lower planes, but different interactions take place on each plane according to its own rules. For each size scale, there is therefore also a special fundamental basic force.

But there are principles such as universal attraction force in the space balls or universal timing cycles, which manifest themselves across all dimension planes and under different laws.

This made it possible for us to attribute the fundamental physical processes on the elementary principle, and thus to derive the quantitative-based magnitudes. In the following Chapters we will analyze this primordial principle of attraction and the macrocosm.

7.1. The structure of the universe

The universe mainly consists of "empty space". The "empty" space is the decisive element between planets, solar systems, galaxies and even in the microcosm, in the atoms and its components.

In this "empty" space, structures such as particles, atoms, stars, galaxies are only formed in certain length scales. Its special feature is its size, because they only do appear in certain size dimensions. In any spatial dimension, there are special laws that build on these structures.

However, these known structures only occupy very little space in the vastness of the universe. The micro-and macro-cosmos therefore mainly consists of "empty" space with no visible structures. But as we have seen with the new world model, these observable structures are only clusters of smaller elements, which are formed in the for us invisible microscopic dimensions.

In the macrocosm, it is clear that the galaxies exist of stars and planets, and that clusters of galaxies are a collection of many galaxies in turn. But even in the microcosm, all the particles only consist of accumulations of even smaller elements to the space balls in size from the Planck length. So far, the research only reaches the subatomic particles in the microcosm. However, these elements are huge collections of even smaller quantized particles, too.
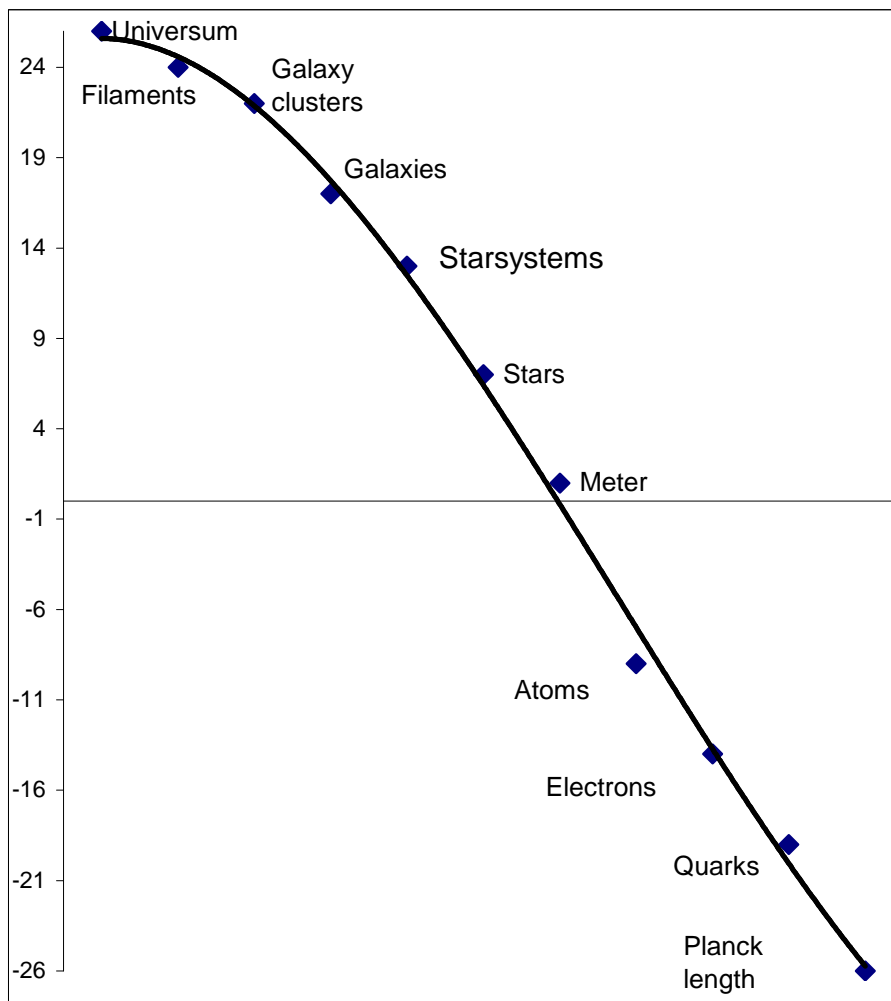
Illustration:
The broad division of the size scale in 10^{X} meters according to the structures they contain.

7.2. The genesis of space

The space as a stage of the physical world contains the primal force in the form of magnetism in the space balls. All physical processes are caused by the interaction of magnetism. But each process ends at some point, even if it would take very long. Therefore each particle as a collection of smaller particles also has a certain decay time. Because all particles over time can break down into its component parts with even smaller particles, which then decay again after some time itself, until finally only radiation is left over; there in a permanent feed in the universe, which produces new quantized particles.

New and permanent space in the form of space balls, which cause the expansion of the universe therefore are formed at the Planck level. Because of the immensity of the universe, the distribution in space and thus the density of space development is very small. Even if it takes place constantly, the new space is distributed on a very large area and this distribution takes place by chance. The random in the smallest dimension, which

makes the predictability in dynamic systems impossible is also formed with the random creation of space. Without this principle of random, the universe would be constructed deterministically just like a mechanical clock and future events would almost certainly be predictable.

The cosmic censorship makes itself felt in the smallest planes by random spatial development. And the structure of the universe according to the onion skin model, in which each event in the lower plane has an impact on the next plane, produces the world's complexity. In our macroscopic dimension we can only observe accumulation of objects and explore laws that have their origin in the smallest dimensions.

New space in the form of space balls can only occur between the existing balls. Through the space development, the surrounding space balls are pushed to the side and it will be formed a pulse as a power blast that forwards the space balls in the form of spherical waves. This impulse consists of the smallest electromagnetic radiation, and thus the known reduced Planck constant is formed.

Through the emergence of space, magnetism balance between the space balls is disturbed. In the vicinity of the newly created space balls therefore a tension is created because the existing inelastic space balls move and resist against it. Without external influences; this local voltage -as a kind of compressed spring- is kept for a long time. If it is disturbed by a pulse, then this tension are discharged and there is thus an even larger pulse, which in turn moves a spherical wave of the space balls.

The smallest dimension at the Planck plane can be imagined as a place with permanent radiation and particle collisions. If we could look into this dimension, it would be very bright there because of the radiation. The processes involved here, are similar to the processes inside stars, but with very small amounts of energy and particle density. What takes place in the plasma of the star with tremendous energy and large number of particles, also takes place in similar form in the space creation. But because of the immense size of the universe, their share by summing up over multiple length scales is very large, and accordingly, this radiation can be explained as **"dark energy"**.

The smallest electromagnetic waves show their features with overlapping and extinguishing already in the smallest dimension. At some points much pulsed power is accumulated by the superimposition which cannot transmit the space balls and this will lead to destruction of space in the form of mini-black holes.

In some places, the superposition of the electromagnetic waves causes standing waves and circular motions of the space balls. Through this circular movement, charge is being transported, and thereby the mass is created. It thus is created the first quantized mini particles. However, these elementary particles are not as stable as their macroscopic relatives, and they also decompose more easily at the smallest disturbance by electromagnetic waves coming from all directions.

The smallest dimension is a place in which, a large surfaced and permanent space is formed and there are formed mini particles and annihilated again. New and larger particles are created with this radiation or other particles are destroyed.

This perpetual cycle of creation and annihilation does not only take place in the microcosm, but it is a universal principle to any size dimension. This universal circuit can be explained as follows:

> **Space-emergence** => pulse energy is produced
> Pulse transport = > charges are produced
> Charge transport => particles are produced
> Attraction of particles => atoms are produced
> Attraction of atoms => Stars are produced
> Attraction in the stars => Black Holes
> **Space-destruction** <= Black Holes

The locations of space development can be defined as white holes and black holes as places of space destruction. In the black holes the space, and so all it includes, is removed (energy, time) from our three dimensional world. By the disappearance of the space, state changes in the physical world will no longer be possible. The singularity thus describes the transition as the gateway between the physical and the transcendent world.

All matter in the cosmos and the macroscopic structures, such as stars and galaxies are an accumulation of pulse energy in its particles, which are formed in the smallest dimension of space development. Pulse energy caused by space emergence accumulates in the smallest structures, thereby forming particles with mass and charge. This pulse accumulates on several dimension planes and together with the magnetism in the space balls forms different particles of different sizes and shapes, finally, the whole universe.

Without permanent new space creation, and thus without expansion of the universe, the dynamic in the universe would become extinct after some time and the existing Impulse energy would have disappeared since a long time in the universe in the mini-black-holes or in their larger relatives in the center of galaxies.

Without new space creation, the universe would only consist of resting space balls that do not have any interaction. The whole dynamic of the universe has its origin in the pulse energy, which is released in the space development.

Energy transformations in periods

physical world

Particles   Stars

Charge   Galaxies

Creation of
space and time

Magnetism

Space de-
struction in
black holes

Singularity   Singularity

transcendent world
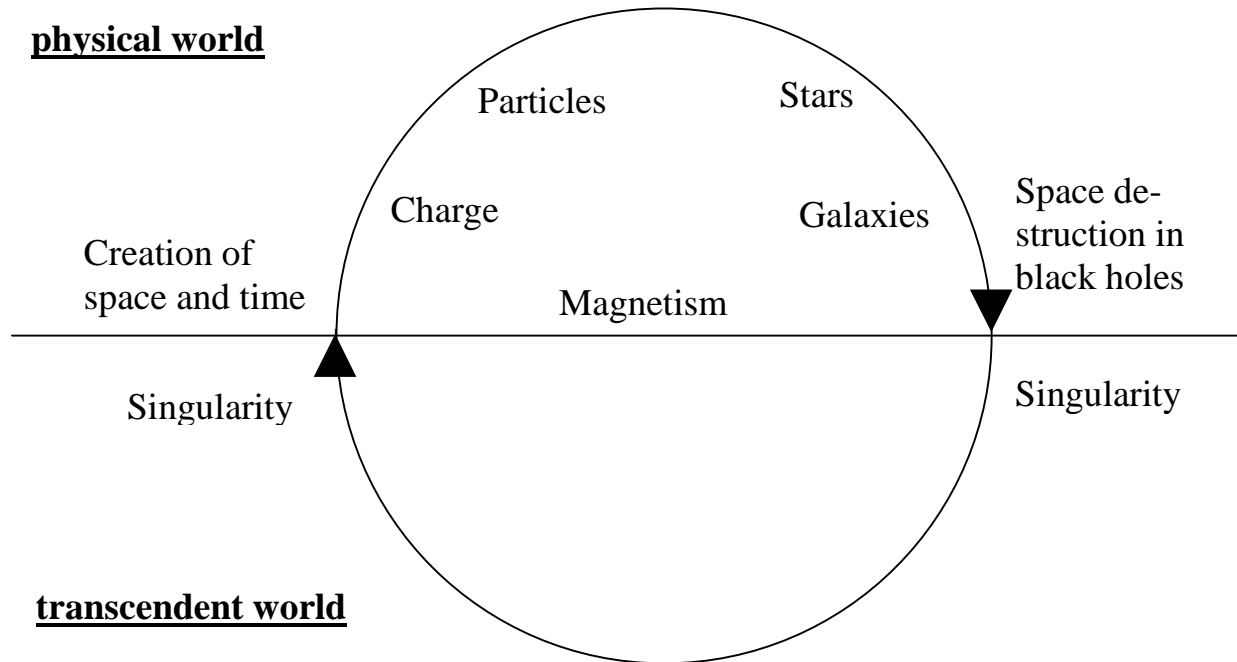
7.3. The expansion of the universe

Between the galaxy clusters, there are huge "empty" cavities, the so-called voids, with an average diameter of 100 million light years. The universe has a honeycomb structure on large scales, a kind of bubble structure, which we will call a **"space bubble"** in this study.

At the overlapping regions of the space bubbles, concentrations of visible (atoms) and invisible (dark) matter occurs, which, over long periods ultimately produce our known galaxy.

Despite a uniform distribution of quantized particles in the space bubbles, galaxy clusters are formed at their edges, which are pushed together by the giant space bubbles. This is also observable in the expansion of the universe. It is known that the galaxies do not attract each other gravitationally over very long distance, but by the expansion of space between them, are pushed to each other.

Figure: Clusters of galaxies between the space bubbles

Galaxycluster
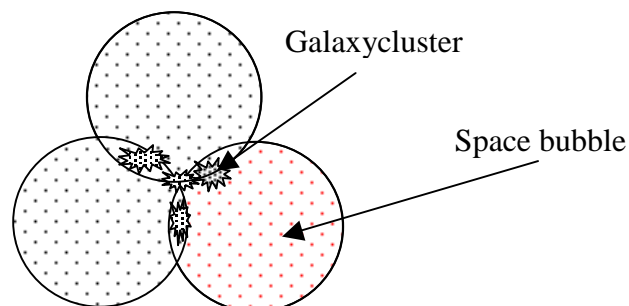
Space bubble

In the overlapping areas between the space bubbles more interaction occurs between radiation, matter and charges, as in other areas of space bubbles. At even greater length scales, the filaments, as the largest known structures in the universe, are the result of this phenomenon.

Here, one space bubble does not penetrate another, but by the expansion of the space bubbles, permanently radiation (dark energy) and mini particles (dark material) are pushed to the edges of the space bubbles. There, they collide with each other to a greater accumulation, which still form larger particles, which then produce the stars and galaxies as interstellar gas clouds.

The giant space bubbles are the birthplace of new microscopic particles and radiation, and thus of future galaxies. They are like giant **"white holes"**, and its products migrate over long periods of time and distances in space and finally form the galaxies at the edges of the space bubbles. In this space bubbles still immeasurably many germs are present for the formation of new particles for the future galaxies.

Due to lack of density no gravitational attraction acts between these quantized particles. The area with the space bubbles is similar to the area in the smallest plane. It lacks the necessary density and thus it cannot contribute to gravity. In its place, a new fundamental force that is responsible for the expansion of the universe occurs. We will learn more about these expansion forces in the next Chapter.

The expansion of the universe is often clearly explained with a filled balloon. Here, immeasurably many space bubbles exist in the universe, which as the individual balloons effect the expansion of the universe and bring the filaments as the largest known structures in the universe. Instead of using only a balloon, the universe can also be explained with countless, expanding space bubbles as "balloons".

Even the big bang is explained in accordance to the "balloon model". But there was no big bang, and the universe; in the long term is in equilibrium through continuous space creation and space destruction in the black holes.

The disorder of the balance is compensated for very long periods, resulting in a rapid expansion with the formation of more black holes in the micro and macrocosm compensates by increasing contraction again. Viewed over very long periods; the universe pulsates with its expansion and contraction.

Figure:

The expansion and the subsequent contraction are not as strong as shown here for illustration. The universe does not shrink together up to half its size.
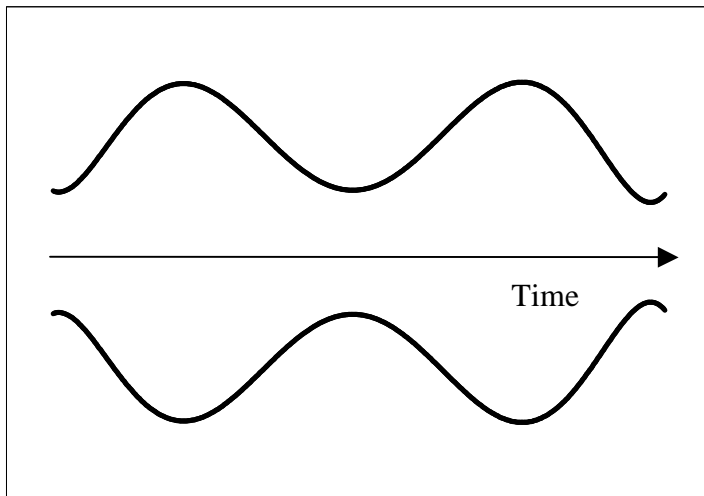
With this expansion curve the pitch is varying. The accelerated expansion determined during astronomical observations results from the increase rate of the expansion curve. With the passage of time, the gradient rate decreases and decreases again after the maximum. The universe is currently seems to be on an expanding course and in billions of years, it could be observed an accelerated shrinking of the universe.

The astronomical observations with the expansion of the universe and the background radiation, which are called the evidence for the Big Bang, can also be explained with the new world model. The background radiation is the result of dynamic processes in the smallest dimensions of the space, which were explained in the previous Chapter in the space creation. Their uniform distribution and minimal density variations are also consistent with the new model and can be described as a result of dark energy and dark matter.

The processes described in the Big Bang theory at the beginning of the universe with the development of radiation, particles, etc. do also take permanently place in a similar way in the smallest dimensions in space development. Therefore, no "big bang" is needed in order to explain the expansion of the universe. Instead of the single huge explosion with the Big Bang, permanently and unspectacular new space is created the universe, which is responsible for the expansion of the universe.

7.4. The basic fundamental forces

The basic fundamental forces, which hold together the universe in the Micro-and macrocosm are the following forces, when they are listed according to their dimension sizes:

<u>Size scale</u>

<u>Expansion force:</u>
$$F_E = ????$$
Space bubbles (Voids)

<u>Gravitation force:</u>
$$F_G = G \cdot \frac{m_1 \cdot m_2}{r^2}$$
Stars and Galaxies

<u>Coulomb force:</u>
$$F_C = \frac{1}{4 \cdot \pi \cdot \varepsilon_0} \cdot \frac{q_1 \cdot q_2}{r^2}$$
Atomic area

<u>Magnetism:</u>
$$F_M = \frac{1}{4 \cdot \pi \cdot \mu_0} \cdot \frac{p_1 \cdot p_2}{r^2}$$
Planck scale

Except for the expansive force which will be explained below, this principle forces are subject to attraction and magnetism and they all have a finite range. They ensure that the structures which we have discussed at the beginning of this chapter are formed in the corresponding size scales.

The magnetism as a macroscopic phenomenon has been known for many thousands of years. In recent centuries, the magnetism has been studied extensively as an electro dynamical phenomenon. However, it is a new approach to explain the magnetic attraction as a fundamental basic force in the universe, on which the new world model is based.

The universe is a complete electromagnetic, and the domain of magnetism is the smallest dimension. Their impact is reflected in the higher dimensions in the form of the above listed other basic fundamental forces. The fundamental forces build on each other and in the appropriate size scales ensure the formation of the known structures.

As we saw in the chapter about the origination of space, the expansion of the universe in the space bubbles cannot be explained by gravity. Since the discovery of gravitation, it is assumed, however, that it holds together the entire universe. According to the new world model, it is the force of attraction in the space balls that holds the universe together as a whole and produces the physical world with its interactions.

For the explanation of the expansion in the space bubbles and thus the expansion of the entire universe, we need a new fundamental force. It forms the galaxy clusters, compresses it, and finally brings out the filaments as the largest structures in the universe. The origin of this new fundamental force is the emergence of space in the huge space bubble. Unimaginably large expansion forces also arise through the emergence of new space in the smallest dimension, which have an impact over huge distances and squeeze giant structures such as galaxies and clusters of galaxies to form the filaments.

During the origination of space a volume expansion takes place in the smallest dimension. The summation over all the size dimensions ultimately causes this tremendous expansion force. Analogue to the other fundamental forces, this unknown new force can also be described as the interaction of space volume.

The constants are known for the other fundamental forces.
The fourth basic force, the expansion force, is a volume expansion and the interaction coefficient contains the expansion constant with the Planck volume:

$$V_K = \frac{1}{V_P} \qquad (7\text{-}1)$$

This constant V_K for the expansion force has the enormous value of $1,9098 \cdot 10^{77}$, and in conjunction with the huge volume of space bubbles we do obtain the extremely large expansion force that causes the motion of galaxies and the formation of the filaments. With future astronomical investigations the new fundamental force and its constant can be determined.

8. Chapter

This Chapter contains the topic of universal logic, which should contribute to a better understanding of the Theory of Everything.

The question of whether there can be a universal formula has been discussed for a long time. It is also expected that the reality confirms our theories, as if the universe would have to be based on us. However, the one thing that is hardly considered is the result of the base formula:

- Can we understand a base formula at all?
- Is our logic and imagination sufficient for something like this?
- Do we have the correct mathematical tools for this?

The basic structure and principles of reality cannot be explained with classical logic. We need a metalogic so that we can better understand the language of the cosmos.

8.1. The limits of mathematics

Mathematics in physics is like salt in the soup. Without mathematics, it's does not work, but too much of it is also bad. The mathematics used in physics rather than a substitute for the lack of perception. What we are not able to observe and in most cases, do not understand the underlying principle, shall made comprehensible to us by mathematical laws. We use mathematics as a tool, as a sort of magnifying instrument such as a microscope or telescope.

Mathematical laws and derived formulas contain hidden principles in it, which are transferred to reality in physics. In what extend these abstract principles do reflect the reality is, however, questionable. Even though they only account for some aspects, they are based on abstract principles that cannot always be transferred into reality. With mathematical formalism, the depicted reality can be distorted because the axiom, established with human logic is made about reality.

Chaos theory has already taught us with the "butterfly effect" that the smallest influences can alter a dynamic system totally. This principle also applies to the mathematical formalism. A hidden property of a mathematical proposition can totally change the described system. And the more complex an equation is, the less likely is its counterpart in reality. Therefore it is possible to formulate basic physical phenomena with short equations. Nature does not calculate and how can it be explained by complex formalism?

Nature knows no mathematics, and therefore it is not possible to explain nature with mathematics. Even thanks to our human logic on which mathematics is based, we are able to win many interesting findings, there are only rough approximations to reality. It can be tried to come closer to reality with sophisticated computational acrobatics. But reality cannot be calculated exactly. The "Chaos theory" has shown this to us with dynamic systems, and the universe is quite dynamic and surely makes no assumptions about our human logic.

In the new world model I also have used mathematical equations as a formalized language. But I was well aware that it is only a rough approximation of reality. Nature knows no universal formula, and this formula is only an attempt to explain the basic principles in the universe with our human logic.

To put it in the words of Albert Einstein, who once said "God does not play dice": God does not calculate, he rolls. But, in another way than we can imagine. In the space creation God plays dice, and makes the universe as a dynamic system and thus unpredictable.

However, we can still try to understand the universe as God's work with our mathematical approximations and our intelligence.

8.2. The Metalogic

At some points in this book it has already been mentioned, that nature does not "calculate" and also does not work according to our logic. However, the physical processes contain regularities, and they take place in a certain system. From our observations we derive laws of nature and describe them with our number system and our mathematical laws that are based on our human logic. These terrestrial physics is merely a crude image of the physical processes.

Even if nature does not calculate, it can be approximately described mathematically. For a better understanding, we require a new mathematics and for the interpretation of the results, we also need a new philosophy.

I call this "metaphysics" but it is not about the traditional metaphysics. It also could be referred to as binary physics or mathematics, but that will also not meet the topic.

At traditional metaphysics as a basic discipline of philosophy, the terrestrial physics is used as the basis. The new metaphysics first needs a new "metalogic" on which "meta-mathematics" is based. Only then a new metaphysics can be operated. Just as traditional physics cannot be performed without mathematics and logic, the new metaphysics cannot be performed without proper principles.

The prefix meta means "what comes next" and the concepts of metalogic, meta-mathematics, and metaphysics have indeed defined meanings, which can lead to Misunderstandings, but by modifying these terms, facts can be better explained.

The base formula gives us a first indication of the universal metalogic that resembles our human logic, but still exceeds it. Our logic of this metalogic is similar, because the neural networks in our brain and also all physical phenomena observed by us are the product of this universal metalogic.

As we noted in our previous analyzes, the physical phenomena are based on the universal timing cycles with the number sequences of one and zero. As an analogy, this can be compared with computers. These devices work only with zeros and ones, and they deliver us the results in a comprehensible form on the monitor. Nature also works only with ones and zeros, and at our earthly physics we see the finished results on the monitor. The processes running in the inside remain hidden from us. However, that does not mean that the universe works digital, but the meta-mathematics is based on a different logic.

The metalogic is based on calculations with infinite number sequences. The principle of the infinity of the universe, however provides finite ratios for quantizing. As we have seen in several calculations in this book, we get i.e. a finite number as a result from infinite number sequences, as the following, which is also included in the Sommerfeld fine structure constant.

$$\frac{1}{(1,111111....)^3} = 0,729$$

To better understand the nature, therefore first of all a new metalogic, a meta-mathematics and also a new metaphysics must be developed. Nature has almost a meta-language, and the more we learn its language and logic, the better we can understand it.

The Base formula opens a little the veil before our eyes. This veil is made of our human logic, because we are accustomed to look at everything from our perspective. The base formula shows us a different logic, which we cannot yet understand with the classical sense and our terrestrial physics.

However, we are not able to think about the metalogic which is necessary, but we need to derive it from nature. Otherwise it would be just a product of our human imagination without reference to reality.

As Einstein said earlier: "*If God created the world, his main concern surely was not to make it so that we can understand it.*"

The Base formula gives us tips on how we can better understand the mystery of the universe and its creator.

Epilogue

The essence of the world, that is the relationship as a whole has, since ancient times, is the subject of the philosophy of nature. Today, it is talked about a standstill in physics, however, this actually is a standstill in natural philosophy. Natural philosophy cannot proceed, because modern, metaphysical themes are missing, which can later lead to tangible physical evidence.

With this book I have tried to re-arrange some puzzle pieces from the physics and to develop a new world model based on physical findings. This study should be a stimulus for further reflection and research by curious physicists and philosophers.

I wish to conclude this book with some quotes from Einstein. His humorous expressed thoughts should always open our eyes and our hearts and make us food for thought.

The more a culture realizes that it current worldview is a fiction, the higher its academic standards will be.

We believe that science serves humanity best when it is all free of influence by any dogma and reserves the right to question all assumptions, including their own.

How terribly inadequate does a theoretical physicist face nature - and his students.

Wisdom is not a product of schooling but of the lifelong attempt to acquire it.

Since the mathematicians have attacked the theory of relativity, I myself do not understand them any longer.

It is more difficult to break down a prejudice than an atom.

There are neither great discoveries nor true progress, as long as there is an unhappy child in the world.

Appendix 1

The speech by Albert Einstein
An Address delivered on May 5th, 1920, in the University of Leyden

ETHER AND THE THEORY OF RELATIVITY

How does it come about that alongside of the idea of ponderable matter, which is derived by abstraction from everyday life, the physicists set the idea of the existence of another kind of matter, the ether? The explanation is probably to be sought in those phenomena which have given rise to the theory of action at a distance, and in the properties of light which have led to the undulatory theory. Let us devote a little while to the consideration of these two subjects.

Outside of physics we know nothing of action at a distance. When we try to connect cause and effect in the experiences which natural objects afford us, it seems at first as if there were no other mutual actions than those of immediate contact, e.g. the communication of motion by impact, push and pull, heating or inducing combustion by means of a flame, etc. It is true that even in everyday experience weight, which is in a sense action at a distance, plays a very important part. But since in daily experience the weight of bodies meets us as something constant, something not linked to any cause which is variable in time or place, we do not in everyday life speculate as to the cause of gravity, and therefore do not become conscious of its character as action at a distance. It was Newton's theory of gravitation that first assigned a cause for gravity by interpreting it as action at a distance, proceeding from masses. Newton's theory is probably the greatest stride ever made in the effort towards the causal nexus of natural phenomena. And yet this theory evoked a lively sense of discomfort among Newton's contemporaries, because it seemed to be in conflict with the principle springing from the rest of experience, that there can be reciprocal action only through contact, and not through immediate action at a distance.

It is only with reluctance that man's desire for knowledge endures a dualism of this kind. How was unity to be preserved in his comprehension of the forces of nature? Either by trying to look upon contact forces as being themselves distant forces which admittedly are observable only at a very small distance and this was the road which Newton's followers, who were entirely under the spell of his doctrine, mostly preferred to take; or by assuming that the Newtonian action at a distance is only apparently immediate action at a distance, but in truth is conveyed by a medium permeating space, whether by movements or by elastic deformation of this medium. Thus the endeavour toward a unified view of the nature of forces leads to the hypothesis of an ether. This hypothesis, to be sure, did not at first bring with it any advance in the theory of gravitation or in physics generally, so that it became customary to treat Newton's law of force as an axiom not further reducible. But the ether hypothesis was bound always to play some part in physical science, even if at first only a latent part.

When in the first half of the nineteenth century the far-reaching similarity was revealed which subsists between the properties of light and those of elastic waves in ponderable bodies, the ether hypothesis found fresh support. It appeared beyond question that light must be interpreted as a vibratory process in an elastic, inert medium filling up universal space. It also seemed to be a necessary consequence of the fact that light is capable of polarisation that this medium, the ether, must be of the nature of a solid body, because transverse waves are not possible in a fluid, but only in a solid. Thus the physicists were bound to arrive at the theory of the "quasi-rigid" luminiferous ether, the parts of which can carry out no movements relatively to one another except the small movements of deformation which correspond to light-waves.

This theory -also called the theory of the stationary luminiferous ether- moreover found a strong support in an experiment which is also of fundamental importance in the special theory of relativity, the experiment of Fizeau, from which one was obliged to infer that the luminiferous ether does not take part in the movements of bodies. The phenomenon of aberration also favoured the theory of the quasi-rigid ether.

The development of the theory of electricity along the path opened up by Maxwell and Lorentz gave the development of our ideas concerning the ether quite a peculiar and unexpected turn. For Maxwell himself the ether indeed still had properties which were purely mechanical, although of a much more complicated kind than the mechanical properties of tangible solid bodies. But neither Maxwell nor his followers succeeded in elaborating a mechanical model for the ether which might furnish a satisfactory mechanical interpretation of Maxwell's laws of the electro-magnetic field. The laws were clear and simple, the mechanical interpretations clumsy and contradictory. Almost imperceptibly the theoretical physicists adapted themselves to a situation which, from the standpoint of their mechanical programme, was very depressing. They were particularly influenced by the electro-dynamical investigations of Heinrich Hertz. For whereas they previously had required of a conclusive theory that it should content itself with the fundamental concepts which belong exclusively to mechanics (e.g. densities, velocities, deformations, stresses) they gradually accustomed themselves to admitting electric and magnetic force as fundamental concepts side by side with those of mechanics, without requiring a mechanical interpretation for them. Thus the purely mechanical view of nature was gradually abandoned. But this change led to a fundamental dualism which in the long-run was insuportable. A way of escape was now sought in the reverse direction, by reducing the principles of mechanics to those of electricity, and this especially as confidence in the strict validity of the equations of Newton's mechanics was shaken by the experiments with β-rays and rapid kathode rays.

This dualism still confronts us in unextenuated form in the theory of Hertz, where matter appears not only as the bearer of velocities, kinetic energy, and mechanical pressures, but also as the bearer of electromagnetic fields. Since such fields also occur in vacuo — i.e. in free ether the ether — also appears as bearer of electromagnetic fields. The ether appears indistinguishable in its functions from ordinary matter. Within matter it takes part in the motion of matter and in empty space it has everywhere a velocity; so that the ether has a definitely assigned velocity throughout the whole of

space. There is no fundamental difference between Hertz's ether and ponderable matter (which in part subsists in the ether).

The Hertz theory suffered not only from the defect of ascribing to matter and ether, on the one hand mechanical states, and on the other hand electrical states, which do not stand in any conceivable relation to each other; it was also at variance with the result of Fizeau's important experiment on the velocity of the propagation of light in moving fluids, and with other established experimental results.

Such was the state of things when H. A. Lorentz entered upon the scene. He brought theory into harmony with experience by means of a wonderful simplification of theoretical principles. He achieved this, the most important advance in the theory of electricity since Maxwell, by taking from ether its mechanical, and from matter its electromagnetic qualities. As in empty space, so too in the interior of material bodies, the ether, and not matter viewed atomistically, was exclusively the seat of electromagnetic fields. According to Lorentz the elementary particles of matter alone are capable of carrying out movements; their electromagnetic activity is entirely confined to the carrying of electric charges. Thus Lorentz succeeded in reducing all electromagnetic happenings to Maxwell's equations for free space.

As to the mechanical nature of the Lorentzian ether, it may be said of it, in a somewhat playful spirit, that immobility is the only mechanical property of which it has not been deprived by H. A. Lorentz. It may be added that the whole change in the conception of the ether which the special theory of relativity brought about, consisted in taking away from the ether its last mechanical quality, namely, its immobility. How this is to be understood will forthwith be expounded.

The space-time theory and the kinematics of the special theory of relativity were modelled on the Maxwell-Lorentz theory of the electromagnetic field. This theory therefore satisfies the conditions of the special theory of relativity, but when viewed from the latter it acquires a novel aspect. For if K be a system of co-ordinates relatively to which the Lorentzian ether is at rest, the Maxwell-Lorentz equations are valid primarily with reference to K. But by the special theory of relativity the same equations without any change of meaning also hold in relation to any new system of co-ordinates K' which is moving in uniform translation relatively to K. Now comes the anxious question: — Why must I in the theory distinguish the K system above all K' systems, which are physically equivalent to it in all respects, by assuming that the ether is at rest relatively to the K system? For the theoretician such an asymmetry in the theoretical structure, with no corresponding asymmetry in the system of experience, is intolerable. If we assume the ether to be at rest relatively to K, but in motion relatively to K', the physical equivalence of K and K' seems to me from the logical standpoint, not indeed downright incorrect, but nevertheless inacceptable.

The next position which it was possible to take up in face of this state of things appeared to be the following. The ether does not exist at all. The electromagnetic fields are not states of a medium, and are not bound down to any bearer, but they are independent realities which are not reducible to anything else, exactly like the atoms of ponderable matter. This conception suggests itself the more readily as, according to

Lorentz's theory, electromagnetic radiation, like ponderable matter, brings impulse and energy with it, and as, according to the special theory of relativity, both matter and radiation are but special forms of distributed energy, ponderable mass losing its isolation and appearing as a special form of energy.

More careful reflection teaches us, however, that the special theory of relativity does not compel us to deny ether. We may assume the existence of an ether; only we must give up ascribing a definite state of motion to it, i.e. we must by abstraction take from it the last mechanical characteristic which Lorentz had still left it. We shall see later that this point of view, the conceivability of which I shall at once endeavour to make more intelligible by a somewhat halting comparison, is justified by the results of the general theory of relativity.

Think of waves on the surface of water. Here we can describe two entirely different things. Either we may observe how the undulatory surface forming the boundary between water and air alters in the course of time; or else — with the help of small floats, for instance — we can observe how the position of the separate particles of water alters in the course of time. If the existence of such floats for tracking the motion of the particles of a fluid were a fundamental impossibility in physics — if, in fact, nothing else whatever were observable than the shape of the space occupied by the water as it varies in time, we should have no ground for the assumption that water consists of movable particles. But all the same we could characterise it as a medium.

We have something like this in the electromagnetic field. For we may picture the field to ourselves as consisting of lines of force. If we wish to interpret these lines of force to ourselves as something material in the ordinary sense, we are tempted to interpret the dynamic processes as motions of these lines of force, such that each separate line of force is tracked through the course of time. It is well known, however, that this way of regarding the electromagnetic field leads to contradictions.

Generalising we must say this: - There may be supposed to be extended physical objects to which the idea of motion cannot be applied. They may not be thought of as consisting of particles which allow themselves to be separately tracked through time. In Minkowski's idiom this is expressed as follows: - Not every extended conformation in the four-dimensional world can be regarded as composed of world-threads. The special theory of relativity forbids us to assume the ether to consist of particles observable through time, but the hypothesis of ether in itself is not in conflict with the special theory of relativity. Only we must be on our guard against ascribing a state of motion to the ether.

Certainly, from the standpoint of the special theory of relativity, the ether hypothesis appears at first to be an empty hypothesis. In the equations of the electromagnetic field there occur, in addition to the densities of the electric charge, only the intensities of the field. The career of electromagnetic processes in vacua appears to be completely determined by these equations, uninfluenced by other physical quantities. The electromagnetic fields appear as ultimate, irreducible realities, and at first it seems

superfluous to postulate a homogeneous, isotropic ether-medium, and to envisage electromagnetic fields as states of this medium.

But on the other hand there is a weighty argument to be adduced in favour of the ether hypothesis. To deny the ether is ultimately to assume that empty space has no physical qualities whatever. The fundamental facts of mechanics do not harmonize with this view. For the mechanical behaviour of a corporeal system hovering freely in empty space depends not only on relative positions (distances) and relative velocities, but also on its state of rotation, which physically may be taken as a characteristic not appertaining to the system in itself. In order to be able to look upon the rotation of the system, at least formally, as something real, Newton objectivises space. Since he classes his absolute space together with real things, for him rotation relative to an absolute space is also something real. Newton might no less well have called his absolute space "Ether"; what is essential is merely that besides observable objects, another thing, which is not perceptible, must be looked upon as real, to enable acceleration or rotation to be looked upon as something real.

It is true that Mach tried to avoid having to accept as real something which is not observable by endeavouring to substitute in mechanics a mean acceleration with reference to the totality of the masses in the universe in place of an acceleration with reference to absolute space. But inertial resistance opposed to relative acceleration of distant masses presupposes action at a distance; and as the modern physicist does not believe that he may accept this action at a distance, he comes back once more, if he follows Mach, to the ether, which has to serve as medium for the effects of inertia. But this conception of the ether to which we are led by Mach's way of thinking differs essentially from the ether as conceived by Newton, by Fresnel, and by Lorentz. Mach's ether not only conditions the behaviour of inert masses, but is also conditioned in its state by them.

Mach's idea finds its full development in the ether of the general theory of relativity. According to this theory the metrical qualities of the continuum of space-time differ in the environment of different points of space-time, and are partly conditioned by the matter existing outside of the territory under consideration. This space-time variability of the reciprocal relations of the standards of space and time, or, perhaps, the recognition of the fact that "empty space" in its physical relation is neither homogeneous nor isotropic, compelling us to describe its state by ten functions (the gravitation potentials $g_{\mu\nu}$), has, I think, finally disposed of the view that space is physically empty. But therewith the conception of the ether has again acquired an intelligible content, although this content differs widely from that of the ether of the mechanical undulatory theory of light. The ether of the general theory of relativity is a medium which is itself devoid of all mechanical and kinematical qualities, but helps to determine mechanical (and electromagnetic) events.

What is fundamentally new in the ether of the general theory of relativity as opposed to the ether of Lorentz consists in this, that the state of the former is at every place determined by connections with the matter and the state of the ether in neighbouring

places, which are amenable to law in the form of differential equations; whereas the state of the Lorentzian ether in the absence of electromagnetic fields is conditioned by nothing outside itself, and is everywhere the same. The ether of the general theory of relativity is transmuted conceptually into the ether of Lorentz if we substitute constants for the functions of space which describe the former, disregarding the causes which condition its state. Thus we may also say, I think, that the ether of the general theory of relativity is the outcome of the Lorentzian ether, through relativation.

As to the part which the new ether is to play in the physics of the future we are not yet clear. We know that it determines the metrical relations in the space-time continuum, e.g. the configurative possibilities of solid bodies as well as the gravitational fields; but we do not know whether it has an essential share in the structure of the electrical elementary particles constituting matter. Nor do we know whether it is only in the proximity of ponderable masses that its structure differs essentially from that of the Lorentzian ether; whether the geometry of spaces of cosmic extent is approximately Euclidean. But we can assert by reason of the relativistic equations of gravitation that there must be a departure from Euclidean relations, with spaces of cosmic order of magnitude, if there exists a positive mean density, no matter how small, of the matter in the universe. In this case the universe must of necessity be spatially unbounded and of finite magnitude, its magnitude being determined by the value of that mean density.

If we consider the gravitational field and the electromagnetic field from the standpoint of the ether hypothesis, we find a remarkable difference between the two. There can be no space nor any part of space without gravitational potentials; for these confer upon space its metrical qualities, without which it cannot be imagined at all. The existence of the gravitational field is inseparably bound up with the existence of space. On the other hand a part of space may very well be imagined without an electromagnetic field; thus in contrast with the gravitational field, the electromagnetic field seems to be only secondarily linked to the ether, the formal nature of the electromagnetic field being as yet in no way determined by that of gravitational ether. From the present state of theory it looks as if the electromagnetic field, as opposed to the gravitational field, rests upon an entirely new formal motif, as though nature might just as well have endowed the gravitational ether with fields of quite another type, for example, with fields of a scalar potential, instead of fields of the electromagnetic type.

Since according to our present conceptions the elementary particles of matter are also, in their essence, nothing else than condensations of the electromagnetic field, our present view of the universe presents two realities which are completely separated from each other conceptually, although connected causally, namely, gravitational ether and electromagnetic field, or -as they might also be called - space and matter.

Of course it would be a great advance if we could succeed in comprehending the gravitational field and the electromagnetic field together as one unified conformation. Then for the first time the epoch of theoretical physics founded by Faraday and Maxwell would reach a satisfactory conclusion. The contrast between ether and matter would fade away, and, through the general theory of relativity, the whole of physics

would become a complete system of thought, like geometry, kinematics, and the theory of gravitation. An exceedingly ingenious attempt in this direction has been made by the mathematician H. Weyl; but I do not believe that his theory will hold its ground in relation to reality. Further, in contemplating the immediate future of theoretical physics we ought not unconditionally to reject the possibility that the facts comprised in the quantum theory may set bounds to the field theory beyond which it cannot pass.

Recapitulating, we may say that according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether. According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense. But this ether may not be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it.

Appendix 2 - Formula overview

Halit Eroglu, 04/2014

With the base formula the following fundamental constants and significant physical parameters were derived.

<u>Variable used:</u>

c = Speed of light

h = Planck constant

$\hbar$ = reduced Planck constant

l_P = Planck length

t_P = Planck time

m_P = Planck mass

V_P = Planck volume

m_{PeV} = Planck mass in eV

$\lambda_{C(Planck)}$ = Compton wavelength of Planck mass

E_P = Planck energy

G = Gravitational constant

α = Fine structure constant

g = Acceleration due to gravity

Q_P = Planck charge

R_K = Von-Klitzing constant

u = Atomic mass unit

N_A = Avogadro constant

R_m = universal gas constant

k_B = Boltzmann constant

<u>Electron</u>

e = Elementary charge

m_e = Electron mass

r_K = Classical electron radius

O_{rk} = Surface of classical electron radius

V_e = Volume of classical electron radius

μ_e = Magnetic moment of electron

$\lambda_{C(Elektron)}$ = Compton wavelength of electron

C_e = Coulomb force of electron

$g_{FaktorElektron}$ = Electron spin g-factor

e_{gyro} = gyromagnetic ratio of electron

$m_{e(eV)}$ = electron mass in eV

<u>Proton</u>

m_{Prot} = proton mass

r_{Prot} = proton's radius

V_{Prot} = volume of proton

O_{Prot} = surface of proton

$m_{Prot(eV)}$ = proton mass in eV

μ_{Prot} = magnetic moment of proton

$\lambda_{C(Prot)}$ = Compton wavelength of proton

C_{Prot} = Coulomb force of proton

$g_{FaktorProton}$ = proton spin g-factor

<u>Neutron</u>

m_N = neutron mass

r_N = neutron's radius

V_N = volume of neutron

O_N = surface of neutron

$m_{N(eV)}$ = neutron mass in eV

μ_N = magnetic moment of neutron

$\lambda_{C(Neutron)}$ = Compton wavelength neutron

C_N = Coulomb force of neutron

$g_{FaktorNeutron}$ = neutron spin g-factor

Important note:

No original Planck units and their numerical values were used in this book and in this formula overview. However, in honor of Max Planck, I have named after him the new quantized sizes. The Planck mass, the Planck length, etc. should therefore not to be confused with the original Planck units.

The following equations are derived to make certain connections clear. Here, the Planck length wasn't used in order to ensure clarity. The multiplication by the number one in the Planck length has no effect on the numerical values. During the comparison of equations derived with CODATA values, however, the Planck length is included in the extension with the orders of ten.

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The base formula as elementary constant

With $\hbar = 1{,}05482228647939 \cdot 10^{-34}$, c= 299.792.458 and $l_P = 10^{-26}$

CODATA-value of reduced Planck constant: $\hbar = 1{,}054571726 \cdot 10^{-34}$ Js
The deviation from the CODATA value: $0{,}00025056114310492 \cdot 10^{-34}$

CODATA-Value $\hbar \cdot c$ in eV: $\hbar \cdot c = 197{,}3269718\,\text{MeVfm}$
With the base formula in eV: $\hbar \cdot c = 197{,}392088021787\,\text{MeVfm}$

1.	$\hbar \cdot c = \sqrt{10} \cdot 10^{-26}$	2.	$\hbar = \dfrac{\sqrt{10}}{c} \cdot 10^{-26}$

Planck charge

$Q_p = 3{,}20405715533983 \cdot 10^{-19}\,Coulomb$

3.	$Q_P = 2e \;\Rightarrow\; e = \dfrac{Q_P}{2}$	4.	$Q_P = \dfrac{\sqrt{10}}{\pi^2}$
5.	$Q_P = \dfrac{\hbar \cdot c}{\pi^2}$	6.	$Q_P = \dfrac{m_P \cdot c^2}{\pi^2}$

Planck mass

$$m_p = 3,51850841584345 \cdot 10^{-17}\, kg$$
$$m_{PeV} = 197,3920880217870\, \text{MeV}$$

7.	$m_p = \dfrac{\hbar}{c \cdot l_P}$	8.	$m_P = \dfrac{Q_P \cdot \pi^2}{c^2}$
9.	$m_p = \dfrac{\sqrt{10}}{c^2}$	10.	$m_P = \dfrac{1}{c^2 \cdot \sqrt{10}}$
11.	$m_P = \dfrac{\hbar^2}{\sqrt{10}}$	12.	$m_{P(eV)} = 2 \cdot \pi^2$
13.	$m_{p(eV)} = \dfrac{\hbar \cdot c}{e}$		

Planck energy

$$E_P = 3,16227766016838\ \ Joule$$

14.	$E_P = \sqrt{10} = e \cdot 2\pi^2$	15.	$E_P = \sqrt{10}$
16.	$E_P = \dfrac{\hbar \cdot c}{l_P}$	17.	$E_P = m_P \cdot c^2 = \sqrt{10}$
18.	$E_P = Q_P \cdot \pi^2$		

Planck time

19.	$t_P = 1,00100100100100....$

Planck length

20.	$l_P = 10^{-26}$

Elementary charge

With the CODATA-value: $e = 1{,}602176565 \cdot 10^{-19}$ C.

With the following equations, we obtain the value: $e = 1{,}602028577669910 \cdot 10^{-19} C$.

The deviation from the CODATA value: $0{,}000147987330086531 \cdot 10^{-19} C$.

21.	$e = \sqrt{\dfrac{Q_P \cdot r_K}{m_P}} \cdot \sqrt{10}$	22.	$e = \sqrt{10} \cdot c^{2} \cdot \dfrac{r_K}{5}$
23.	$e^2 = m_e \cdot r_K$	24.	$e = \dfrac{\sqrt{10}}{2\pi^2}$
25.	$\dfrac{1}{3}e = 8 \cdot G \qquad \dfrac{2}{3}e = 16 \cdot G \qquad \dfrac{4}{3}e = 32 \cdot G \qquad \dfrac{1}{2}e = 12 \cdot G$ Charges of subatomic particles such as quarks		
26.	$e = \dfrac{12 \cdot V_P \cdot r_K}{m_P \cdot \pi}$	27.	$e = 24 \cdot G$

Electron mass

With the CODATA-value: $9{,}10938291 \cdot 10^{-31} kg$

With the following equations, we obtain the value: $m_e = 9{,}106293851429520 \cdot 10^{-31} kg$

The deviation from the CODATA value: $0{,}003089058570479190 \cdot 10^{-31}\,\text{kg}$

28.	$m_e = \dfrac{Q_P}{m_P}$	29.	$m_e = Q_P \cdot \dfrac{c}{\hbar}$
30.	$m_e = \left(\dfrac{c}{\pi}\right)^2$	31.	$\sqrt{m_e} = 2\pi \cdot e \cdot c$
32.	$m_e = \left(\dfrac{\hbar \cdot m_{eV}}{2\pi \cdot c^2}\right)^2$	33.	$m_{e(eV)} = \dfrac{2 \cdot c^2}{m_P}$
34.	$m_e = \dfrac{2e}{m_P}$	35.	$m_e \cdot m_P = Q_P = 2 \cdot e$

Classical electron radius

With the following equations, we obtain the value: $r_K = 2{,}818375516476650 \cdot 10^{-15} m$

36.	$r_K = \dfrac{\hbar \cdot e}{2 \cdot c}$	37.	$\left(\dfrac{Q_P}{2}\right)^2 = m_e \cdot r_K$
38.	$r_K = \dfrac{1}{4} Q_P \cdot m_P$	39.	$r_K = \dfrac{\hbar^2}{4\pi^2}$

Fine structure constant

With the CODATA-value: $0{,}00729735253594845000$ or $\dfrac{1}{137{,}03599971}$

With the following equations, we obtain the value:

$\alpha = 0{,}007294271493324960$ or $\dfrac{1}{137{,}0938826331190}$

The deviation from the CODATA value: $0{,}00000308104262349701$

40.	$\alpha = \dfrac{c^2}{\sqrt{10}} \cdot \left(\dfrac{\sqrt{10}}{2 \cdot \pi^2}\right)^2$	41.	$\alpha = c^2 \cdot \dfrac{\sqrt{10}}{4\pi^4}$
42.	$\alpha = \dfrac{c}{\hbar} \cdot \dfrac{1}{4\pi^4}$	43.	$\alpha = \dfrac{1}{m_P} \cdot \dfrac{1}{4\pi^4}$
44.	$\alpha = \dfrac{Q_P^2}{4 \cdot m_P}$	45.	$\alpha = \dfrac{1}{4} Q_P \cdot m_e$
46.	$\alpha = \dfrac{m_e \cdot e}{2}$	47.	$\alpha = \dfrac{2 \cdot e}{h^2} = \dfrac{Q_P}{h^2}$
48.	$\alpha = 12 \cdot m_e \cdot G$		

Gravitational constant

With the CODATA-value: $G = 6{,}67384 \cdot 10^{-11}$

With the following equations, we obtain the value: $G = 6{,}6751190736246400 \cdot 10^{-11}$

The deviation from the CODATA value: $0{,}001279073624637630 \cdot 10^{-11}$

49.	$G = 3\dfrac{1}{3} \cdot \hbar \cdot c \cdot \dfrac{1}{4\pi \cdot \mu_0}$	50.	$G = 3\dfrac{1}{3} \cdot \dfrac{Q_P}{16}$
51.	$G = \dfrac{Q_P}{48}$	52.	$G = \dfrac{e}{24}$

Acceleration due to gravity

With the CODATA-value: $g = 9{,}80665$

With the following equations, we obtain the value: $g = 9{,}8066298275635$

53.	$g = \dfrac{3{,}33333...}{6{,}06060...} \cdot \dfrac{m_{prot}}{V_e}$	54.	$g = \dfrac{3}{6} \cdot \dfrac{1{,}11111...}{1{,}01010...} \cdot \dfrac{m_{prot}}{V_e}$
55.	$g = \dfrac{1}{0{,}181818181...} \cdot \dfrac{m_{prot}}{V_e}$	56.	$g = 5{,}5 \cdot \dfrac{m_{prot}}{V_e}$

Proton's radius

According to the experiments with muonic hydrogen at the Paul Scherrer Institute (Germany):
$r_{prot} = 8,4184 \cdot 10^{-18} m$

With the following equations, we obtain the value: $r_{prot} = 8,415160546424410 \cdot 10^{-18} m$

57.	$\sqrt{10} \cdot r_K \cdot r_{prot} = \dfrac{3}{4}$	58.	$r_{prot} = \dfrac{3}{4 \cdot r_K \cdot \sqrt{10}}$
59.	$r_{prot} = \dfrac{3}{Q_P \cdot m_P \cdot \sqrt{10}}$	60.	$Q_P^2 \cdot 2\pi^3 \cdot r_{prot} = 360 \dfrac{V_P}{m_P}$
61.	$r_{prot} = 1,5 \cdot \dfrac{c^2}{e}$	62.	$r_{prot} = 1,8\pi \cdot \dfrac{V_P}{m_P}$
63.	$r_{prot} = m_N \cdot 16\pi$	64.	$r_{prot} = \dfrac{m_{prot}}{h \cdot c}$
65.	$r_{prot} = \dfrac{c^2}{16 \cdot G}$	66.	$r_{prot} = \dfrac{1,5 \cdot c^2}{e}$
67.	$r_{prot} = \dfrac{m_e \cdot c^2 \cdot 7,5}{\alpha}$	68.	$r_{prot} = V_N \cdot \mu_N \dfrac{32}{0,181818....}$ $\mu_N = $ magnetic moment of neutron
69.	$\dfrac{m_{prot}}{V_{prot}} = \dfrac{r_K}{r_{prot}} \cdot 2$	70.	$r_{prot} = \dfrac{m_{prot}}{V_{\mathrm{Pr}ot}} \cdot \dfrac{r_K \cdot g}{22}$ $g = $ acceleration due to gravity
71.	$r_{prot} = \dfrac{g \cdot \pi}{V_{\mathrm{Pr}ot}} \cdot 6,81818181...$	72.	$r_{\mathrm{Pr}ot}^2 \cdot r_K^2 = \dfrac{16}{g}$

Volume / surface

73.	$$V_e = \frac{4}{3}\pi \cdot r_K^3 \qquad V_P = \frac{4}{3}\pi \cdot \left(\frac{l_P}{2}\right)^3 = \frac{\pi}{6} \qquad V_{prot} = \frac{4}{3}\pi \cdot r_{prot}^3$$ $$O_e = 4\pi \cdot r_K^2 \qquad O_P = 4\pi \cdot \left(\frac{l_P}{2}\right)^2 = \pi \qquad O_{prot} = 4\pi \cdot r_{prot}^2$$

Proton mass

With the CODATA-value: $1{,}672621777 \cdot 10^{-27}\,kg$.

With the following equations, we obtain the value: $m_{prot} = 1{,}672023104385960 \cdot 10^{-27}\,kg$.

The deviation from the CODATA value: $0{,}00004498013555790 \cdot 10^{-27}\,kg$

74.	$$m_{prot} = c \cdot h \cdot r_{prot}$$	75.	$$m_{prot} = c \cdot \hbar \cdot 2\pi \cdot r_{prot}$$
76.	$$m_{prot} = \sqrt{10} \cdot 2\pi \cdot r_{prot}$$	77.	$$m_{prot} = m_P \cdot c^2 \cdot 2\pi \cdot r_{prot}$$
78.	$$m_{prot} = Q_P \cdot 2\pi^3 \cdot r_{prot}$$	79.	$$m_e \cdot m_{prot} \cdot m_P^2 = 360 \cdot V_P$$
80.	$$m_{Prot} \cdot e \cdot \frac{m_P}{V_P} = 1{,}8$$	81.	$$m_{Prot} \cdot 1{,}111111... = \frac{V_P}{r_K}$$
82.	$$m_{Prot} = \frac{36 \cdot V_P}{m_e \cdot m_P^2}$$	83.	$$m_{Prot} = \frac{1{,}5 \cdot \pi}{r_K}$$
84.	$$m_{Prot} = \frac{6 \cdot \pi}{m_e \cdot m_P^2}$$	85.	$$m_{Prot} = 3\pi \cdot m_{Prot(eV)} \cdot c^2$$
86.	$$m_{Prot} = 1{,}5 \cdot \frac{m_{Prot(eV)}}{r_{prot}}$$	87.	$$m_{Prot} = 2\pi \frac{V_{Prot}}{m_{Prot(eV)}}$$

88.	$$m_{\text{Pr}ot(eV)} = \frac{m_P}{4 \cdot V_e}$$	89.	$$m_{\text{Pr}ot(eV)} = 1\frac{1}{3} \cdot r_K \cdot V_{\text{Pr}ot}$$
90.	$$m_{\text{Pr}ot} = \frac{3}{4} \cdot \frac{m_{e(eV)}}{\alpha \cdot \pi}$$	91.	$$m_{prot} = g \cdot \frac{V_e}{5,5}$$ g = acceleration due to gravity
92.	$$m_{prot} = \frac{h \cdot c^3}{16 \cdot G}$$	93.	$$m_{prot} = 6\pi^3 \cdot c^2$$
94.	$$m_{prot}^2 \cdot G \cdot \frac{m_{prot}}{V_{prot}} = \frac{1}{8}$$	95.	$$m_{prot} = \frac{r_{\text{Pr}ot}}{24\pi \cdot G}$$
96.	$$m_{prot} = \frac{18 \cdot V_P}{e \cdot m_P}$$	97.	$$m_{prot} = \frac{9 \cdot V_P}{r_K}$$
98.	$$m_{\text{Pr}ot(eV)} = \frac{r_K \cdot g}{176 \cdot m_N} = \frac{r_K \cdot g}{m_N} \cdot \frac{0,181818...}{32}$$	99.	$$m_{prot} = \frac{V_P}{m_P \cdot 9 \cdot 8}$$
100.	$$\frac{m_P}{V_P} \cdot g \cdot 0,18181818... = 48 \cdot V_{\text{Pr}ot}$$	101.	$$m_{prot} = \frac{r_{\text{Pr}ot}^2}{V_P \cdot c^2} \cdot 1,111111....$$
102.	$$E_{\text{Pr}ot} = m_{\text{Pr}ot} \cdot c^2 = \frac{r_{\text{Pr}ot}^2}{V_P} \cdot 1,111111....$$	103.	$$\frac{m_{prot}}{V_{prot}} = 48 \frac{V_e \cdot V_P}{m_P}$$
104.	$$m_{prot} = \frac{V_P}{m_P} \cdot 4\pi^2 \cdot 9 \cdot \sqrt{10}$$	105.	$$\frac{\sqrt{10}}{m_e} \cdot \frac{\sqrt{10}}{m_{prot}} \cdot V_P = \frac{m_P^2}{36}$$
106.	$$G \cdot m_{prot} \cdot m_P = 7,5 \cdot V_P$$		

Neutron mass

With the CODATA-value: $1{,}674927351 \cdot 10^{-27}\,kg$

With the following equations, we obtain the value: $m_{Neutron} = 1{,}6741429973441700 \cdot 10^{-27}\,kg$

The deviation from the CODATA value: $0{,}00062964748531780900 \cdot 10^{-27}\,kg$

107.	$m_{Neutron} = m_{\mathrm{Prot}} \cdot G \cdot 1{,}5$	108.	$m_{N(eV)} = \dfrac{m_e \cdot O_{\mathrm{Prot}}}{2 \cdot 6 \cdot 8 \cdot 8 \cdot O_N}$
109.	$\dfrac{m_{Neutron}}{m_{prot}} = \dfrac{Q_P}{32} = \dfrac{e}{16}$	110.	$m_{Neutron} = \dfrac{m_{prot} \cdot e}{16}$
111.	$\dfrac{m_{prot} \cdot e}{m_{Neutron}} = 16$	112.	$m_{Neutron} = \dfrac{V_P}{8{,}8888... \cdot m_P}$
113.	$m_{Neutron} = \dfrac{r_{\mathrm{Prot}}}{16\pi}$	114.	$m_{Neutron} = \dfrac{r_{\mathrm{Prot}}}{96 \cdot V_P}$
115.	$m_{Neutron} = \dfrac{\pi}{6 \cdot 8{,}8888... \cdot m_P}$	116.	$m_{Neutron} = \dfrac{r_{\mathrm{Prot}} \cdot m_e \cdot \pi}{16 \cdot c^2}$
117.	$m_{Neutron} = \dfrac{r_K \cdot V_{\mathrm{Prot}}}{5 \cdot r_{\mathrm{Prot}}}$	118.	$m_{Neutron} = \dfrac{G \cdot \pi}{r_K \cdot 4{,}444....}$
119.	$m_{Neutron} = \dfrac{m_e \cdot V_P}{e \cdot 2 \cdot 8{,}8888....}$	120.	$m_{Neutron} = \dfrac{c^2}{G} \dfrac{1}{256\pi}$
121.	$m_{Neutron} = \dfrac{c \cdot V_P}{\hbar \cdot 8{,}8888....}$	122.	$m_{Neutron} = \dfrac{V_P}{m_P \cdot \hbar \cdot 8{,}8888....}$
123.	$m_{N(eV)} = \dfrac{r_K}{32 \cdot V_K}$	124.	$m_{N(eV)} = 6{,}6666... \cdot m_{\mathrm{Prot}} \cdot r_{\mathrm{Prot}}$

Neutron's radius

CODATA: no value
With the following equations, we obtain the value: $r_N = 1,057123637686110 \cdot 10^{-18}\, m$

125.	$r_N = \sqrt{m_N \cdot G}$	126.	$r_N = \dfrac{8,1818... \cdot m_e}{\alpha \cdot \mu_N}$
127.	$r_N^2 = \dfrac{e \cdot r_{\mathrm{Prot}}}{8 \cdot 8 \cdot 6 \cdot \pi}$	128.	$r_N = \dfrac{m_e \cdot \pi^2}{8 \cdot 8 \cdot 8 \cdot u}$ u = atomic mass unit

Surface of neutron

129.	$O_N = \dfrac{c^2}{8 \cdot 8}$	130.	$O_N = \dfrac{m_e \cdot O_{\mathrm{Prot}} \cdot O_{r_K}}{8 \cdot 8 \cdot 9}$

Mass ratios

With the CODATA-value: 1836,152671948660
With the following equations, we obtain the value: 1836,118108711690

131.	$\dfrac{m_{prot}}{m_e} = \dfrac{1,5 \cdot \pi}{e^2}$	132.	$\dfrac{m_{prot}}{m_e} \cdot \dfrac{\alpha}{m_{Neutron}} = 8$ (Oktettregel)
133.	$\dfrac{m_{Neutron}}{m_{\mathrm{Prot}}} = G \cdot 1,5$		

Second

The atomic second is defined as the duration of 9192631770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the ^{133}Cs atom.

134.	$\dfrac{1}{Second} = m_e \cdot g_{FaktorNeutron} \cdot 3{,}1222222...$
135.	$\dfrac{1}{Second} = m_e \cdot g_{FaktorNeutron} \cdot 2{,}81 \cdot 1{,}11 \cdot 1{,}00100100100...$
136.	$Second = \dfrac{1}{m_e \cdot g_{FaktorNeutron} \cdot 2{,}81 \cdot 1{,}1111111...} = 9192631770$

Spin g-Factor

Spin g-Factor of Neutron with the CODATA-value: -3,82608545
With the following equation, we obtain the value: $g_{FaktorNeutron} = 3{,}826085450369120$
The deviation from the CODATA value: 0,0000000003691172

137.	$g_{FaktorNeutron} = \dfrac{1}{m_e \cdot 9192631770 \cdot 2{,}81 \cdot 1{,}1111111...}$

Spin g-Factor of Proton with the CODATA-value: 5,585694713
With the following equations, we obtain the value: $g_{Faktor\,Proton} = 5{,}584695283128080$
The deviation from the CODATA value: 0,0009994298719231

138.	$g_{Faktor\,Proton} = \dfrac{1}{4{,}68 \cdot g_{FaktorNeutron}}$	139.	$g_{Faktor\,Proton} \cdot g_{FaktorNeutron} = \dfrac{1}{4{,}68}$

140.	$$\dfrac{\left(g_{Faktor\,\mathrm{Pr}oton} \cdot g_{FaktorNeutron}\right)^2}{h} = 6{,}88888....$$

Spin g-Factor of Electron with the CODATA-value: $g_{FaktorElektron} = 2{,}00231930436153$

With the following equations, we obtain the value:

$2 + 2 \cdot g_{FaktorElektron} = 2{,}0023193043835300$

The deviation from the CODATA value: $0{,}0000000000219992$

141.	$g_{FaktorElektron} = \dfrac{1{,}48 \cdot c}{g_{FaktorNeutron}}$	142.	$1{,}48 = 1{,}11 * 1\dfrac{1}{3} = \dfrac{1{,}11}{7{,}5}$
143.	$g_{FaktorElektron} = \dfrac{1{,}11 \cdot c}{7{,}5 * g_{FaktorNeutron}}$	144.	$g_{FaktorElektron} = \dfrac{4 \cdot e_{gyro}}{m_P}$ $e_{gyro} =$ gyromagnetic ratio of electron

Compton wavelength

With the CODATA-value of Proton: $\lambda_{C(\mathrm{Pr}ot)} = 1{,}32140985623 \cdot 10^{-15}$

With the following equations, we obtain the value: $\lambda_{C(\mathrm{Pr}ot)} = 1{,}32219706316403 \cdot 10^{-15}$

The deviation from the CODATA value: $0{,}007872069340326 \cdot 10^{-15}$

145.	$\dfrac{16}{\lambda_{C(prot)}} = \dfrac{c^4}{G} = Planckforce$	146.	$\lambda_{C(prot)} = \dfrac{16 \cdot G}{c^4}$
147.	$\lambda_{C(prot)} = 1{,}5 \cdot \dfrac{V_P \cdot r_K}{m_N}$		

With the CODATA-value of Neutron: $\lambda_{C(Neutron)} = 1{,}319590906 \cdot 10^{-15}$

With the following equations, we obtain the value: $\lambda_{C(Neutron)} = 1{,}32052282371853 \cdot 10^{-15}$

The deviation from the CODATA value: $0{,}00931917218528954 \cdot 10^{-15}$

148.	$\lambda_{C(Neutron)} = m_P^2 \cdot 1{,}066666....$	149.	$\lambda_{C(Neutron)} = 8 \cdot 8 \cdot 6 \cdot 1{,}11111.... \cdot \dfrac{r_K}{m_e}$

150.	$$\lambda_{C(Neutron)} = \frac{8 \cdot 8 \cdot 8 \cdot r_K \cdot G}{\alpha}$$	151.	$$\lambda_{C(Neutron)} = \frac{12 \cdot m_P}{m_N \cdot V_P}$$

With the CODATA-value of Electron: $\lambda_{C(Elektron)} = 2{,}4263102389 \cdot 10^{-12}$

With the following equation, we obtain the value:

$\lambda_{C(Elektron)} = 2{,}427709970960890 \cdot 10^{-12}$

The deviation from the CODATA value: $0{,}001399732060891070 \cdot 10^{-12}$

152.	$$\lambda_{C(Elektron)} = 2\pi \cdot \frac{r_K}{\alpha}$$	153.	$$\lambda_{C(Planck)} = \frac{h}{m_P \cdot c} = 2\pi$$ with Planck mass

Magnetic moment

With the CODATA-value of Neutron: $\mu_N = -0{,}96623647 \cdot 10^{-26}$

With the following equations, we obtain the value: $\mu_N = -0{,}966237251887549 \cdot 10^{-26}$

The deviation from the CODATA value: $-0{,}0000781887549 \cdot 10^{-26}$

154.	$$\mu_N = \frac{m_e}{1{,}222... \cdot r_N \cdot \alpha}$$	155.	$$\mu_N = \pi \cdot \frac{m_N}{V_N}$$

With the CODATA-value of Proton: $\mu_{Prot} = 1{,}410606743 \cdot 10^{-26}$

With the following equations, we obtain the value: $\mu_{Prot} = 1{,}4106135538495 \cdot 10^{-26}$

The deviation from the CODATA value: $0{,}0000676238495292 \cdot 10^{-26}$

156.	$$\mu_{Prot} = \frac{m_e}{6{,}45555....}$$	157.	$$\mu_{Prot} = \frac{2 \cdot \alpha}{e \cdot 6{,}45555....}$$

With the CODATA-value of Electron: $\mu_e = -928{,}47643 \cdot 10^{-26}$

With the following equation, we obtain the value: $\mu_e = -928{,}492610427093 \cdot 10^{-26}$

The deviation from the CODATA value: $0{,}016180427092 \cdot 10^{-26}$

158.	$\mu_e = 7.5 \cdot m_P^2$

Coulomb force

159.	$C_e = \dfrac{1}{4\pi \cdot \varepsilon_0} \cdot \dfrac{e^2}{r_K}$	160.	$C_e = m_e \cdot c^2$

161.	$C_{\mathrm{Pr}ot} = \dfrac{1}{4\pi \cdot \varepsilon_0} \cdot \dfrac{e^2}{r_{\mathrm{Pr}ot}}$	162.	$\dfrac{m_{\mathrm{Pr}ot}}{V_{\mathrm{Pr}ot}} = \dfrac{2 \cdot C_{\mathrm{Pr}ot}}{C_e}$

163.	$C_N = \dfrac{1}{4\pi \cdot \varepsilon_0} \cdot \dfrac{e^2}{r_N}$	164.	$V_N = \dfrac{m_e^2}{2 \cdot 6 \cdot 8 \cdot 8 \cdot C_N}$

Von-Klitzing constant

Von-Klitzing-Konstante with the CODATA-value: 25.812,8074434
With the following equation, we obtain the value: 25.823,7106890331
The deviation from the CODATA value: 10,903245633129700

165.	$R_K = \dfrac{h}{e^2} = \dfrac{\lambda_{C(Elektron)}}{r_K} \cdot c$

Atomic mass unit

With the CODATA-value: $u = 1,660538921 \cdot 10^{-27}\,kg$

With the following equation, we obtain the value: $u = 1,660525927045410 \cdot 10^{-27}\,kg$

The deviation from the CODATA value: $0,000012993986783342 \cdot 10^{-27}\,kg$

166.	$u = r_N \cdot 5\pi$

Avogadro constant

With the CODATA-value: $N_A = 6,02214129 \cdot 10^{23} \, mol^{-1}$

With the following equations, we obtain the value: $N_A = 6,02218841460255 \cdot 10^{23} \, mol^{-1}$

The deviation from the CODATA value: $0,000047124602546406 \cdot 10^{23}$

167.	$N_A = \dfrac{8 \cdot 8 \cdot 8 \cdot m_e \cdot r_K}{C_N}$ with Coulomb force of neutron	168.	$N_A = \dfrac{1}{u} = \dfrac{1}{r_N \cdot 5\pi}$

Universal gas constant

With the CODATA-value: $R_m = 8,3144621 \dfrac{J}{molK}$

With the following equations, we obtain the value: $R_m = 8,31445842206723 \dfrac{J}{molK}$

The deviation from the CODATA value: $0,0000037234017185$

169.	$R_m = \dfrac{5,55}{G}$	170.	$R_m = \dfrac{1}{G \cdot 18 \cdot 1,00100100...}$

Boltzmann constant

With the CODATA-value: $k_B = 1,3806488 \cdot 10^{-23} \dfrac{J}{K}$

With the following equation, we obtain the value: $k_B = 1,380637377918370 \cdot 10^{-23} \dfrac{J}{K}$

The deviation from the CODATA value: $0,00001142200816319967$

171.	$k_B = 8 \cdot 888 \cdot r_N \dfrac{m_N}{m_e}$

Speed of light

With the following equations, we obtain the value: c=299.792.457,985574
Difference to the literature value: 0,014425933361054

172.	$$c = \dfrac{3}{\left(\dfrac{10}{9,99}\right)} \cdot 10^8 + \dfrac{9}{10} \cdot Q_P^2 \cdot 10^6 + \dfrac{9}{10} \cdot \dfrac{10}{9,99} \cdot 2 \cdot Q_P \cdot 10^3 \cdot \sum_{n=1}^{26} \dfrac{1}{10^n}$$
173.	$$c = \dfrac{3}{1,00100100...} \cdot 10^8 + 36 \cdot e^2 \cdot 10^{42} + 36 \cdot e \cdot 1,00100100... \cdot 1,111111 \cdot 10^{18}$$