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The study of an early unknown property of the space-time

and its influence on a modeling of the Universe

Naryan-Mar, 2014

Contents

Introduction

The aim of the writing of this work is an attempt to provide a fresh view of evolution of the Universe, which appeared in the course of studying (we with great care will call them so) previously unexplored properties of space-time. The conclusions, that have been received after considering this "new" space-time properties, questioned the correctness of the prevailing currently in the scientific community concepts about the expanding Universe, about the Big Bang, about the Dark Mass and about the Dark Energy.

Let briefly to explain up the essence of these concepts, which we are going to criticize:

This theory assumes in its basis that in the beginning (or before the beginning, as you prefer) the matter in the Universe was concentrated inside the negligibly small volume with indefinitely great temperature and pressure. Then, according to the script, this substance was exploded up with monstrous force. This explosion produced a huge lot of superheated ionized gas, or plasma. The plasma has been expanding homogeneously until it was cooled down up to such a degree that it was been turned into an ordinary gas. Many galaxies appeared inside of this cooled cloud of expanding gas, and inside of these galaxies, generations of the stars were born there. Then, a lot of planets as our Earth, appeared around of these stars. [1]

The main

Chapter 1

Creation of a mental construction

1.1 An agreement about the terms

Although concepts such as expanding Universe and the Big Bang are being disproved by the conclusions of this research, we shall continue to use terminology from these hypotheses, by virtue of established traditions of the scientific community. We will particularly apply such terms as the radial velocity, removing, the rate of the removal, but also we will be to express of the value of the red shift in kilometers per second.

Now we will explain the essence of this work:

We found out that the space-time possesses some unique properties, which are very similar to the properties of the complex space, nevertheless the author does not dare to assert it definitely, that this the same a complex space. As for the properties of a space-time, about which described in its article, although properly speaking, they are not properties of "the complex space", we also will apply some terms referring to concept of a complex space due to their accuracy and expressiveness. As examples may be use such terms are as "the real one's" and as "the imaginary one's", also the term "complex" is in meaning as composite or compound.

1.2 A mental construction

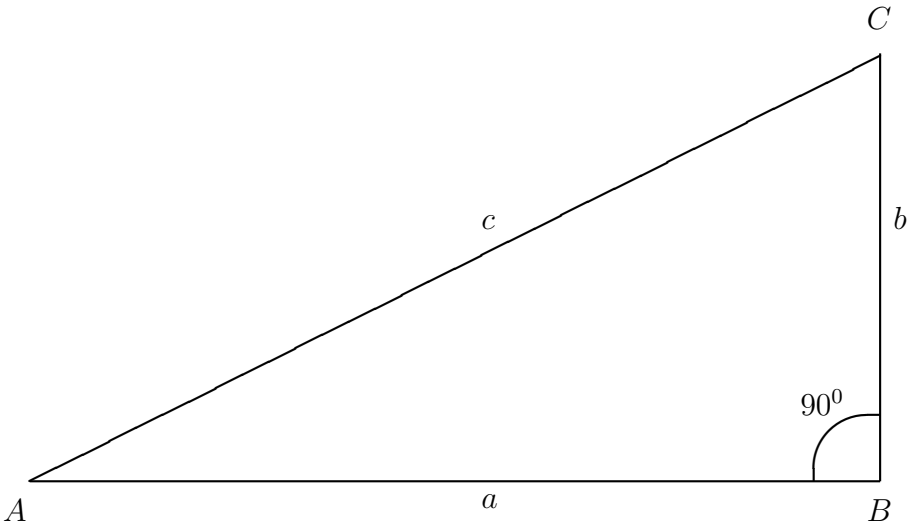
We found out that the Observed distance of space consists out of the vector sum of Real and Imaginary components. Not to frighten unsophisticated readers by using such "an odd and terrible" term as complex space, let us explain the reasons of dividing the space into Real and Imaginary parts. This division is made in order to avoid confusion between the Observed distances and Real distances, which are placed between the Objects and the Observer. By the way, owning to this confusion, one had brought forth an illusion about that there is deficit of substance available in the Universe, which, in its turn, brought forth a hypothesis about the presence of the Dark matter; this issue will be discussed below.

For an ease of the explanation we will offer the following mental construction. For what is it we need? Its aim is to try to pull out our beliefs on surface of a sanity out of sticky morass of images being inspired by the Standard Theory. We need to find such a solid basis to make a separation the Real from the Virtual, also the Actual from the Mythical. How are we to reconcile the irreconcilable points of view? The thoughtful reader can read it all, at the end of this book in an appendix "Some conclusions". Therefore, in our mental construction we have the Real one's and the Imaginary one's which are presented here, but all it in a structured way.

In theory, any such "the Real one's" and "the Imaginary one's" components may be considered, but in practice, we deal only with their complex resultant – the Observed

distance. Taking the forestalling of this question, we shall note that these properties of an illusory space-time doing its effect only on a large intergalactic distances, which gave an impulse for revising the views about evolution of the Universe.

Above we mentioned a term of the vector sum. The vector sum, according to the Pythagorean Theorem, means that the hypotenuse length of a right triangle which is equal to square root out of sum of square sides. Let us show it on the Picture 1



Picture 1

$$(AC) = \sqrt{(AB)^2 + (BC)^2} \qquad c = \sqrt{a^2 + b^2}$$

(hypotenuse length (AC) is always larger than side length of a triangle (AB). This property of hypotenuse will be required us during our further explanation).

Above we have mentioned about «the complex space». If we were speaking about the true complex space, then we would take a root of **difference** of squares instead of a **sum**, by virtue of the properties of the complex space.

$$Z = a + ib \qquad \mid Z \mid = \sqrt{a^2 - b^2}$$

Now we shall imagine, that the segment (AB) which is laid on the horizontal line and presents itself a real component of distance, and perpendicular to it, i. e. vertically, lies the segment (BC) - it is an imaginary component of distance. On this scheme, we see the Observed distance (AC) this is a hypotenuse of the right-angled triangle, which will be equal to the vector sum of triangle sides (AB) and (BC), as shown below.

$$(AC) = \sqrt{(AB)^2 + (BC)^2}$$

Note that the points A, B, C are laying in the same plane, that is through these three points can be spend a plane. And as we have previously agreed that it will be a complex plane, then the Real direction (previously we have agreed to consider this is to be on a horizontal direction) and the Imaginary (perpendicular to the horizontal, that is, the vertical direction).

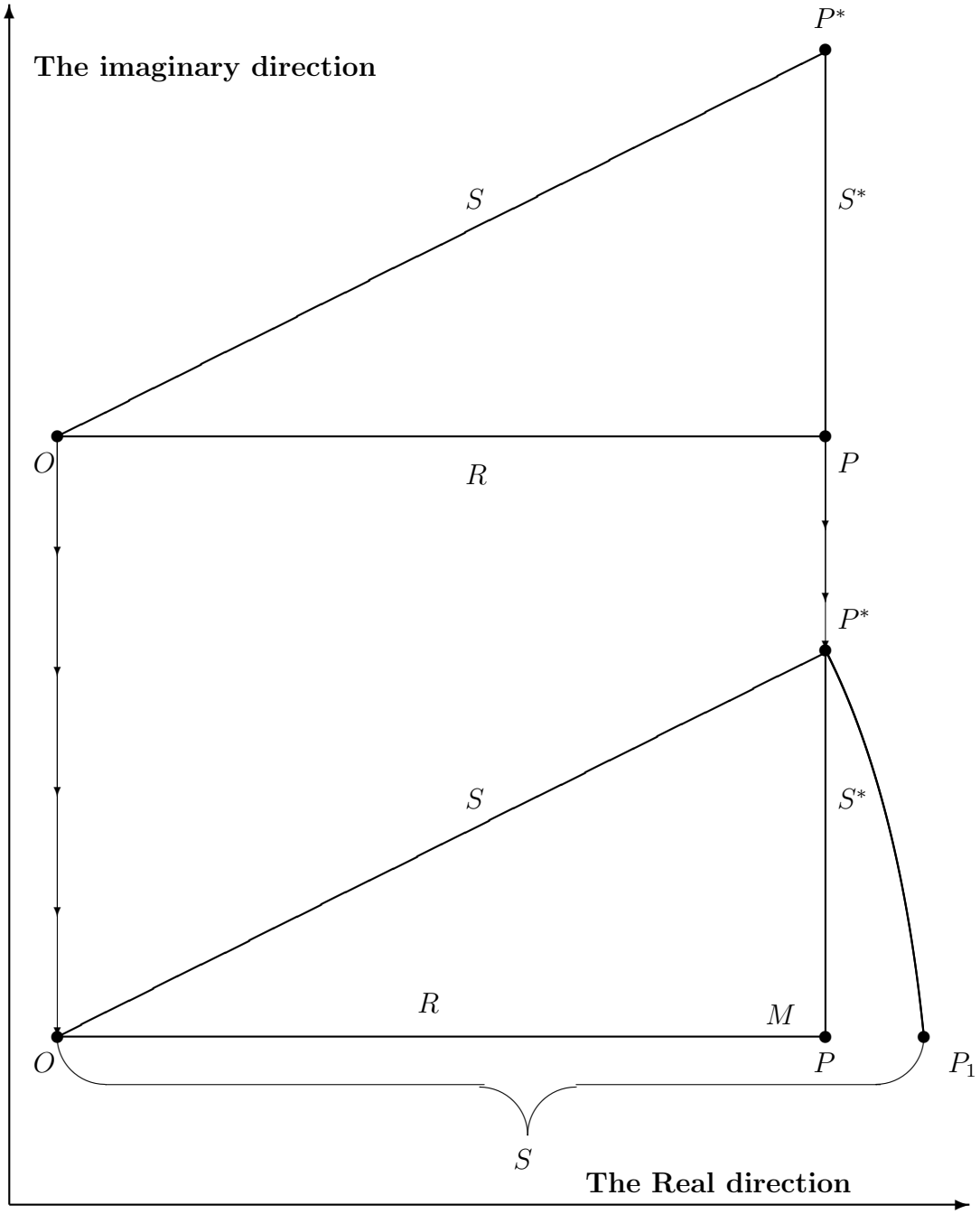
Let's will put the Observer at the point O of this complex plane. So that he will to observe for the Object M located in point P, (this object can be a star, a galaxy, a quasar, etc.) which is placed at real distance $R = (OP)$ from the Observer.

Above there were some cautious hints about «an early-unknown properties» of the space-time. What do we know about them? (Some factors influencing on these properties of the space-time are given in Appendix #1.)

1.3 The physical meaning of the "new" properties of space-time

The physical meaning of this new property of the space-time is that — ≪*... due to the fact that all Objects in the Universe emit the energy, around of these objects the property of the space-time is changed. The change of the property is manifested as an increase in the time delay of the signal between the Object and the Observer. In addition, that an increase of the travel time of the signal from the Object is equivalent to the fact that this Object is observed farther. The shift of the spectrum of radiation in the red side (i.e. the effect of the red shift) also shows that the travel time of the signal is increased. Continuous influence of this factor leads to the fact that the Object is observed farther and farther, so that is seem to us, it is removed from the Observer ...*≫

1.4 Amendments to the mental construction



Picture 2

Let's back to our scheme. On this complex plane we have an Observer at the point O, Which who is watching the Object M, which located at the point P, (an Object can be a Star, Galaxy, Quasar etc), located it on the Real distance $R = (OP)$ from the Observer.

Let's will add to it the followings: from out the point P, in the upwards direction, the perpendicular to the horizontal direction, shall mark a segment PP^*. The point P^* and the segment itself PP^*, also lie on the imaginary direction.

Let's focus our attention on the fact that the Object does not move from Observer. However, we observe this Object how if it moving away from us. So that, if to consider it all on the complex plane, the Object M from point P "moved" to in the imaginary direction (that is, the perpendicular to the Real direction, i.e. vertically) up to the point P^*.

Here, we see that the Object M has made the Imaginary displacement $S^* = (PP^*)$. So that the Observed distance S from the Object to the Observer, which located at the point O is already a geometrical sum (a vector sum) of the Real distance $R = (OP)$ and the Imaginary displacement $S^* = (PP^*)$.

Let's us will draw the arc with the centre in the point O and radius of its equal to $S = (OP^*)$ up to the Horizontal line upon which the segment (OP) is laying itself, so shall found the position of the point P_1.

It's a starting position of the system "Object - Observer".

$$OP^* = \sqrt{(OP)^2 + (PP^*)^2} \qquad \text{or} \qquad S = \sqrt{R^2 + (S^*)^2}$$

The next position of the system after a long of time.

The observer "sees" how the Object M has "moved" from the point P along an beam to the point P_1. Right now we see that this Object M is observed further from the Observer, on the distance S. Once again, let us focus on the fact that this Object has remained on Real distance R from the Observer, but has been observed "farther" - on the distance S. In relation to the Object M, we have two distances: the Real distance R and Observed distance S, as well as we have the Imaginary displacement – it is the distance of the imaginary moving $S^* = (PP^*)$.

1.5 An important note

As mentioned above, in the course of the theoretical abstraction we can show that the Object has "moving" away from the Observer along the beam; as a rule, in practice we cannot do it. Not possible see plainly this process how the Object is moving away from the Observer, even if this observation is carried out for many centuries. It is impossible to see from Earth the moving of the Galaxies even with the most powerful telescopes. We can only see motionless pictures. We can fix that red shift of the Object spectrum has increased. An increasing of the red shift, as well as the red shift effect in the context of hypothesis of the Universe expansion may be explained as the Object's receding from the Observer.

Chapter 2

Properties of the space-time

2.1 Factors affecting red shift

Now let's pay attention at the "new" property of the space-time, which one we are aiming to investigate. Let's more fully describe all the factors, from which its property depend on.

We shall start from mentioning that the red shift in radiation spectrum may be caused by the following reasons:

- a receding source of the radiation from the Observer, i.e. it's a manifestation of the **Doppler**'s principle;
- a movement of light through the gravitational field, with partial loss of the energy and in consequence of occurring of the red shift (Appendix #2);
- it's may be some early-unknown space-time properties, which one may become the cause of effect of the the red shift , which one as we learn further depends on emission power, to put it more precisely from a relative emission power.

2.2 Lagrange function

The following statement was presented above - «**. . . Because all objects in the Universe are radiated the energy around themselves, that so the properties of the space-time around these objects are being changed . . .** ».

Let's have a detailed look at the system consisting of the Physical body (the Object) which is radiating energy around itself, and the space surrounding of this body. So as the Body is radiating energy around itself, so the whole **energy of this system obviously depends on time**. Therefore, partial derivative by time should be added into the Lagrange function, which determines the movement of the system,

$$\frac{\partial L}{\partial t} \neq 0$$

(the conclusion of the formula in Appendix #3). As a result, we have the following:

$$\ddot{q} = \ddot{q}^m + \ddot{q}^n = \Gamma^m_{ik}\dot{q}^i\dot{q}^k + \Gamma^n_{jk}\dot{q}^j\dot{q}^k$$

If the system is not depended on time obviously, then its partial derivative by time should be an equal to zero

$$\frac{\partial L}{\partial t} = 0,$$

so that the **Lagrange** function defining the system condition should have more simpler view:

$$\ddot{q} = \ddot{q}^n = \Gamma^n_{jk}\dot{q}^j\dot{q}^k$$

Let us take this formula and shall compare with the foregoing formula. Here is the following designations in these formulas:

$\ddot{q}$ — is an acceleration of the particle (the second derivative of the coordinate change by time) in this area of the space;

$\dot{q}^i, \dot{q}^j, \dot{q}^k$ — here a generalized velocity of the motion of the particle, where the indexes i, j, k are accepting the values as $i, j, k = 1, 2, 3$;

$\ddot{q}^m$ — here is a particle acceleration under the influence of stationary curved space-time, which exists around the **Accumulation of the Mass of Matter**;

accordingly:

Γ^m_{ik} — is here a connectedness (the **Christoffel**'s symbols) which determines the curve of the space-time under the influence of the **Accumulation of the Mass of Matter**;

$\ddot{q}^n$ — is an additional particle acceleration under the influence of energy change factor in this volume of the space-time;

accordingly:

Γ^n_{jk} — is a connectedness which determines the curve of the space-time under the influence of energy change factor in this volume of the space-time.

The analysis and comparison of these formulas shows **qualitatively** us that if the body began to radiate energy, **simultaneously** with it, an environment (the space-time) which surrounds this body changes its properties around this body - as it shows an additional connectedness. (Here has been given «**qualitatively**» estimation, but obviously is not possible to do any practical calculations with these formulas).

2.3 The concept of relative emission power

Right now we shall to clarify the formulation of «new» property of the space-time, about which was previously mentioned:

«**. . . If the body radiates the energy, i.e. the process of the energy liberation is taking place here. Thus, the more intensive process of liberation of the energy (or absorption) in this point of an area is, the more significant of change of properties of the space-time will be occurring especially in this point of an area of space. That is all the changes of properties of the space-time directly depend on the relative emission power of the energy in this point of the area of space . . .** »

Let's specify, that «the relative emission power» (we shall designate it as H) we name a ratio. In numerator we have the value of the process of liberation of energy i.e. power (marked as N) in this area of the space. In other hand, in denominator we have the value of the all-total available energy (marked as E) which is being existing in same area (of the volume) of space.

$$H = \frac{N}{E}$$

Where is:

$N = \dfrac{dE}{dt}\left(\dfrac{\text{joule}}{\text{sec}} \text{ or } \text{watt}\right)$ — wattage of the process of the liberation of energy (an energy emission),

E — is energy (in Joule) of this area (of volume) of space,

$H = \dfrac{dE}{dt} \cdot \dfrac{1}{E} = \dfrac{N}{E} \left(\dfrac{1}{\text{sec}}\right)$ — is dimension of the relative emission power.

2.4 The single rectangular parallelepiped

It was obtained, that the properties change of the space-time show themselves as downsizing the volume of this body, in other words its compression. It is so because the parallelepiped volume change, made up on the basis of a determinant of the metric tensor of the space-time, also in direct ratio depends on the relative emission power of energy which flowing in this space area. (Appendix #4)

Or in plain words: ≪**...If the body radiates energy, the space-time around this body is changing, so that this area of space shrinks (decreases in volume), and then shrinks and the body itself, which occupies this space...**≫ This functional dependence is expressed by formula:

$$\frac{dE}{dt} \cdot \frac{1}{E} = -\frac{\partial\sqrt{h}}{\partial t}$$

or

$$\frac{N}{E} = -\frac{\partial\sqrt{h}}{\partial t}$$

or

$$H = -\frac{\partial\sqrt{h}}{\partial t}$$

where $\dfrac{\partial\sqrt{h}}{\partial t}$ — is expresses the properties change of the space-time, it is a change of a unit volume of the parallelepiped which made up on a basis of a metric tensor. The minus sign "-" shows us that the volume decreases as it shown in this expression. And together with the decreasing of the volume, would be decreased the linear dimensions of this body (its length) too.

2.5 The interval

Thus, it is necessary to pay special attention: General Relativity (GR) is formed on a principle of ≪the conservation of constancy of interval≫.

$$\partial I = 0$$

If the spatial component of the interval is changed, then the temporal component of the interval does not remain without changes too.

$$I^2 = \left(x^0\right)^2 - \left(x^1\right)^2 - \left(x^2\right)^2 - \left(x^3\right)^2,\ I^2 = 0$$

or

$$\left(x^0\right)^2 = \left(x^1\right)^2 + \left(x^2\right)^2 + \left(x^3\right)^2 ,$$

where:

$x^0 = c \cdot d\tau$ — is the temporal component of the interval.

It is all in plain words: ... ≪**the volume decreases, while time interval increases**≫. **The delay of a time of the signal from the Object up to the Observer is increasing. This increase of the signal delay is manifesting itself as an effect of the red shift**. A.L. Zelmanov pointed at this phenomenon in his work: [2] A.L. Zelmanov ≪Chronometric invariants and accompanying coordinates in General Relativity≫ Reports of the Academy of sciences of the USSR, 1956, vol. 107, # 6, p. 815. (Appendix #5) **literally - ≪...this non-relativistic effect is similar to the Doppler effect caused by the reference system deformation ...≫**

Chapter 3

Red shift

3.1 A formula of the red shift

In general, that turns out such long "chain" of the cause-and-effect relations:

≪... That if any object radiates the energy —

— Its properties of the space-time are changing around of this object;

— The changing of the properties of the space-time is manifested itself as an increase of time of delay of the signal from the Object up to the Observer in particular;

— The Observer will record an increase of time of delay of the signal as the manifestation of effect of the red shift at the spectrum of the Object which its is radiating ... ≫.

Naturally, the question arises: is it possible it would be in short. Yes, such a formula was discovered. (Appendix #6) This formula showed us the influence of the object radiation on its object's red shift in the spectrum of radiation. Here is:

$$\frac{\mathrm{dE}}{\mathrm{dt}} \cdot \frac{1}{E} = \frac{c}{\omega} \cdot \frac{\partial \omega}{\partial u},$$

Where is:

$\partial u = c \cdot \partial \tau$ — the Distance from the Object up to the Observer,

c — is velocity of light in vacuum,

$\mathbf{\frac{dE}{dt}} \cdot \frac{1}{E} = H$ — is the relative emission power,

ω — is cyclic frequency,

$\frac{\partial \omega}{\omega} = z$ — is the red shift; the red shift which shall be defined on wave-length (the frequency of wave).

In this formula shown, that the red shift effect $\frac{\partial \omega}{\omega}$ is directly proportional to the relative emission power $H \Rightarrow \frac{\Delta \omega}{\omega} \approx H$, as well as, that this value $\frac{\Delta \omega}{\omega}$ to a first approximation proportional to distance (∂u) from the Object up to the Observer. There are an intuitive guesses about an existence of the dependence between the Red Shift from Relative Emission Power by the A.A. Grishaev's article [3]

3.2 A comparison of the Formulas of Red Shift and the Hubble Law

Let's make in this formula some the "cunning" transformations:

Let us express:

∂u through τ,

$\partial u = c \cdot \partial\tau = r$,

$\frac{dE}{dt} \cdot \frac{1}{E}$ we shall write as H, that is

$\frac{dE}{dt} \cdot \frac{1}{E} = H$;

$\frac{\Delta\omega}{\omega}$ we shall write through z.

For one's turn, we are known that

$$c \cdot z = V^*$$

— is the ≪Radial velocity≫ of the object (in the expanding Universe concept).

As a result, we shall receive the following

$$H = \frac{c \cdot z}{r}$$

Then we will continue the transformation: we will replace the expression

$$c \cdot z \text{ upon } V^*$$

The both parts of the expression we will multiply upon the r, so we will receive the expression

$$r \cdot H = V^*$$

Next will swap both parts - we will finally receive the expression:

$$V^* = H \cdot r$$

This formula shows us, that - the radial velocity of the Object V^* which has been measured by means of the red shift, is directly proportional to the distance r up to the Object. As well as is directly proportional to the relative emission power H of this Object.

Now let's compare it (this formula) to the **Hubble** law, which shows us, that - "the radial velocity of the Galaxy (of the Object) measured by means of the red shift is proportional to the distance r up to it≫ - that is

$$V^* = r \cdot H_{\text{Hubble}}$$

and

$$V^* = r \cdot H$$

These both formulas are very similar, ain't you? As it will be shown below - the **Hubble** constant (parameter) is the mean value of the relative emission power of all Objects in the Universe. In other words, it represents itself the mean value of the relative emission power of the Universe as a whole. In this fact lies the difficulty of accurate calculations.

3.3 The supplemental information

However, there are many various values of the Hubble constant, which were received by scientists in the various years. In 1929 year had obtained the value of Hubble constant which was equal to 500. In 1931 year it was equal to 550. In 1936 year it was equal to 520 or to 526. In 1950 year it had been obtained as 260, then it has considerably fallen. In 1956 year, it has fallen up to 176 or 180. In 1958 year it has fallen, still more downwards, up to 75, but in 1968 it has jumped back up to 98. In 1972, by the highest standards, it reached from up 50 to 130. Today, the Hubble constant value has been accepted as 55. Nevertheless, the different observers receive the various Hubble constant values yet. Tammann and Sandage are giving 55 plus or a minus 5. Abell and Eastmond are finding it to 47 plus or a minus 5. Then Van den Bergh has calculated between 93 and 111. As an illustration, Heidmann has given the Hubble constant value as 100. De Vaucoulers has come to 100 plus or a minus 10. (The Hubble constant is counted in kilometers per second on megaparsec).

Chapter 4

Properties of space-time - continuation

4.1 A manifestation of the "new" properties of space-time

All these manifestation of ≪new≫ space-time properties have been defined on the base of above-mentioned statements:

— A miniaturizing of a visible transverse dimension of the body d;

— An increasing of the time delay of signal τ which is coming from Object up to the Observer.

Let sum it up and give an answer on the previously specified question: ≪**How is manifested a "new" property of the space-time?**≫ ≪**What are the factors from which it depends on?**≫

- This property of the space-time is beginning to manifest its influence when the flow of the energy is been acting in any spatial region. That is, when the Body (the Object) starts to radiate or (to absorb) the energy around itself;

- The exterior Observer "is seeing" (if he will observe an inordinate length of time, an endless amount of millions years) that a Body (an Object) starts to be compressed, that is it decreases in volume, as well as the visible transverse dimension of the body – d decreases too;

  Accordingly, we shall result some formulas define for the transverse dimension of the body d:

  $$d = d_0 \cdot \sqrt{1 - \left(\frac{H \cdot r}{c}\right)^2}, \quad d = d_0 \cdot \sqrt{1 - (H \cdot \Delta t)^2}$$

  (The body lateral dimensions are practically not observed in Astronomy, so they are calculated using the indirect method, so that a check-up of the aforecited formulas are becoming very complicated.)

- Being observed also an increase of the time delay of the signal τ from this Object up to the Observer;

- Red shift appeared in the spectrum of radiation of the Object.

Comparing with two last observations is as - «an increase the time delay of the signal» and «an increase an effect of the red shift» the observer is drew a conclusion that this Object "moving" away from him.

An above-named property of the space-time is directly proportional depended on the relative emission power of the flow of the energy, which is taking place in this spatial region. That is, it depends on the relative emission power of the Object H and also depends on from the time of action of the factor Δt. As is easy to see, that **all these changes (i.e. an increase signal time delay) «is operating» with a progressive total, being accumulated and summed up.**

Let us clarify our computations.

We have done the following operation with the aforecited formula $H = \frac{c \cdot z}{r}$;

we are replaced the variable r instead the expression $r = c \cdot \Delta t$.

After all, we have received

$$H = \frac{c \cdot z}{c \cdot \Delta t}$$

Our next operation will be reduction on c,

$$H = \frac{c \cdot z}{c \cdot \Delta t} \Rightarrow H = \frac{z}{\Delta t}$$

We swapped the place of the value of Δt to the left-hand side of this equation from the right-hand part, as a result, we received the following:

$$H \cdot \Delta t = z \; or \; z = H \cdot \Delta t$$

Let have a look more attentively at last expression

$$z = H \cdot \Delta t$$

Evidently – the red shift z is the result from the product of two variables:

H —which may change itself on a large scale (a cycle is consisting from birth of the star and death of its)

and a variable

Δt — which grows permanently.

We think it will be faithfully to present this formula as the sum:

$$z = \sum_{H} \sum_{\Delta t} H \cdot \Delta t$$

and passing from summation $\Delta t \Rightarrow dt$ to integration, then possible to write the following:

$$z = \int H dt$$

However, this change of the properties of the space-time is so insignificant in itself, so they becoming visible only after the expiration of long time (Millions and Billions years).

For example, the data of our Sun:

$$H_{\otimes} = 2,141 \cdot 10^{-21} \; 1/\text{sec}$$

By the way, by this (**ability for accumulation and summation**) can to explain for such phenomenon as «acceleration of the Universe expansion».

4.2 Two dimensions of time

How to compute these changes using for it aforecited formulas: such as

$$H = \frac{c \cdot z}{r},\ V^* = H \cdot r \text{ and } V^* = c \cdot z$$

Let's find the ratio for two velocities. It is the formula which is connecting the changing of the interval of time from the rate of movement

$$\tau = \frac{\tau_0}{\sqrt{1-\beta^2}}$$

in the Special Relativity (SR), where the factor β - is the ratio $\beta = \frac{V}{c}$ of the rate of movement V to the c velocity of light. We will substitute the V^* instead of the V. Now we will receive the following formula:

$$\frac{\tau_0}{\tau} = \sqrt{1 - \left(\frac{H \cdot r}{c}\right)^2}$$

having replaced the values of z instead of the β. In case, is to substitute the expression $r = c \cdot \Delta t$ taking the r, then we shall receive a certain remarkable formula,

$$\frac{\tau_0}{\tau} = \sqrt{1 - (H \cdot \Delta t)^2}$$

which is to connect two temporal dimensions are such as t and τ,
where:

t - acts as «an age of the Object»,

to opposite

τ - is a span of time.

By the way, the astronomer Halton Arp was suggesting in his works [4] and [5], the following statements, which he made without any mathematical justification:

— **That the Red shift (i.e. the effect of the red shift) is not the manifestation of the Doppler's effect.**

— **The red shift effect is closely connected with the state of the Object.**

— **Halton Arp in his cosmological model has proposed to apply the age of the Galaxy as in parameter.**

[4] Quasars, Redshifts and Controversies by Halton Arp Interstellar Media Cambridge University Press, 1987.

[5] Seeing Red: Redshifts, Cosmology and Academic Science by Halton Arp Apeiron, Montreal, 1999.

4.3 "Gravitational lenses"

Now we will tell you about a remarkable manifestation of the property of space-time - it is the so-called "gravitational lens", in accordance with it, the astronomers make the calculations of the mass of "Dark Matter".

For that purpose we use once again the above-mentioned formula. Here is it:

$$\frac{\tau_0}{\tau} = \sqrt{1 - (H \cdot \Delta t)^2}$$

Let's look from the another point of view upon this new property of the space-time, in order to check-up the accuracy of the given above formulas.

What is it turns out? The volume is decreasing and the time is slowing (the increasing of time). Here we are "seeing" in the whole most characteristic features of "the curved space" (of the deformed space), which it is acting as a denser optical medium against to our space (not deformed space). We should explain that the n is the refraction coefficient. It is ratio of electromagnetic constant c to a velocity of light in medium V.

$$n = \frac{c}{V}$$

In other words, light goes more slowly in denser optical medium than in vacuum. That is, the light will be overcome the same distance in denser optical medium for longer time. Therefore, we can imagine a refraction coefficient n as a ratio of two's span of time.

$$n = \frac{\tau}{\tau_0},$$

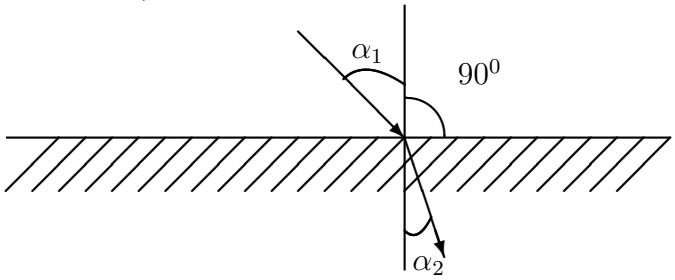
τ_0 — Here is - a span of time, which would be required to the light to overcome the certain distance if it (the light) moved in vacuum.

τ — Where is - a span of time, which would be required to the light to overcome the same certain distance in denser optical medium.

And now we take a short historical digression. Let's remember about the triumphant experience, in which the english astronomer Arthur Stanley Eddington observed the Total Solar Eclipse in 1919 and respectively confirmed the correctness of the conclusions of the General Relativity Theory (GR).

... One way to check the conclusions of GRT about the distortion of space-time near Massive Bodies is the study of the deviation of a light ray passing near the Sun. One photo of the star sky have been done during a solar Eclipse, and the other six months later of the same part of the sky. Then these pictures are being combined and matched for determining the apparent displacement of stars...

≪... The shift of some hundreds positions of the stars were measured and it turned out, that a deviation of light is equal 2" on average. The General Relativity this value is predicted as 1,75"≫.This experiment has certainly proved the prediction of GRT as is truthful to but remained the undefined 0,25" of the beam deviation which has not found its explanation when this epoch-making experiment was carried out. (So, the author of this article with his theory, which you the dear reader can read now, seriously pretends to this ≪bonus ≫ 0,25").



Picture 3

Let us recollect from the school course of physics that the refraction coefficient n, is the ratio of a sine of the light angle α_1 to a sine of the angle of refraction α_2. (Picture 3)

$$n = \frac{\sin \alpha_1}{\sin \alpha_2}$$

How to measure up these angles ? We shall consider that nearby upon the surface of our nearest star i.e. on the surface of the Sun is exists so-called "curved" space. A light beam from that distant star goes on the tangent to surface of the Sun. Thereby an incident ray is coming at an angle of ninety degrees, (horizontal i.e. is at angles 90^0). (If the light beam would enter at right angle to a surface i.e. vertical, angle would be equal to 0^0 (the zero degrees)). In our case, the light beam enters to surface (at the angle 90^0), and goes from its surface but smaller than under a right angle 90^0. Now we shall count the difference between of these two angles. As we know, the sine value of the angle 90^0 is equal to 1. $\alpha_1 = 90^0$ $\sin \alpha_1 = \sin 90^0 = 1$

$$n = \frac{\sin \alpha_1}{\sin \alpha_2} = \frac{\tau}{\tau_0} = \frac{1}{\sqrt{1 - (H \cdot \Delta t)^2}} \quad \alpha_2 = \arcsin\left(\sqrt{1 - \left(H_{\otimes} \cdot \Delta t_{\otimes}\right)^2}\right)$$

Here are:

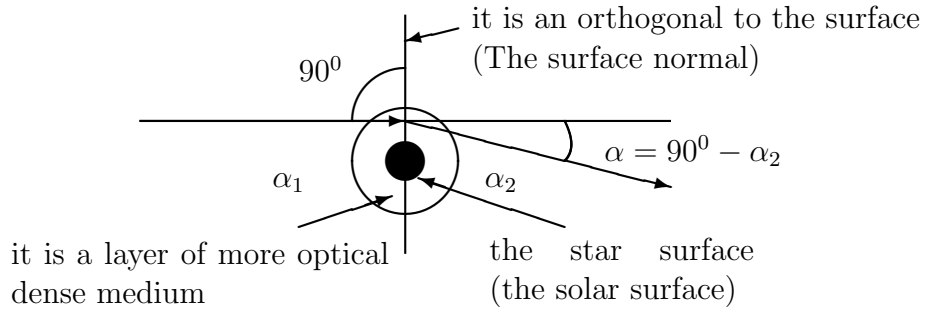
$H_{\otimes}$ — is the relative emission power of our Sun.

$H_{\otimes} = 2,141 \cdot 10^{-21} 1/\mathbf{sec}$

$\Delta t_{\otimes}$ — is a "life time" of the Sun.

$\Delta t_{\otimes} = 3600 \times 24 \times 365 \times 5,4 \cdot 10^9 = 1,70294 \cdot 10^{17}$ **seconds**

$\alpha = 0,21''$ — is the very thing deviation which earlier has not found its explanation.



Picture 4

Chapter 5

Objects are in the Universe

5.1 "Hot" and "Cold" Objects are in the Universe

Let's have a look at this so-called "new" property of the space-time which ≪finds its reflection≫ when doing the observation for the Objects of the Universe. In order to making the better presentation of the next part of the narration, we have invented such terms as "Hot" and "Cold" Objects:

— We shall name by the "Cold" Object, which having a value of the relative emission power as such our Sun has.

— However, we will use the name of the "Hot" ones for the Object which are having a value of the relative emission power as Quasars, for example is the Quasar $3C273$.

By the example of our nearest star - the Sun, we will do the following: we will divide a numerical value of the Solar Luminosity $L_{\otimes}$ which is expressed in watts by a numerical value of the Solar Mass $M_{\otimes}$ which is expressed in kilogram accordingly, thereby we will find the value of the specific power — ${N^*}_{\otimes}$.

Evidently the value of this Specific Power is not so big – the household electric heaters have much higher a values of its. This value of the Specific Power which can be compare with warmth which is produced out from the fallen leaves, which are been collected in heaps after the autumn fall of the leaves.

$$ {N^*}_{\otimes} = \frac{L_{\otimes}}{M_{\otimes}} = \frac{3,826 \cdot 10^{26} \text{ Watt}}{1,989 \cdot 10^{30} \text{ kilogramm}} = 1,924 \cdot 10^{-4} \frac{\text{Watt}}{\text{kilogramm}} $$

For comparison, we shall result the characteristics of one well-known Quasar $3C273$:

— mass - $M_Q \sim 10^8$ Solar masses,

— luminosity - $L_Q \sim 10^{39}$ Watt.

Just as in an aforecited example, we shall find the value of its Specific Power:

$$ {N^*}_Q = \frac{L_Q}{M_Q} = \frac{1 \cdot 10^{39} \text{ Watt}}{10^8 \cdot 1,989 \cdot 10^{30} \text{ kilogramm}} \approx 5 \ \frac{\text{Watt}}{\text{kilogramm}} $$

Further, if the value of the Specific Power to multiply on the multiplier, which is equal to an inverse square of a value of the velocity of light

$$ \frac{1}{c^2} \text{ is equal to } \left(\frac{1}{2,998 \cdot 10^8 \text{ m/sec}} \right)^2 = 1,113 \cdot 10^{-17} \text{ sec}^2/\text{m}^2, $$

that we shall receive — H which is the value of the relative emission power:

$$H = \frac{N}{E} = N^* \cdot \frac{1}{c^2} = \frac{L}{M \cdot c^2}, \text{ and } L = N \text{ and } E = m \cdot c^2,$$

is the dimension of the relative emission power is - minus second $H = \frac{N}{E} \sim 1/\text{sec}$.

Both the value of the Specific Power and the value of the relative emission power differ between themselves by only at a constant factor is $\frac{1}{c^2}$.

For instance, for our Sun $H_\otimes$ is having the value of the relative emission power:

$$H_\otimes = \frac{N_\otimes}{E_\otimes} = 1,924 \cdot 10^{-4} \ \frac{\text{Watt}}{\text{kilogramm}} \times 1,113 \cdot 10^{-17} \ \frac{\text{sec}^2}{\text{m}^2} = 2,141 \cdot 10^{-21} \ 1/\text{sec}$$

For the Quasar $3c273$ - H_Q is having the relative emission power:

$$H_Q = \frac{N_Q}{E_Q} = 5 \ \frac{\text{Watt}}{\text{kilogramm}} \times 1,113 \cdot 10^{-17} \ \frac{\text{sec}^2}{\text{m}^2} = 5,565 \cdot 10^{-17} \ 1/\text{sec}$$

5.2 The Hubble's constant

Now we will consider the Hubble's constant (or the Hubble's parameter). On average, the Hubble's constant has its numerical value:

$$55\frac{\text{km}}{\text{sec}} \text{ on } 1\text{Mps} \ \left(50 \div 100\frac{\text{km}}{\text{sec}} \text{ on } 1\text{Mps}\right)$$

Let's divide kilometers per second on Megaparsec, thereby we shall receive the

$$H_{\text{Hubble}} \approx 1,7 \cdot 10^{-18} \ 1/\text{sec}$$

The dimension of the obtained expression is - a minus second.

Comparing an earlier received values of:

$$\left.\begin{array}{r} H_{\text{Hubble}} \approx 1,7 \cdot 10^{-18} \ 1/\text{sec} \\ H_\otimes = 2,141 \cdot 10^{-21} \ 1/\text{sec} \\ H_Q = 5,565 \cdot 10^{-17} \ 1/\text{sec} \end{array}\right\}$$

The value of the relative emission power for our Sun, the Quasar $3C273$ and Hubble's constant, one's possible dare to say, that **the Hubble's constant, in its deep essence, expresses a mean value of the relative emission power of the Universe.**

What is «**a mean value of the relative emission power of the Universe**»? For this purpose, let's perform a rough calculation, which in no circumstances, one's should not to been estimated precisely.

Let x — are a number of the "Cold" Objects in the Universe, which are similar to our **Sun**, are having the value of the relative emission power — $H_\otimes$.

Whereas y — are a number of the "Hot" Objects in the Universe, which are similar to the **Quasar 3C 273**, are having the value of the relative emission power — H_Q.

Let's make a ratio for these values:

$$H_{\text{Hubbla}} = \frac{x \cdot H_{\otimes} + y \cdot H_Q}{x + y}$$

In our case, the value of the Hubble's constant will represent itself as the mean value, which has been compiled from the mix of value for the "Cold" and "Hot" Objects. From the aforecited expressions, let's find a numerical ratio between a number of the Objects which are similar to our Sun and a number of Objects which are such as the Quasar $3C273$. Here are:

$$\frac{x}{y} = \frac{H_Q - H_{\text{Hubble}}}{H_{\text{Hubble}} - H_{\otimes}} \text{ or } \frac{x}{y} \approx 32 \Rightarrow y \approx 3,1\%$$

An according to this estimation we see that a number of Quasars (and the "Hot" Objects similar to Quasars) in the Universe should make not less than 3% from total number of all objects in it. Nevertheless an astronomical observations show us, such a number of these objects are much less.

Is it time to invent the Dark Matter for ourselves?

5.3 An explanation of the paradox of a disappearance of the Objects

What is the matter? The matter of the fact, all these "hot" objects also are yet "the super heavy" ones. These all objects have ceased to be visible! The paradox consist in that - an Object radiates enormous number of energy; but instead of it, an Object is not visible! How should we understand it!

To explain this paradox we use such a method as analogy. (Ones shall notice, that the analogy is not exact the mathematical proof, only a direction of thought so quite suitable in given article).

Let's bring formula of an imaginary velocity V^*. For this purpose, in the Hubble's law which shows us — **the radial velocity of ≪the Galaxy (of the Object) which has been measured by means of the effect of red shift is proportional to the distance r up to it≫**, we make some operations.

$$V = H_{\text{Hubble}} \cdot r$$

Let's replace the value r on the expression $c \cdot \Delta t$, i.e. $r = c \cdot \Delta t$ - and let's substitute it in this formula, in the next step we substitute the Hubble's constant instead the value of the relative emission power H, in a result we shall receive:

$$V^* = c \cdot H \cdot \Delta t$$

Let's write down also one more formula from a school course of Physics. These are well-known simplest formula, which tie together up the value of rate of movement with the value of acceleration of this object:

$$V = a \cdot \Delta t$$

Here is:

V — velocity (rate of movement),

a — acceleration,

Δt — time.

How in our case we shall find acceleration? For it, let's multiply the value of the relative emission power H upon a multiplier c (c – the velocity of light in vacuum).Then we shall receive an imaginary acceleration of the Object, with which it is moving away from the Observer.

$$V^* = c \cdot \frac{N}{E} \cdot \Delta t,$$

Here:

V^* — is a radial velocity of an imaginary moving away of the Object from the Observer,

$a = c \cdot \frac{N}{E}$ — is an imaginary acceleration of the Object.

For our triples of values are the following:

$$\left.\begin{aligned} a_{\otimes} = H_{\otimes} \cdot c = 6,418 \cdot 10^{-13}\ \text{m/sec}^2 \\ a_Q = H_Q \cdot c = 1,668 \cdot 10^{-8}\ \text{m/sec}^2 \\ a_{\text{Hubble}} = H_{\text{Hubble}} \cdot c = 5,096 \cdot 10^{-10}\ \text{m/sec}^2 \end{aligned}\right\}$$

Right now, we shall ask a question – how much time is needed to any object which is moving with such "acceleration" can achieve of the value of velocity of light? Any object becomes invisible for observation on reaching the velocity of light, as we know, i.e. it «will disappear" from "field of vision".

For a finding the value of time of this object - we shall divide the value of velocity of light upon the value of acceleration of this object.

$$T = \frac{V}{a} \Rightarrow \frac{c}{a},\ \text{where } V \Rightarrow c \text{ then } T = \frac{c}{a}\ \Rightarrow \frac{c}{c \cdot H} = \frac{1}{H}$$

As may be seen from these calculations, the value of time is equal to the reciprocal value of the relative emission power H. Let's make the following calculations for our "triples" of objects:

$$\left.\begin{aligned} T_{\otimes} = \frac{c}{a_{\otimes}} = \frac{c}{c \cdot H_{\otimes}} = \frac{1}{H_{\otimes}} = \frac{1}{2,141 \cdot 10^{-21}\ 1/\text{sec}} = 4,671 \cdot 10^{20}\ \text{sec} \\ T_Q = \frac{c}{a_Q} = \frac{c}{c \cdot H_Q} = \frac{1}{H_Q} = \frac{1}{5,565 \cdot 10^{-17}\ 1/\text{sec}} = 1,797 \cdot 10^{16}\ \text{sec} \\ T_{\text{Hubble}} = \frac{c}{a_{\text{Hubble}}} = \frac{c}{c \cdot H_{\text{Hubble}}} = \frac{1}{H_{\text{Hubble}}} = \frac{1}{1,7 \cdot 10^{-18}\ 1/\text{sec}} = 5,882 \cdot 10^{17}\ \text{sec} \end{aligned}\right\}$$

Let have a look more closely at last expression — T_{Hubble}. In front of us is the same age of the Universe, which is calculated based on the data of «the Big Bang»!

Further, we shall find for our triples of objects «the horizon of visibility» – D, for this purpose we multiply the value of time — T upon the velocity of light in vacuum — c.

$$\left.\begin{aligned} D_{\otimes} = T_{\otimes} \cdot c = 4,671 \cdot 10^{20}\ \text{sec} \cdot 2,998 \cdot 10^{8}\ \text{m/sec} = 1,400 \cdot 10^{29}\text{m} \\ D_Q = T_Q \cdot c = 1,797 \cdot 10^{16}\ \text{sec} \cdot 2,998 \cdot 10^{8}\ \text{m/sec} = 5,387 \cdot 10^{24}\text{m} \\ D_{\text{Hubble}} = T_{\text{Hubble}} \cdot c = 5,882 \cdot 10^{17}\ \text{sec} \cdot 2,998 \cdot 10^{8}\ \text{m/sec} = 1,763 \cdot 10^{26}\text{m} \end{aligned}\right\}$$

Again, let have a look at last expression — D_{Hubble}, we see it is the value of a size of the Universe according to the data of "the Big Bang"!

The analysis of these values shows to us that if the value the horizon of visibility D is less than value of horizon of visibility D_{Hubble} ffor the Universe, such object is not «visible» or becomes to be "invisible"! Paradoxical! Just fancy, a powerful and heavy "Hot" object, which radiates a lot of the energy, and this object becomes to be "invisible"! Meanwhile, rather small and "Cold" objects no "disappear"! (One of the "comic" proofs is presented in the appendix #7). However, those not numerous Quasars, which else continue to discover, we have been observing them just on border of a visible part of the Universe. Therefore, we see only the "cold" and the limited part of the Universe.

5.4 The formulas for calculation of distances

For the further explanation, we needed the formula for the calculation of Observed distance. For its derivation we use again such a method as an analogy. For this purpose, let's write out some formulas of accelerated motion of body from a school course of Physics.

$$V = a \cdot \Delta t \quad \text{and} \quad S = R_0 + \frac{a \cdot (\Delta t)^2}{2}$$

Here are:

V — velocity,

a — acceleration,

R_0 — the initial distance,

S — passed distance,

Δt — traveling time.

We must rebuild the equations so that they contained the speed and acceleration in it (because they are accessible to measurement).

$$\overrightarrow{S} = \overrightarrow{R_0} + \frac{\overrightarrow{a \cdot (\Delta t)^2}}{2}$$

Above it was shown how to find an imaginary acceleration.

$$a = c \cdot H \quad V^* = c \cdot H \cdot \Delta t$$

Then we shall receive on a complex plane the followings:

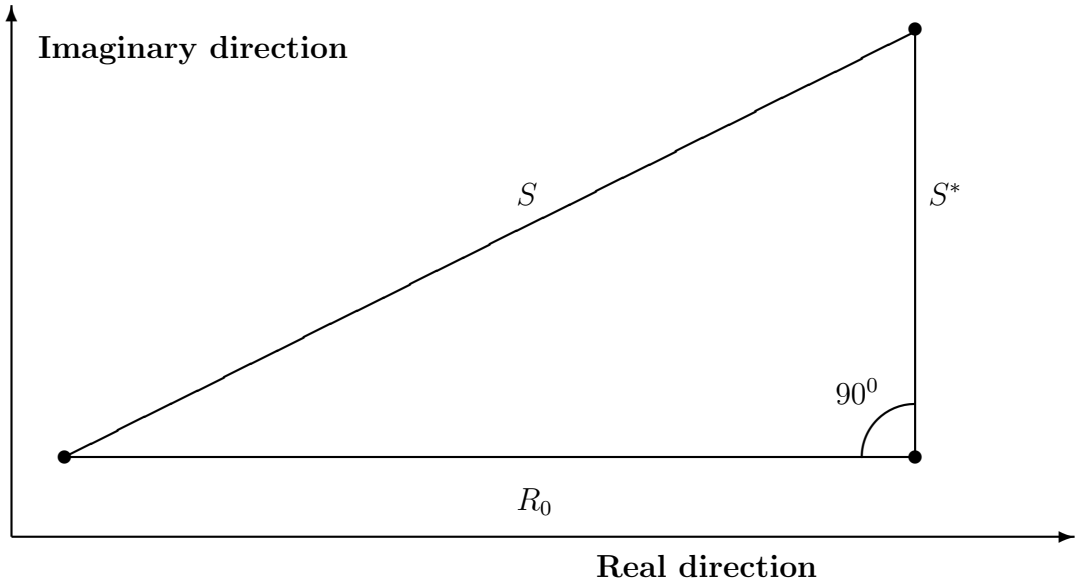
$$S^* = \frac{(V^*)^2}{2 \cdot c \cdot H}$$

Here is:

S^* — is "illusory moving" of the object that moving on a vertical in an imaginary direction.

S — is the Observed distance.

R_0 — the initial distance from the observer (the real distance).



Picture 5

Here is the formula for calculation of a length of the Observed distance.

$$S = \sqrt{(R_0)^2 + (S^*)^2} = \sqrt{(R_0)^2 + \left(\frac{(V^*)^2}{2 \cdot c \cdot H}\right)^2}$$

Accordingly, it is possible to show the formula for calculation of a length of the Real distance:

$$R_0 = \sqrt{S^2 - \left(\frac{(V^*)^2}{2 \cdot c \cdot H}\right)^2}$$

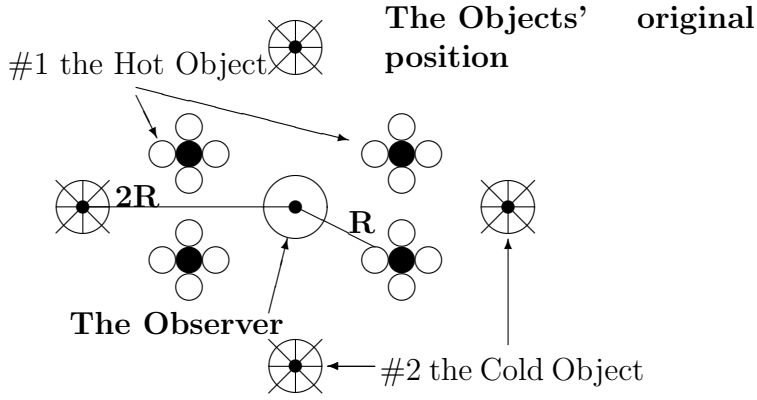
As it is shown by this formula, the Real distance is by definition shorter than the Observed distance, that it must be taken into account in Astronomy.

Chapter 6

How could be appearing the illusion of separation of the Universe

6.1 An illusion of separation of the Universe

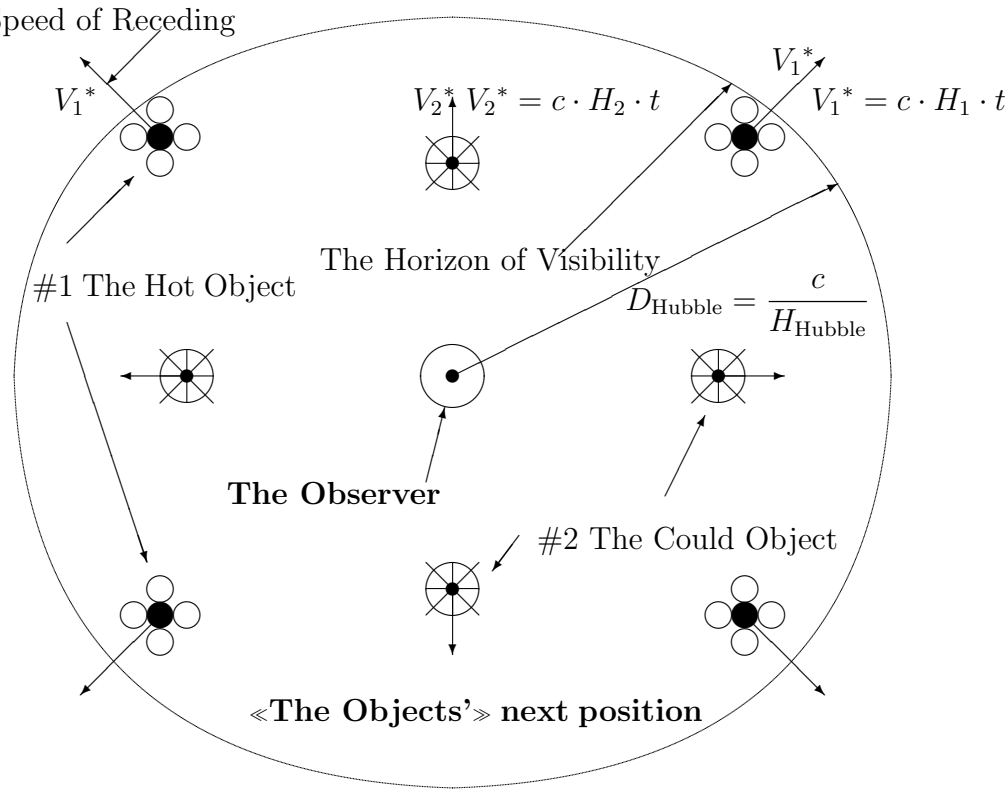
Now, let's do one the "mental" experiment, with the purpose of showing an illusion of the "stratification of the Universe». In fact why such a powerful Energy Sources as Quasars "are observed" at the edge of "visible" part of the Universe, besides they are moving away with a huge velocity from us? Why they (the Quasars) are not close by us? In fact yet, the cosmological principle says that the Universe is homogeneous and isotropic. Where from such "Exfoliation" and heterogeneity is appears?



Picture 6

The "mental" experiment #1. Let's set the Observer in the center. Next, we will place "Hot" objects on distance equal to $R_1 = R_0$ (The Real distance) around of him. As it is well known "Hot" Objects are powerful Energy Sources which are noted by #1 in the foreground of the picture. Let's place the "Cold" Objects which are noted by #2 on the double distance $R_2 = 2 \cdot R_0$ at the background of this picture.

After a time the Observer will see the following picture.



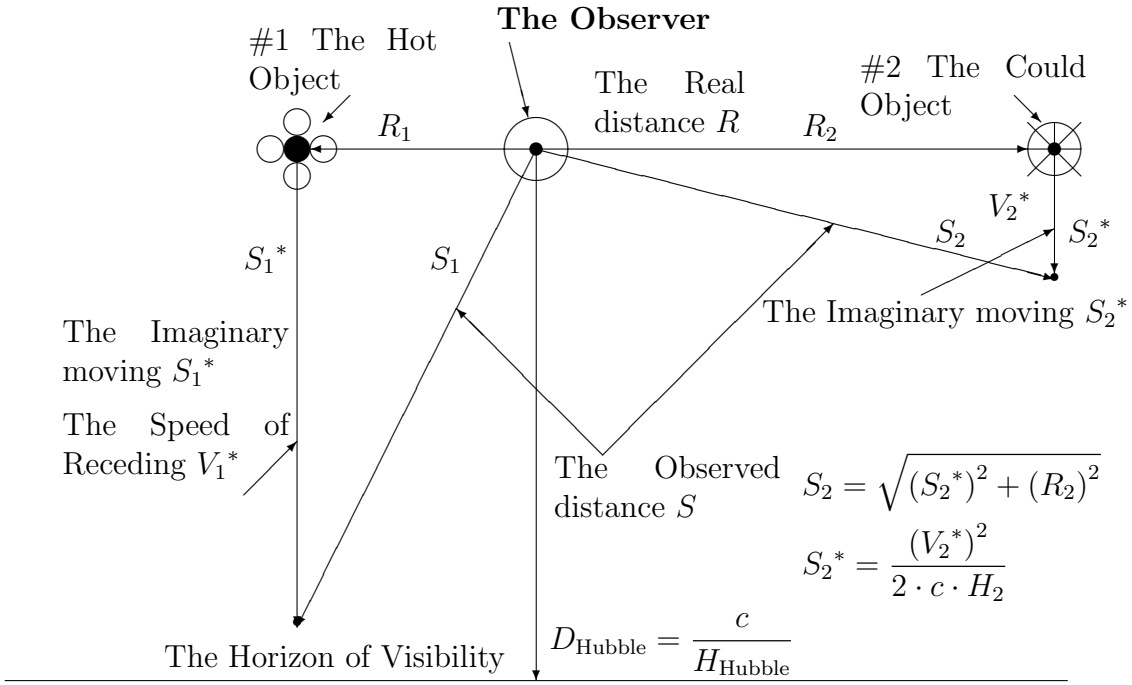
Picture 7

After the expiry of a long time i.e. plenty of millions and millions years the property of the space-time around of these Objects have been changed. A greater change will take place near to the "Hot" Objects rather than one's will take place around of the "Cold" Objects. As it turned out earlier, the "Hot" Objects have moved away considerable «farther» rather than one's their "Cold" neighbours have done. Our Observer will see the following: the "Cold" Objects will abide in the foreground but now the "Hot" Objects will be on the background. That is to say the opposite to the original position. Because $H_1 > H_2$ (The value of the relative emission power of the "Hot" Objects is higher the value of the relative emission power of the "Cold" Objects). $V_1^* > V_2^*$ (Speed of receding of the "Hot" Objects is greater speed of receding of the "Cold" Objects.)

So $S_1^* > S_2^*$ (the receding distances of the "Hot" Objects is greater rather than one's for the "Cold" Objects.) It follows from this that $S_1 > S_2$. (The Observed distance S_1 of the "Hot" Objects is greater than the Observed distance S_2 of the "Cold" Objects). On the expiry still more long time, our Observer will not discover the "Hot" Objects, and then the turn "to disappear" will be suited to the "Cold" Objects. It is an explanation why the Quasars and other "Hot" energy sources are observed at the edge of a visible part of the Universe!

We put the Observer in the center of this picture and we place a Hot Object marked #1 **on the Real distance** R_1 from the Observer, meanwhile **on double Real distance** R_2 from the Observer, we place a Cold Object marked #2. Accordingly, each Object will be has own Imaginary movement which depends on its imaginary speed. Which, as we learned earlier, depends on the Relative emission power of the same Object. Accordingly, the rate of removal of the Hot Objects will be higher than a Cold one. But the **Observed distances** S out from these Objects, which as we know it is a geometrical sum of the Real distance and Imaginary removing, will **be approximately equal**!

The same mental experiment is on the complex plane.



Picture 8

6.2 Halton Arp's abnormal observation

Now we shall carry another "imaginary" experiment #2 in order to give an explanation to the anomalous red shift effect upon **Halton Arp**'s observation – "he reports that he has found an Object with the great red shift located in a close proximity to him another Object with a small red shift". According to the notions of theory of the expanding Universe, the Object with the small red shift should be located comparatively closer to us while the Object with the big red shift – much farther. Therefore, two objects located in a close proximity shall be defined by approximately the same red shift.

However, **Arp** exemplifies the following: the **Spiral Galaxy NGC7603** is connected to the next galaxy through the luminous bridge, and nevertheless the next galaxy has the red shift bigger for 8000 kilometers per second than this spiral Galaxy. If judge on a difference of their red shift, galaxies should be in significant distances from each other, definitely the next galaxy should be on 478 millions light years are farther than - already strange, in fact two galaxies are close enough for physical contact. For comparison, Our Galaxy (the **Milky Way**) is away from nearest "neigbour" a galaxy **M31 (NGC224)** whom is located in **Andromeda** constellation at $2,9$ million light years further only.

Another disputable discovery made by **Arp**: the **Quasar Makarian 205** is near to the spiral **Galaxy NGC4319**, visually connected to this galaxy by means of the luminous bridge. The galaxy has red shift of 1700 kilometers per second, corresponding to distance about 107 million light years. The Quasar has red shift 21000 kilometers per second that should mean, that it on the distance of $1,24$ billion light years. However, **Arp** has supposed that these objects are connected definitely. [For example, the spiral galaxy **NGC4319** and the nearby Quasar **Makarian 205**, have very different Redshifts ($CZ = 1,700$ and $21,000$ respectively), anyone can see it upon the photographs the luminous bridge to which they are connected. Therefore, the Quasar is close to the galaxy in a space, not at distance calculated by law of the red shift (distance according to the **Hubble**'s law). Despite much criticism, several independent lines of evidence have confirmed this result, which plainly contradicts conventional notions.]

For an explanation, we will to apply the same pattern of reasoning is consisting from the Observer, the "Hot" and "Cold" objects. So that these two galaxies are connected through the luminous bridge that both them are in physical contact there, most likely they are away from us (Observer) on the same Real distance. Repeating all aforecited judgments, the observer will see the following picture that these two galaxies are removed from each other on significant distance on the expiry any long time. Just like the same conclusion, possible to suggest as an explanation of an Observed picture - the **Galaxies NGC4319** and the **Quasar Makarian 205**.

With all due evidence, these examples show us the distinctions between the Observed distances and the Real distances from the Object up to the Observer.

Chapter 7

Dark Matter

7.1 An illusion of a lack of the matter

This article has been written for the purpose of an elimination of confusion between two these distances. The further narration will be proceed about that how this substitution of the Real distance instead the Observed distance has led to an appearance of an illusion of the "shortage" of matter this is turn led to the creation of the hypothesis about ≪the Dark Matter≫. To understand the essence of the problem, let's go back to the history of its appearance. As we previously noted above, it's excess of the value of the Observed distance over the value of the Real distance, beginning to have an impact only in the intergalactic scales. By the way, there is, in these intergalactic scales **Fritz Zwicky (1933)** found its ≪the Dark Matter≫ and **Mordechai Milgrom (1987)** proposed to introduce amendments to the law of Newton in to the same intergalactic scales.

The reference information: *Many years the scientists were in the big difficulty in an explanation of movement dynamics of galaxies in terms of the law of gravity.* ***Jan Oort (1933)*** *has noticed that our galaxy stars move too quickly in order that their attractive interaction has not allowed them to scatter.* ***Fritz Zwicky*** *and* ***Sinclair Smith*** *have measured the velocity of the galactic cluster in constellations of* ***Berenice's Hair*** *and* ***Virgo****. In accordance this calculations, the galaxies should be much more massive. For an explanation of an absent mass of the bodies, not sacrificing the law of gravity, astronomers assume an existence of the enormous invisible dark matter. Some people speak that* ***90%*** *of the mass of the Universe is invisible.*

7.2 An explanation of occurrence of the illusion of a lack of the matter

Fritz Zwicky (1933) studied a rotation the remote galaxy around of a galactic cluster. If it possible, we may simply have a look at this system as a **Keplerian problem**, in which the remote galaxy rotates around of the common center mass of a galactic cluster; in which one body (Object) M_2 rotates around more massive body M_1. F_{IN} – is a centrifugal force of inertia of the small body mass M_2, which is moving in a circle of around of massive body M_1. F_{GR} – is a force of their attraction, which counterbalanced by the force F_{IN}. F_{GR} is acting under the **Newton's law** (the law of gravity).[6]

$$F_{\mathrm{IN}} = \frac{M_2 \cdot V^2}{R} \; ; \; F_{\mathrm{GR}} = G\frac{M_1 \cdot M_2}{R^2} \; ; \; F_{\mathrm{IN}} = F_{\mathrm{GR}} \Rightarrow \frac{M_2 \cdot V^2}{R} = G\frac{M_1 \cdot M_2}{R^2}$$

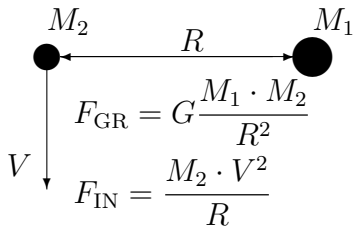
$$V = \sqrt{G \cdot \frac{M_1}{R}}$$

Here is:

G — gravitational constant,

R — the distance (the Real distance) between two bodies,

V — rate of movement of body M_2.



Picture 9

In his observation, **Fritz Zwicky** has found out that these two forces F_{IN} and F_{GR} are **not equal** (as if an accountant would be said - the balance has not coincided with oneself - the debit with the credit). What is the matter? How to solve it? Earlier we have shown that value of the Observed distance (only it we can observe) represents itself the complex value. Thereby it has generated this problem, but at the same time, it contains a key to its decision!

The value of the distance R is there in the denominator in these two formulas.

$$F_{\text{GR}} = G\frac{M_1 \cdot M_2}{R^2} \; ; \; F_{\text{IN}} = \frac{M_2 \cdot V^2}{R}$$

As earlier, we hinted that all the matter is that there was a "substitution" of R — the Real distances instead of S — the Observed distance, which obviously is greater always. If to substitute the value of the Real distance — R instead of the value of the Observed distance — S in these formulas, then for balance of forces will be necessary to increase the value of mass M_1 in the numerator of fraction also.

$$M_1 \;\Rightarrow\; V = \sqrt{G \cdot \frac{M_1}{R}}$$

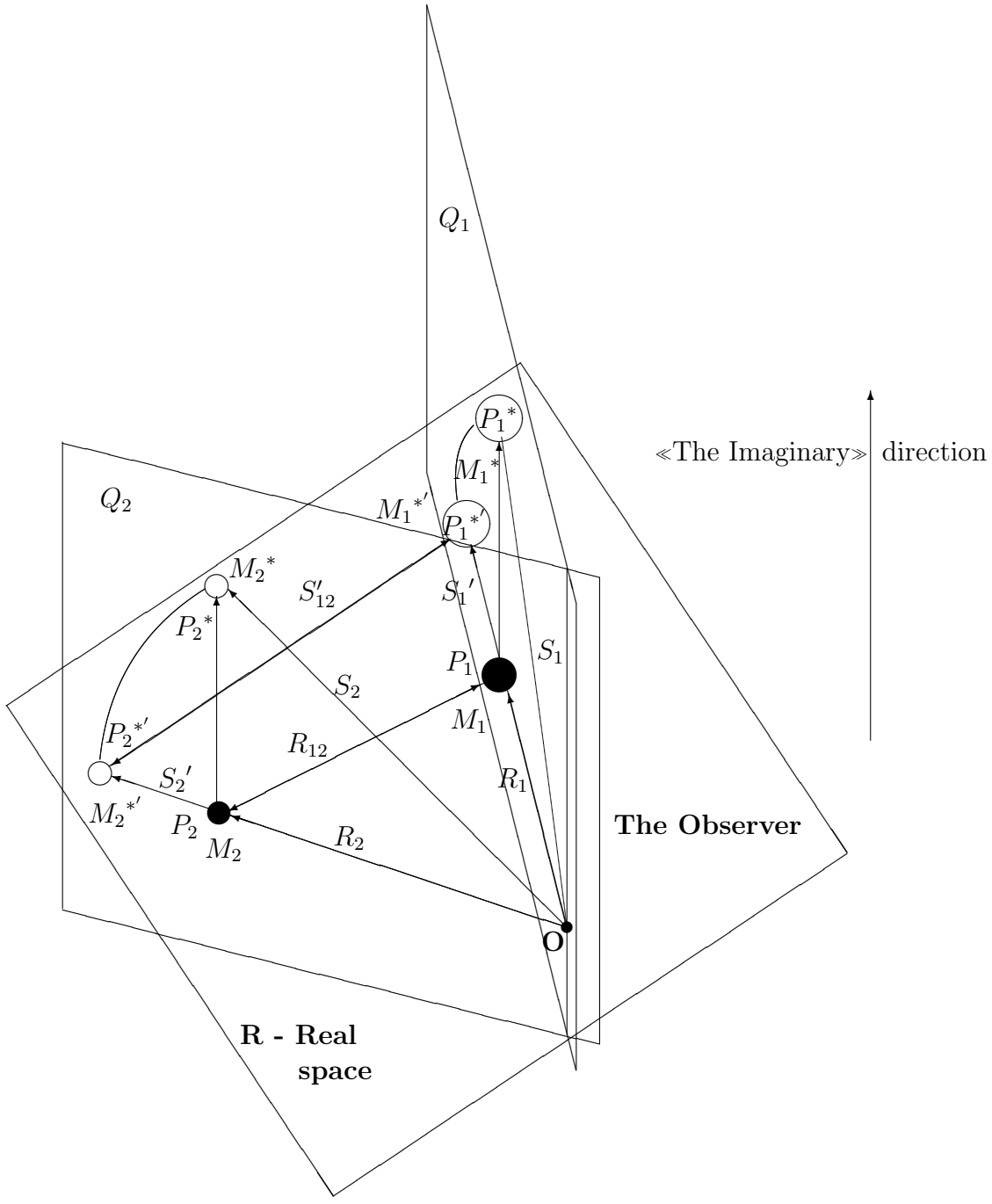
Where is to take the additional mass? These values of mass M_1 and M_2 are taken from the diagram of the «mass-luminosity». From which moreover greater than is observed (that is shines), impossible to take anything extra. Then as it expected, the so-called problem of «The Dark Matter», or «the shortage of the luminous Matter» has been appeared. As it turned out, «The Dark Matter» possesses a surprising property – it cannot be observed, however interacts with all Objects in the Universe by means of the gravity force.

Let's add into our picture the Observer and from him to objects M_1 and M_2 we will drawing the segments which are expressions of the Real distances — R_1 and R_2 . Now we shall imagine that plane of the figure — R represents **our real three-dimensional space**. Let's draw the complex plane is Q_1 at right angle to plane of the figure R through a point O in which there is an Observer and also point P_1 into which the Object M_1 is placed. Let's do for Object M_2 the same actions. Let's draw of the complex plane Q_2. By the way, the Q_1 plane and Q_2 plane are represents an imaginary direction i.e. they express of the distance of removal, of course they will settle down at right angle to the plane R of the picture.

Let's draw a perpendicular from point P_1 in this complex plane Q_1, at right angle to the Real plane R. The segment itself – $S_1^* = P_1P_1^*$ is being a perpendicular, also is an imaginary moving of object M_1. Let's connect the point O with the point P_1^* using with the segment - thus we shall receive the Observed Distance S_1.

Further, let's draw an arch from point P_1^* with the center in the point O and radius equal to distance S_1 before crossing an arch with the real plane R thus we will find position of the point P_1'. We carry out the same procedure to the Object M_2, thus we find a position of the point P_2'. Then we draw the S_{12}' segment between the points P_1' and the point P_2' which will represent itself the Observed distance between the Objects M_1 and M_2.

Now we shall repeat all those arguments by which we shall perform for similar mental constructions - something like the following — «... because the Object radiates energy - around of this Object the space-time properties has changed - and so on ...».



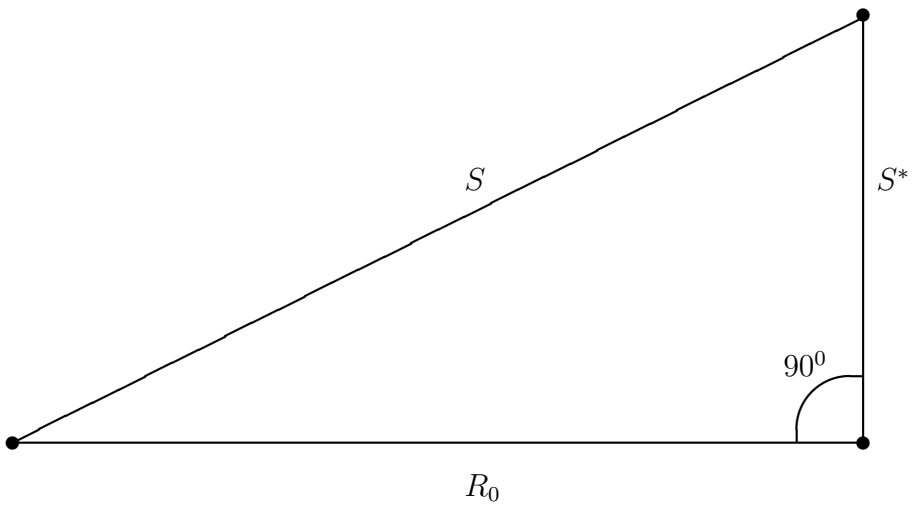
Picture 10

As we see in figure, clearly $S'_{12} > R_{12}$ that the Observed distance is greater than the Real distance. Again, we repeat that problem of «the Dark Matter» i.e. is «a shortage of the luminous matter» has taken place owing to a "substitution" of the Real distance instead the Observed distance. All the values of the distances in the Universe (in intergalactic scales) have turned out to be **overrated** because of a manifestation of the «new» property of the space-time.

7.3 The amendments for the formulas of calculation distances

There is a natural question - «Is it possible to regard seriously to the data received during an observation at present? Could we trust to our own eyes? Could we trust the values of the distances, which obtained based on the red shift? For this questions we shall answer to their unambiguously - «it is possible but taking into account the correction data». For solving the problem, by the way again for illustration, we shall result our "triangle".

$$S = \sqrt{(R_0)^2 + (S^*)^2}$$



Picture 11

Here, we shall repeat again:

S — is the Observed distance,

R_0 — is the Real distance,

S^* — is the Imaginary moving, the imaginary displacement,

$$S^* = \frac{(V^*)^2}{2 \cdot c \cdot H}$$

Let's find the R_0,

$$R_0 = \sqrt{S^2 - (S^*)^2}$$

Here is the aforecited formula for calculations S^* - Imaginary moving, the imaginary displacement. Let's find the Observed distance S - by means of the **Hubble** law:

$$S = \frac{V^*}{H},\ V^* = H \cdot r \Rightarrow V^* = H \cdot S$$

Where:

H — is the relative emission power,

c — is velocity of light,

V^* — is radial velocity.

In that case the Real distance R_0 will be:

$$R_0 = \sqrt{\left(\frac{V^*}{H}\right)^2 - \left(\frac{(V^*)^2}{2 \cdot c \cdot H}\right)^2} \text{ or } R_0 = \frac{V^*}{H} \cdot \sqrt{1 - \frac{1}{4} \cdot \left(\frac{V^*}{c}\right)^2}$$

It has been shown above that the radial velocity

$$V^* = c \cdot H \cdot \Delta t$$

in direct proportion depends on an "age" of the Object is – Δt. Then this formula can be presented as:

$$R_0 = \frac{V^*}{H} \sqrt{1 - \frac{1}{4} \cdot (H \cdot \Delta t)^2}$$

Analyzing of these formulas, possible to come to a conclusion (in the context of hypothesis of the ≪Expanding Universe≫) that the overrated of the Observed distances above the Real distance of the Object, increases with increase the Radial velocity of this Object , so with increase the Observed distance or according of the "age" of this Object . The presented amendment allows us to measure the distance up to the Objects in the Universe more precisely, taking into account the "peculiarity" of the Object, what is its relative emission power, rather than the **Hubble's Law**, which is used in hypothesis of the ≪Expanding Universe≫. The **Hubble** constant H_{Hubble} - as it turned out is an averaged value of the relative emission power of the Universe, therefore, it is resulted in emergence an illusion of a shortage of matter (i.e. hypothesis of ≪the Dark Matter's≫) and to the emergence of others absurdities such as the abnormal observations of Halton Arp.

Chapter 8

Hypothesises in Cosmology

8.1 A criticism of the hypothesis in Cosmology

Let's consider the existing Hypotheses in the Cosmology. To prove or deny ones or others hypotheses, we shall result some notorious facts, based on them we shall argue for and against for each of these hypothesis.

There are the following facts:

— There is a red shift at the emission spectrum of the objects in the Universe, which they radiate;

— This red shift is increasing in the course of time;

There are three explanations of a phenomenon of the Red shift at present time:

- There is a hypothesis of "ageing" of photons. According to this hypothesis, the photons are being absorbed and radiated repeatedly, overcoming enormous distances in the Universe, forced his way through the clouds of interstellar dust and clouds of the gas of an atomic hydrogen, they become so frayed that lose part of their energy and as a result they are redden and are grow old. According to this idea, the more time a photon is flying to us through the spaces of the Universe, the becomes to older and to redder.

- The following explanation of an origin of the red shift is a well-known hypothesis of ≪the Big Bang≫. The effect of the red shift is interpreted there as a manifestation of the **Doppler**'s effect.

- The author puts forward the third explanation of an origin of the red shift. The effect of the red shift is an internal parameter of radiation of the object inseparable with it and the reason of it is became an early-unknown property of the space-time.

Next, we shall make a critical remarks about the hypothesis of Aging Photons. French astrophysicist Jean Pierre Vigier from the Institute of Henry Poincare, he suggested that there is some type of hypothetical particles in the intergalactic space, which interact with the light in such a way that the particles is taking away some of the energy of light.

There are the following remarks on this cause:

— If it would that type of hypothetical particles is existed, Jean Pierre Vigier told to us about them, which take away a little energy out from the photons of a light, then according to Thermodynamics entropy would grow and it would lead to heat death of the Universe.

— According to canons of quantum mechanics — a photon of the E-field radiation is emitted and absorbed by portions - i.e. by quantum. The photon as quantum of energy is emitted and absorbed completely, that is entirely and without any remains. So it (a photon, a quantum of E-field radiation) is indivisible; consequently, it has no internal structure. Therefore in it (in a photon) there are no those "parts", which could be separated from it.

— The Special Relativity (SR) is grounded upon **four-dimensional pseudo-Euclidean Minkowski space-time** in which photon moves upon its four-dimensional isotropic line. A movement upon its isotropic line in according to these properties of the space-time occurs instantly, i.e. outside of time. So the photon does not have the such an abyss of time during which it are aging and becoming red.

— Alteration of radiation frequency effect is well-studied in the nonlinear optics, showing us a manifestation of the quantum properties among the photons. This effect is shown, for example, when laser's coherent emission interacted to substance, thus an additional spectrum lines are appearing but not an effect of the red shift . Also a diversion of a laser beam to be observed.

8.2 The stages of formation of the concept of an expanding of the Universe

Let's now in retrospect, will return onto those "turning points" of a natural science advancement, where the scientific thought "has made" an incorrect direction which now with all acuteness was showed as deadlock. We will make a brief survey about how the concept of the expanding Universe was formed.

*In **1913**, the American astronomer **Vesto Melvin Slipher** started to study the spectra of light, which are arriving to him from ten known nebulas. He also has noticed that a line the certain elements in spectra of galaxies have been displaced in a direction of the red end of a spectrum. **Slipher** has explained the red shift by means of **Doppler**'s effect and has decided that Galaxies should move the away from us. The next step bringing us to belief in Universe expansion has been made in **1917** when **Einstein** has published own theory of **Relativity**. According to **Einstein**'s theory, there are a set of forms in which the space can being shaped. One of them is - the closed space-time without the borders, similar to a spherical surface; another is – a negatively curved space which is infinite constantly extending in all directions. **Einstein** supposed that the Universe is static and he has adapted his equation for this purpose. Almost at the same time, Danish Astronomer **Willem de Sitter** has found the solution of the **Einstein** equation that predicted a fast expansion of the Universe. Such geometry of the space shall to change in the course of time. **De Sitter**'s work has caused an interest among the astronomers in whole world. **Edvin Hubble** was among them. He attended the American Astronomical Society conference in **1914** when **Slipher** reported on his original discoveries in the movement of the galaxies.*

*In **1928**, **Hubble** being in **Mt. Wilson observatory** has started for his work in an attempt to combine the theory of the **Sitter** about the expanding Universe and the **Slipher**'s observations for the receding galaxies. **Hubble** argued about like this: - «in the expanding Universe, you should expect a moving away of galaxies from each other. The remote galaxies will move faster, then farther they are placed away from each other. It should mean that the Observer should see it from any point including from the Earth, that all other galaxies move away from him, however the distant galaxies should move faster on the average from him ...». He observed that in spectra in the most galaxies are having a place the effect of the red shift and the the farther galaxies are placed from us*

have the greater red shift. ***Hubble*** *has proved that this proportional dependence between the distance to galaxy and a degree of red shift in their spectrum, now known as* ***Hubble****'s law (the law of the red shift or the relation of the velocity-distance).*

(One's arises, of course, a very difficult and an unpleasant question: - ≪How **Edvin Hubble** could learn as far removed from us an each galaxy is situated ≫? A very difficult question for **Edvin Hubble** and it heretofore remains difficult for modern astronomers too. Eventually, there is no measuring scale, which could reach the stars. Generally, the distance measurement is very difficult problem and one might say – a sick theme in Astronomy.)

8.3 A criticism of the Universe expanding concept

However, we shall return to that initial point, when in **1913 Vesto Melvin Slipher** has taken as interpretation the red shift of the galaxies on base the **Doppler**'s effect. In this work, we have shown that the overwhelming majority of effects of the red shift of the Objects are the internal properties of their radiation and not associated with the rate of movement of the Objects. Correspondingly, the **Doppler**'s effect means the presence of the very Real not Imaginary movement of any Objects among themselves.

If these movements are real and not imaginary, then we have to confront with a **fundamental problem** – is a **violation of energy conservation law**.

(In annex #8 are given some calculations for the missing wattages, which lack to maintain the stability of the Universe, according to the views of the concept of the expanding Universe.)

The hypothesis of the Expanding universe was confronted with it, and, so to say, for repair, was invented the patch - is hypothesis of ≪the Dark Energy≫.

Now, assume by contradiction (there is such the method of proof in mathematics) that all movements removal are real but not imaginary. And will we see it as to happen:

The Objects in the Universe (i.e. galaxies, stars, quasars, planets, etc.) possess mass (real) and are connected among them by means of a universal gravitation forces (under the Newton's law), that is are in the universal gravitational field. These objects play the role of charges in a gravitational field.

Let's assume that the movement are real and not imaginary, therefore these Charges are moving apart from each other (as we notice the Universe extends, the galaxies move away from each other) with some various velocities (according to the latest received information moving with acceleration).

As is well known in physics, that for separating these charges away from each other in Potential field in which they are, it is necessary perform the work.

And it does not make any difference that whether are they electric charges in electric field or are gravitational charges in gravitational field. All the same, it is necessary do work. The spatial scales, quantity of charges and field intensity do not cancel of necessity of fulfillment of work. Energy is required for fulfillment of work! Where do we get energy necessary for performance of this work for separating charges from each other? Where its source is? Otherwise, the energy conservation law will not work!

(The observance of the conservation law is the line that separates an advancement of science from the flight of fancy.).

So here hypothesis of ≪the Dark Energy≫ became the source of the missing energy in the extending Universe concept. The Dark Energy is in this concept, as it turned out, has amazing properties, has not been registered by the devices, but expands the space of the Universe, makes the galaxy to run off away.

Here is a fine kettle of fish! Judge for yourself, dear reader! As it turns out, assuming at least for a moment that a movement of ≪removal≫ of galaxies is really, figuratively immediately - ≪we get a shot in the forehead≫ - the violation of Conservation Laws.

Summed up to the aforesaid, possible to add that all this flight of fancy as it has appeared in consequence what for interpretations of the red shift in the spectrum radiation of the Objects has been chosen the incorrect basis – is the **Doppler**'s effect. Another vulnerability of a hypothesis of ≪the Universe expansion≫ also is a fundamental problem of its, that velocity of the "flying debris" shall not increase with the distance from ≪the place of explosion≫ otherwise it contradicts to the law of conservation of energy-momentum.

Some conclusions

In the beginning of this article, we were promised to give "the fresh, sensible view" on an evolution of the Universe. We would try to reproduce this "vision" in a form of the theses, when as we have divided all the distances on Real distances and Observed distances, thus we have two various consistently "visions" of the Universe:

In the Real part of the Universe (where the real distances), the Universe represents itself:

- It is the Universe of Newton - it is infinite, homogeneous, and eternal.
- The Universe is static; it is not expanded and is not compressed.
- All objects in the Universe (objects can be - galaxies, Quasars, stars, planets and so on) are committing own movements according to Newton's law and Kepler's celestial mechanics.
- In emission spectra of the objects contain a red shift, which is the internal parameter of the Object.
- This effect of the red shift equals in direct proportion to the relative emission power of the object and its age.

The so-called an imaginary component, which has been appeared owing to a wrong interpretation of red shift as manifestations of Doppler's effect, which it actually is not present because we have thought up it, in fact. This seeming, an illusory idea was imposed on a solid basis of the Real part; in a result we have received the Observed phenomenon which is combination of Real and Imaginary. In an Observed part, we have everything that the concept of the expanding Universe represents, namely:

- The Universe extends.
- All Objects in the Universe move away from each other with the velocity proportionate to their distances among themselves.
- The Universe is limited in size and age; the **Hubble**'s law reflects this restriction.
- In the past, the Universe had the compact size, indefinitely big temperature and pressure, huge density.
- All Objects began to move away from each other by virtue of the Universal Cataclysm named by the Big Bang who had taking place about 20 billion years ago.
- There is ≪the Dark Energy≫ which causes the Universe to expand rapidly.
- As well as, there is ≪the Dark Matter≫ which explains the discrepancy between theoretical calculations upon the gravitational influence and the data of the Observed in the Universe.

In this article, we have a touch upon the very difficult problem and one might to say - the acute problem of modern Astronomy – is a distance measurement in the Universe. Lack of knowledge about the properties of the space-time has led to birth such concepts like are: «the Expanding Universe», «the Big Bang», «the Dark Matter» and «the Dark Energy» which are proved to be as the "speculative" ideas and better to say - illusions.

The appendices

Appendix #1 In the beginning of the article it has been suggested that all the matter in the properties of the surrounding us space-time. What we know about these properties? What are the perturbing factors are influencing them that we know from the school's course of Geometry?

We list these disturbing factors:

- Enormous mass of matter;
- Relativistic Speed;
- In addition to the above factors, the author suggests that this factor may be the Source of Energy, which characterized by such its parameter as Power.

Now we shall consider an influence of each factor on properties of the Space-time individually:

- If Mass of Substance not so much and Velocity of Movement not so high, as an example can serve our circumterrestrial Space. The distortions in it are so insignificant that in practice we can take no into account them. Such the space is possible to consider as the **Euclidean** space.
- If Velocity of Movement is coming nearer to velocity of light, so already possible to speak about of relativistic effects of the Special Relativity. The working tool here will be the **Minkowski**'s 4-dimensional pseudo-Euclidean space-time.
- On the contrary, in case Mass of Substance which are so much in some region of space, so it possible already to speak about the curvature of the space-time near to this huge body. ≪The more Mass is, the more curvatures is≫. The influence on properties of the space-time well shown in **Einstein**'s Equations. Which connected the tensor of space-time curvature with the mass distribution of Substance, in the form of energy-momentum tensor is in these formulas. The working tool in this curved space will be no **Euclidean** geometry but **Riemann**'s already.
- In consideration of such space-time properties - as ability to distort the spase-time near of the big Mass of Substance, for some reason earlier nobody was taking into account such an essential fact that the big Masses of Substance i.e.: stars, nucleus of galaxies, Quasars, Galaxies; they all radiate the energy. At all points of space, in which they are the sources of energy, which (an energy) is characterized by yourself such parameter as is wattage - N. The more powerfully source of energy is, the more significant its influence on surrounding space will be. Significant that this influence in the cosmological plan is shown as followings: ≪the more powerfully source of energy is, the faster it "moves away off" from us and consequently also "is observed" farther≫.

Appendix #2 Let us compute the value of gravitational red shift on a basis of the neoclassical ideas. The mass of the Photon — m, which is radiated from a surface of some star.

$$m = \frac{h \cdot \nu_0}{c^2}$$

E — the part of energy of the Photon which is needed to spent for overcoming the gravitational attraction of a star:

$$E = \frac{G \cdot M \cdot m}{r_0}$$

Where:

M — is the mass of a star,

r_0 — is its radius,

G — is a gravitational constant.

The frequency of the photon will be changing from ν to ν_0 with the same energy.

$$E = h \cdot (\nu_0 - \nu)$$

Substituting $m = \frac{h \cdot \nu_0}{c^2}$ instead of $E = \frac{G \cdot M \cdot m}{r_0}$, afterwars it equating both parts $E = h \cdot (\nu_0 - \nu)$, we will find an expression for variation of frequency of relative change of a spectral line, after some transformations:

$$z = \frac{\nu_0 - \nu}{\nu}$$

This expression is:

$$z = \frac{1}{\frac{c^2 \cdot r_0}{G \cdot M} - 1}$$

Substituting instead of $z = \frac{\nu_0 - \nu}{\nu}$ the numerical data for our Sun (the solar data), we shall find that the red shift for it will make $2 \cdot 10^{-6}$

Appendix #3 There is a system consisting of a physical body (Object), which radiates energy around itself and plus the space, which surrounds this body. Thus so, all energy of the System is just depends on time. Consequently, the partial derivative by time $\frac{\partial L}{\partial t}$ is added into the **Lagrange** function, which determines the motion of the system.

Let's find the value L from the expressions such are as

$$L = \sum_i \dot{q}_i \frac{\partial L}{\partial \dot{q}_i} - \text{const} \quad \text{and} \quad \frac{\partial L}{\partial t} = \frac{\partial \left(\sum_j \dot{q}_j \cdot \frac{\partial L}{\partial \dot{q}_j} - \text{const} \right)}{\partial t}$$

The derivative of a constant is equal to zero.

$$\frac{\partial (\text{const})}{\partial t} = 0$$

We substitute the value $\frac{\partial L}{\partial t}$ instead of the expression

$$\frac{dL}{dt} = \sum_i \frac{\partial L}{\partial q_i} \cdot \dot{q}_i + \sum_i \frac{\partial L}{\partial \dot{q}_i} \cdot \ddot{q}_i + \frac{\partial L}{\partial t}$$

as a result we will get the followings:

$$\frac{dL}{dt} = \sum_i \frac{\partial L}{\partial q_i} \cdot \dot{q}_i + \sum_i \frac{\partial L}{\partial \dot{q}_i} \cdot \ddot{q}_i + \frac{\partial \left(\sum_j \dot{q}_j \cdot \frac{\partial L}{\partial \dot{q}_j} \right)}{\partial t}$$

Let's replace the expression

$$\frac{\partial}{\partial t} \left(\sum_j \dot{q}_j \cdot \frac{\partial L}{\partial q_j} \right) = \sum_j \frac{\partial L}{\partial q_j} \cdot \ddot{q}_j + \sum_j \dot{q}_j \frac{\partial}{\partial t} \left(\frac{\partial L}{\partial q_j} \right)$$

instead of last item, finally we will get the following:

$$\frac{\partial L}{\partial q} - \frac{d}{dt} \cdot \left(\frac{\partial L}{\partial \dot{q}} \right) = 0$$

Let's express the value of

$$\frac{d}{dt} \cdot \left(\frac{\partial L}{\partial \dot{q}} \right)$$

through

$$\frac{\partial L}{\partial q}.$$

Then the general equation of motion will taking such a form:

$$\frac{dL}{dt} = \underbrace{\sum_i \frac{\partial L}{\partial q_i} \cdot \dot{q}_i + \sum_i \frac{\partial L}{\partial \dot{q}_i} \cdot \ddot{q}_i}_{\text{summation by i}} + \underbrace{\sum_j \frac{\partial L}{\partial \dot{q}_j} \cdot \ddot{q}_j + \sum_j \dot{q}_j \cdot \frac{\partial L}{\partial q_j}}_{\text{summation by j}}$$

On here, under the first parenthesis passes summation on i,also under the second one passes summation on j. The Lagrange function and its partial derivatives should look like:

$$L = \frac{1}{2} \cdot \sum_{ik} g_{ik}(q) \cdot \dot{q^i} \cdot \dot{q^k} - U(q), \quad \frac{\partial L}{\partial q_i} = \frac{1}{2} \cdot \frac{\partial g_{ik}}{\partial q_i} \cdot \dot{q}^i \cdot \dot{q}^k, \quad \frac{\partial L}{\partial q_i} = -\frac{1}{2} \cdot \frac{\partial g^{ik}}{\partial q_i} \cdot \dot{q}_i \cdot \dot{q}_k, \quad \frac{\partial L}{\partial \dot{q}_i} = g_{ik} \cdot \dot{q}^k = \dot{q}^i$$

we substitute it in our equation

$$\frac{dL}{dt} = \sum_i \left(-\frac{1}{2} \cdot \frac{\partial g^{ik}}{\partial q^l} \cdot \dot{q}_i \cdot \dot{q}_k \cdot \dot{q}^l + \ddot{q}_i \cdot \dot{q}^l \right) + \sum_j \left(-\frac{1}{2} \cdot \frac{\partial g^{jk}}{\partial q^l} \cdot \dot{q}_j \cdot \dot{q}_k \cdot \dot{q}^l + \ddot{q}_j \cdot \dot{q}^l \right)$$

Taking out the multiplier $\dot{q}^l$ outside the brackets, and in order to rising of index we multiply all by g^{ij} on an expression $\ddot{q}_i \cdot g^{ij} = \ddot{q}^j$ on an expression

$$\frac{dL}{dt} = \dot{q}^l \cdot g^{ij} \cdot \sum_i \left(-\frac{1}{2} \cdot \frac{\partial g^{ik}}{\partial q_l} \cdot \dot{q}_i \cdot \dot{q}_k + \ddot{q}^i \right) + \dot{q}^l \cdot g^{ij} \cdot \sum_j \left(-\frac{1}{2} \cdot \frac{\partial g^{ik}}{\partial q_l} \cdot \dot{q}_j \cdot \dot{q}_k + \ddot{q}^j \right)$$

we knowing the momentum conservation's law $\frac{dL}{dt} = 0$ and its manifestation. Then one, is separating the derivative of order $n = 1$ from the derivative of order $n = 2$, having made replacement of the metric tensor's partial derivative on the full-weight **Christoffel**'s symbols.

*Known that the **Christoffel**'s symbols represent oneself:*

$$\Gamma^l_{ki} = \frac{1}{2} \cdot g^{im} \cdot \left(\frac{\partial g_{mk}}{\partial x^i} + \frac{\partial g_{mi}}{\partial x^k} - \frac{\partial g_{ki}}{\partial x^m} \right) \quad \Gamma_{ij,l} = g_{lk} \cdot \Gamma^k_{ij} \quad \Gamma_{ki,l} = \frac{1}{2} \cdot \left(\frac{\partial g_{mk}}{\partial x^i} + \frac{\partial g_{mi}}{\partial x^k} - \frac{\partial g_{ki}}{\partial x^m} \right)$$

Should swapping the indexes m and i which are in the third and in the first members of the equation. We see both members which in brackets have canceled themselves mutually, so that

$$\Gamma^l_{ki} = \frac{1}{2} \cdot g^{im} \cdot \frac{\partial g_{im}}{\partial x^k}$$

In our case, we should do "the inverse operation". We should substitute the partial derivative of the metric tensor $\frac{1}{2} \cdot \frac{\partial g_{ik}}{\partial q^m}$ upon the full-weight **Christoffel**'s symbols Γ^m_{ik}.

Then one, taking outside the brackets the second derivatives of the generalized coordinates $\ddot{q}^n$ and by reducing it up on $\dot{q}^l$, in a result we shall receive:

$$\ddot{q} = \ddot{q}^m + \ddot{q}^n = \Gamma^m_{ik} \cdot \dot{q}^i \cdot \dot{q}^k + \Gamma^n_{jk} \cdot \dot{q}^j \cdot \dot{q}^k,$$

Where

$\ddot{q}^m$ — is the particle acceleration, which is taking place under the influence of a stationary curved space-time, which one is existing around the **Accumulation of the Mass of Matter**;

$\ddot{q}^j$ — Here is the additional particle acceleration under the influence of energy change factor in this volume of the space-time;

Γ^m_{ik} — Here are the connectedness (the **Christoffel**'s symbols) – by which determined the space-time curvature under the influence of an **Accumulation of the Huge Mass of Matter.**

Γ^n_{jk} —Here are the connectedness, - which determine the space-time curvature, is taken place under the influence of the factor of the change an energy in this volume of the space-time.

Appendix #4 As is well known, in the absence a gravitational field - the law of conservation of energy and conservation of momentum (along with electromagnetic field) is expressed by the equation: $\frac{\partial T^{ik}}{\partial x^k} = 0$ [7] (94.7) page 362

The equation

$$T^k_{i;k} = \frac{1}{\sqrt{-g}} \cdot \frac{\partial \left(T^k_i \sqrt{-g}\right)}{\partial x^k} - \frac{1}{2} \cdot \frac{\partial g_{kl}}{\partial x^i} \cdot T^{kl} = 0 \quad [5](96.1)$$

is the generalization of this equation in the presence of a gravitational field. [7] (96.1)

Making some simple transformations i.e. had made the separation of the variables, we had received the following equation:

$$T^{kl} = g^{il} \cdot T^k_i, \text{ then } \frac{1}{T^k_i \sqrt{-g}} \cdot \frac{\partial \left(T^k_i \sqrt{-g}\right)}{\partial x^k} = \frac{1}{2} \cdot g^{il} \cdot \frac{\partial g_{kl}}{\partial x^i}, \text{ or } \frac{\partial \ln}{\partial x^k}\left(T^k_i \sqrt{-g}\right) = \frac{1}{2} \cdot g^{il} \cdot \frac{\partial g_{kl}}{\partial x^i} [7]$$

As can be seen from this equation that change of state of a matter (changes of the Energy-momentum tensor) and changes of the Gravitational Field (these expressions are made from the metric tensor derivatives) occurs simultaneously. That is the state of a matter varies and varies its ambient field (the surrounding of it Gravitational field) simultaneously.

It is possible to show by the example of ambient field which makes an influence on a state of a matter how the particle motion in the alternating gravitational field. In these equations very evidently shown how a energy of the particles and its impulse are varying according to ambient field, which surrounds it. Here given an example, when the

free particle is moving in a gravitational field in which it (particle) receives acceleration, which its projections onto Coordinate axes are expressed as:

$$\frac{d^2x^\alpha}{dt^2} = -c \cdot \frac{\partial \gamma_{\alpha 0}}{\partial t} + \frac{c^2}{2} \cdot \frac{\partial \gamma_{00}}{\partial x^\alpha} - \frac{\partial \gamma_{\alpha\beta}}{\partial t} \cdot \frac{dx^\beta}{dt} + c \cdot \left(\frac{\partial \gamma_{\beta 0}}{\partial x^\alpha} - \frac{\partial \gamma_{\alpha 0}}{\partial x^\beta} \right) \cdot \frac{dx^\beta}{dt} - \frac{1}{2} \cdot \frac{\partial \gamma_{00}}{\partial t} \cdot \frac{dx^\alpha}{dt}$$

As evident, this acceleration depends on the particle location, on time and on its rate of movement also. Where:

$\frac{d^2x^\alpha}{dt^2}$ — Here is a particle acceleration (a projection of acceleration onto Coordinate axes);

$\frac{dx^\alpha}{dt}$ — Here is the rate of particle motion (a projection of velocity onto Coordinate axes);

$\frac{\partial \gamma_{\alpha 0}}{\partial t}$, $\frac{\partial \gamma_{00}}{\partial t}$, $\frac{\partial \gamma_{\alpha\beta}}{\partial t}$ — Here is the metric tensor component variation by time;

$\frac{\partial \gamma_{\beta 0}}{\partial x^\alpha}$, $\frac{\partial \gamma_{\alpha 0}}{\partial x^\beta}$, $\frac{\partial \gamma_{00}}{\partial x^\alpha}$ — Here is the variation of the metric tensor component by distance.

In a gravitational field, which does not vary in the course of time (a stationary case), all metric tensor partial derivatives on time are equal to zero, so in that case the expression for an acceleration of the particle will become:

$$\frac{d^2x^\alpha}{dt^2} = \frac{c^2}{2} \cdot \frac{\partial \gamma_{00}}{\partial x^\alpha} + c \cdot \left(\frac{\partial \gamma_{\beta 0}}{\partial x^\alpha} - \frac{\partial \gamma_{\alpha 0}}{\partial x^\beta} \right) \cdot \frac{dx^\beta}{dt}$$

In addition to it if the gravitational field has the central symmetry, that is its $\frac{\partial \gamma_{\beta 0}}{\partial x^\alpha}$, $\frac{\partial \gamma_{\alpha 0}}{\partial x^\beta}$ components are equal to zero, then acceleration of particle motion accepts a classical kind:

$$\frac{d^2x^\alpha}{dt^2} = \frac{c^2}{2} \cdot \frac{\partial \gamma_{00}}{\partial x^\alpha}$$

Where:

$\frac{\partial \gamma_{00}}{\partial x^\alpha}$ — is a gravitational field gradient. [8] (128.9)

Let us write the equations (7) and (8) out from the work [2]

$$\frac{dE}{d\tau} + mD_{ij}\nu^i\nu^j - mF_i\nu^i = \xi_i\nu^i \qquad (7)$$

$$\frac{dp^k}{d\tau} + \Delta_{ij}p^i\nu^j + 2m\left(D_i^k + A_i^k\right) \cdot \nu^i - mF^k = \xi^k \quad (8)$$

Where:

$\frac{dE}{d\tau}$ and $\frac{dp^k}{d\tau}$ — are the expressions which show the change of energy and impulse accordingly,

D_{ij} and A_i^k — are the expressions which show the change of the Gravitational Field (these expressions had made up from the metric tensor derivatives). [2]

Although, all these aforecited equations also show us the physical meaning of occurring processes, but they "are not so convenient" for the further operations. We need such equation that would show us that not only as the field influences on a state of a matter, but also as state of a matter influences to a field accordingly. That's equation was found, it is the continuity equation and look like:

$$\frac{\partial}{\partial t}\left(\rho\sqrt{h}\right) = 0 \text{ [9]}$$

Where:

ρ — is a density of mass,

$\sqrt{h}$ — – is a unit volume of parallelepiped, which made from the determinant of the metric tensor.

$h =\mid h_{ik} \mid$

$\sqrt{h} \cong 1$ — (one's in **Euclidean** space will be $\sqrt{h} \equiv 1$).

$\frac{\partial\sqrt{h}}{\partial t} \neq 0$

Let's shall fulfill some simple transformations,

$$\frac{\partial}{\partial t}\left(\rho\sqrt{h}\right) = 0 \;\Rightarrow\; \frac{\partial\rho}{\partial t}\cdot\sqrt{h} + \frac{\partial\sqrt{h}}{\partial t}\cdot\rho = 0$$

i.e. multiplying both member of an equation by the factor k is equal to product of an elementary volume v and the squared velocity of light c^2, $(k = c^2)$ Further we shall receive the followings:

$$\frac{\partial E}{\partial t}\cdot\sqrt{h} + E\cdot\frac{\partial\sqrt{h}}{\partial t} = 0$$

separating the variables, in a result we shall receive the equation of joint variation of energy of any elementary volume of space and change of the metric tensor in its space (volume) available in which this process of change of energy is taking place.

$$\frac{1}{E}\cdot\frac{\partial E}{\partial t} = -\frac{\partial\sqrt{h}}{\partial t}$$

The remark #1 The volume of a unit parallelepiped is equal by definition to a root square of the module of the determinant.

The remark #2 Once upon has been mentioned an expression is – «**Metric tensor**» (not to frighten an amiable reader from continuation of reading this article), we shall explain that by definition «a terrible word» is – «metric tensor» of the **4**-dimensional spaces-time represents itself the square array of **16** numbers placed in a special way, or **9** numbers are — for an usual **3**-dimensional space-time.

Metric tensorX_{ij} consists of a constant component $\mathring{g}_{ij}$ and its variable component γ_{ij}, which whom is a deviation of metric tensor from the Galilean metrics $X_{ij} = \mathring{g}_{ij} + \gamma_{ij}$. For one's turn, its possible to present γ_{ij} as a multiplication of derivative upon time of the metric tensor at a span of time $Y_{ij} = \frac{\partial\gamma_{ij}}{\partial t}\cdot dt$. Or one's in general:

$$X_{ij} = \mathring{g}_{ij} + \frac{\partial\gamma_{ij}}{\partial t}\cdot dt$$

Appendix #5 Now let's draw an attention to motion of light in free space. Let us write the equations (9) and (10) out from the work [2].

K^α — Let it will be the world's phase vector,

ω — also will be the a chronometric invariant of cyclic frequency.

Then:

$$c \cdot K_0 \cdot (g_{00})^{-1/2} = \omega$$

$$c \cdot K^i = \omega \cdot \alpha^i$$

$$\alpha^i = \frac{dx^i}{du}$$

$$c \cdot d\tau = du$$

We have:

$$\frac{1}{\omega} \cdot \frac{d\omega}{du} + \frac{1}{c} \cdot D_{ij}\alpha^i\alpha^j - \frac{1}{c^2} \cdot F_i\alpha^i = 0 \qquad (9)$$

$$\frac{1}{\omega} \cdot \frac{d\left(\omega \cdot \alpha^k\right)}{du} + \Delta^k_{ij}\alpha^i\alpha^j + \frac{2}{c} \cdot \left(D^k_i + A^k_i\right) \cdot \alpha^i - \frac{1}{c^2} \cdot F^k = 0 \qquad (10)$$

Where:

D_{ij} — is strain rate of a reference frame of the system.

This nonrelativistic effect is similar to **Doppler**'s effect that was caused by a deformation of the reference system. Is not to being limited by a range of the macroscopic metrics, we shall consider $\Delta\omega/\omega$ in all directions, which one's in every Points of the Observation, we see that the $D_{ij}\alpha^i\alpha^j \neq 0$ and $F_i\alpha^i \neq 0$. Then from **(9)** equation we shall see, that in each given direction, this value $\Delta\omega/\omega$ as a first approximation is proportional to distance (du) from the Source to the Point of Observation. On these distances in any two opposite directions, we see that the half-sum of the values $\Delta\omega/\omega$ gives the value of the **Doppler**'s effect.

Appendix #6 Let's write down the equations: (7) and (9) from the work [2].

$$\frac{dE}{dr} + mD_{ij} \cdot \nu^i \cdot \nu^j - mF_i \cdot \nu^i = \xi_i \cdot \nu^i \qquad (7)$$

$$\frac{1}{\omega} \cdot \frac{d\omega}{du} + \frac{1}{c} \cdot D_{ij} \cdot \alpha^i \cdot \alpha^j - \frac{1}{c^2} \cdot F_i \cdot \alpha^i = 0 \qquad (9)$$

Where:

$$D_{ij} = \frac{\partial x^i}{\partial t}$$

$$\alpha^i = \frac{dx^i}{c \cdot dr} = \frac{1}{c} \cdot \nu^i$$

$$\frac{\partial}{\partial t} = \frac{c}{\sqrt{g_{00}}} \cdot \frac{\partial}{\partial x^0}$$

$$\nu^i = \frac{dx^i}{d\tau}$$

$du = c \cdot d\tau$

Taking into account the aforecited transformations, let's write down the **(9)** equation as:

$$\frac{1}{\omega} \cdot \frac{d\omega}{du} + \frac{1}{c} \cdot D_{ij} \cdot \frac{\nu^i}{c} \cdot \frac{\nu^j}{c} - \frac{1}{c^2} \cdot F_i \cdot \frac{\nu^i}{c} = 0 \qquad (9)$$

Next, let's deduct an expression $D_{ij} \cdot \nu^i \cdot \nu^j$ from each out equations: **(7)** and **(9)**, that is:

$$D_{ij} \cdot \nu^i \cdot \nu^j = \frac{1}{m} \cdot \xi_i \cdot \nu^i - \frac{1}{m} \cdot \frac{dE}{d\tau} + F_i \cdot \nu^i \qquad (7)$$

$$D_{ij} \cdot \nu^i \cdot \nu^j = F_i \cdot \nu^i - \frac{c^3}{\omega} \cdot \frac{d\omega}{du} \qquad (9)$$

Next, we subtract the equation **(7)** (i.e. will add it with negative sign) out from the equation **(9)**.

$\frac{1}{m} \cdot \xi_i \cdot \nu^i - \frac{1}{m} \cdot \frac{dE}{d\tau} + F_i \cdot \nu^i - F_i \cdot \nu^i + \frac{c^3}{\omega} \cdot \frac{d\omega}{du} = 0$ — let's will reduce it upon $F_i \cdot \nu^i$

$\frac{1}{m} \cdot \xi_i \cdot \nu^i - \frac{1}{m} \cdot \frac{dE}{d\tau} + \frac{c^3}{\omega} \cdot \frac{d\omega}{du} = 0$ — let's will multiply it term wise upon m

$$\xi_i \cdot \nu^i - \frac{dE}{d\tau} + \frac{c^3 \cdot m}{\omega} \cdot \frac{d\omega}{du} = 0$$

Since a selection of reference frame is bearing a random character, so possible to choose such system of reference frame in which ξ_i - not gravitational force is equal to zero, that is expression $\xi_i = 0$. We shall remember about mass-energy equivalence $E = m \cdot c^2$, further we shall continue our transformations:

$$\frac{c \cdot E}{\omega} \cdot \frac{d\omega}{du} - \frac{dE}{d\tau} = 0 \;\Rightarrow\; \frac{1}{E} \cdot \frac{dE}{d\tau} = \frac{c}{\omega} \cdot \frac{d\omega}{du}$$

Appendix #7 As a case in point, possible to result one of an "amusing" proof of such a kind statement. Let be as Energy source will be an usual electric bulb, by which also we will leave to radiate a light for example in an entrance of a house during such long time. According to our calculations, this electric bulb after a while - a great number of millions years - "will disappear" out from "field of vision". However, ours experience speaks us that electric bulbs "disappear" much earlier in particular out of the entrances of the living houses.

Appendix #8

M_{MW} — is mass of the Milky Way (our Galaxy is - Milky Way galaxy) - (Evans and Wilkinson, 2000)

$M_{MW} = 1,9 \cdot 10^{12} M_{\otimes} = 1,9 \cdot 10^{12} \cdot 1,989 \cdot 10^{30}$ kg $= 3,78 \cdot 10^{42}$ kg

M_{M31} — is Mass of the Galaxy in Andromeda constellation **M31 (NGC 224)**

$M_{M31} = 1,23 \cdot 10^{12} M_{\otimes} = 1,23 \cdot 10^{12} \cdot 1,989 \cdot 10^{30}$ kg $= 2,45 \cdot 10^{42}$ kg

V^*_{M31} — it is a radial speed of "recession" of the Galaxy $V^*_{M31} = 300 \pm 4$ km/sec - according to data (NED)

R_{M31} — is the distance up to Galaxy $R_{M31} = 2900\ 000$ light year $= 2,74 \cdot 10^{22}$ m

F — is the attractive force between Milky Way M_{MW} (our Galaxy) and Galaxy M_{31}

$$F = G \cdot \frac{M_{MW} \cdot M_{M31}}{R^2}$$

$$F = 6,67 \cdot 10^{-11} \cdot \frac{3,78 \cdot 10^{42} \text{ kg} \cdot 2,45 \cdot 10^{42} \text{ kg}}{(2,74 \cdot 10^{22} \text{ m})^2} = 9,12 \cdot 10^{29} \ H$$

N^* — is Power which would be required for "taking apart" these two galaxies in the opposing sides.

$$N^* = V^* \cdot F = 300 \frac{\text{km}}{\text{sec}} \cdot 9,12 \cdot 10^{29} \ H = 2,74 \cdot 10^{32} \text{ Watt}$$

The background materials

$M_{\otimes} = 1,989 \cdot 10^{30}$ kilogramm — Solar Mass

$L_{\otimes} = 3,826 \cdot 10^{26}$ Watt — Solar emittance (Luminosity)

$c = 2,99792458 \cdot 10^{8}$ m / sec — Electromagnetic constant (Velocity of light in vacuum)

$G = 6,67 \cdot 10^{-11} \ \frac{H \cdot m^2}{\text{kg}^2}$ — gravitational constant

An equation of the gravitational field is – the Einstein equation:

$$R_{ik} - \frac{g_{ik} \cdot R}{2} = \frac{8\pi}{c^4} \cdot T_{ik} \text{ or } R_{ik} = \frac{8\pi}{c^4} \cdot \left(T_{ik} - \frac{g_{ik} \cdot T}{2} \right), \text{ or } R = \frac{8\pi}{c^4} \cdot T, \text{where:}$$

T_{ik}, T — energy-momentum tensor,

R_{ik}, R — Ricci's tensor (the transformed tensor of curvature),

g_{ik} — metric tensor of space-time.

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