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The Model of Two Spaces

Annotation

We propose the model that gives the explanation of some not entirely clarified chapters of the modern Physics through the use of the elementary formulae. Partly it explains the formation of the inertial and gravitational mass, the cause of the occurring of the gravitation and the divergence of the material points of the Universe, explains the cause of "shortening" of the length in motion, explains Red shift and the cause of changing Hubble constant, that is attributed to the dark energy.

Key words: Inertial mass, gravitational mass, Gravitation, Red shift, acceleration of expansion of the Universe, shortening of the length, recession of galaxies.

Introduction

It is known that there is the symmetries of equations, describing the laws of physics, in the relation to the operation of the time change t to $-t$ (in other words the relation to time). At the basis of this without advancing some inconceivable theories we may have a try to construct some model, where two spaces will be used at the place of one. These spaces will differ with the direction of time. At that the observer considers, that he's in one space. Let's investigate what the observer will see at this case. One space we'll call (+), another (-).

The observer considers that he's only in the space called (+). We'll take as positive direction the shift in (+) and (-) (the movements of the material point from the observer). At this, in (+) it'll be delete, correspondingly for (-) it'll be approaching, if consider in time (+t). Not to get mixed with the spaces, we'll consider that there is only positive motion direction. So, when the point is moving from the observer, it is considered in (+), when to the observer it is considered in (-). In other words there is the transition from one space to another in the relief of the motion direction.

So that, there are two spaces and their characters are absolutely identical (with the exception of the direction of time), the question is about the so called speed of light in these spaces. For our abstract spaces – it is maximal registered speed for positive direction in the physical space. It is known for today that the speed of light in one direction in physical space isn't observed. The speed of light in every (+) and (-) space we'll call one-way speed of light, their average speed we'll call two-way speed of light. As we agreed, that the characteristics of spaces are equal at the observer point the instantaneous speed of light is equal for (+) and (-). But it isn't so for long distances. We don't forget about the extension of the Universe – it is for (+), that's why for (-) is narrowing, because the time is in another direction. It is clear that the distances for one and the same point in such spaces will a bit differ, correspondingly the time of passing the distance will be also different, correspondingly, the observer (if he could measure everything) should assimilate it as different speeds of light in the direction to it and from it. Such as the observer can't measure we can just consider, that the speeds for long-distance points will a bit differ.

The aim of introduction of this model of the descriptions of the space by the observer is the explanation of many observed phenomena of the cosmology without inletting unknown multipliers, incomprehensible phenomena and the components of the Universe itself, incomprehensible origin of gravitation. It belongs to the scale multiplier of dark energy. So, we may try to define in ambient space at this locally in the zone of considered material point we'll use the space of events which corresponds to Minkowsky space. We may elementary explain the origin of the field of gravitation, gravitational and inertial mass without using undefined Yang-Mills-Higgs field and Higgs boson. Even more, the carrier and the waves of field of gravitation aren't recognized and everything is not clear with the Yang-Mills-Higgs field and Higgs boson.

1.0. Gravitational and Inertial Mass in the Model of "Two Spaces".

We'll not go deeply into the origin of some probably existing divergence of material points (we'll consider it in the part 4.0.) We'll take that it has some speed **u**. It is clear that if it exists, it exists for all material points. At this, the existence of restraining forces don't impact on the existence of this divergence – it exists and only then it is compensated with that very gravitation, that occurs as the result of this divergence. We'll take as the body several material points with positive and negative charge equal to absolute magnitude. It is clear that this body may be considered as one electric neutral material point A. It is clear that nearby to A all the speeds in (+) and (-) are equal. The other body is electrically neutral for A we'll take as electrified material point the charge in absolute magnitude the same as in the material point B, charge in absolute magnitude is the same as in material points A (it is for the simplicity of calculations – now the origin of field of gravitation is interesting only). Such as the space of events is considered locally nearby A, we may use the Einstein's formula for velocity addition. We need some explanation: we may notice the approach of the objects or their deletion only relative to one chosen fixed object. That's why we choose object B, relative to it A is deleted at a speed of u. At this, if A is located simultaneously in (+) and (-), it gets in one space (+v), and in another (-v), because of the electric interaction with B. That's why the speeds u and v are considered in different frame of references and they are combined correspondingly. So:

$$w = \frac{(v+u)}{1+\frac{vu}{c^2}}$$

Now in formula for force (the expression of force through impulse) the additional terms appear: $F = \frac{dP}{dt}$, where $P = P(w)$ is the dependence of the impulse from speed (only the variant of speed change in magnitude (look literature [1]). Then:

$$F = \frac{dP}{dt} = A\frac{dw}{dt},$$

Where $A = \frac{m}{(1-\frac{w^2}{c^2})^{\frac{2}{3}}}$ (it is from the same resource),

and $\frac{dw}{dt}$ is derivative with time of the formula of velocity addition. We'll put it in the formula of force:

$$F = A[\frac{\frac{dv}{dt}}{(1+\frac{vu}{c^2})} - \frac{u+v}{(1+\frac{uv}{c^2})^2}\frac{dv}{dt}\frac{u}{c^2}] = f\frac{1-\frac{u^2}{c^2}}{(1+\frac{vu}{c^2})^2},$$

where $f = A\frac{dv}{dt}$ is the relation for force (from the same source), as the result of the speed change in magnitude. The average force received from forces with (+v) and (-v):

$$Fcp = \frac{1}{2}f(1-\frac{u^2}{c^2})(\frac{1}{(1+\frac{uv}{c^2})^2} - \frac{1}{(1-\frac{uv}{c^2})^2}) = -f(1-\frac{u^2}{c^2})\frac{\frac{2uv}{c^2}}{(1-(\frac{uv}{c^2})^2)^2} \qquad (1)$$

In this formula **f, v** are absolute magnitudes. It is clear that **Fcp<<f**, because $u, v, \frac{1}{c^2}$. are put linear in the formula. It is clear that with small velocities values the requiring correlation by **forty** times is received. At this, the force is always negative, so that there will be always gravitation. It should be marked specially: speed **+u** is a part of this as a divergence and has one meaning **+**. But if we should consider formula (1) for some speed for approaching, in other words speed **-v** the formula (1) would have the other repulsive force.

Formula (1) gives us the opportunity to define gravitational mass. Now we may have a try to create a model of the formation of the inertial mass. If we consider all the parts of the Universe, (we consider it to be isotropic), A will interrelate with each of them. In other words every material point of the Universe pulls A on to itself, if we consider A to be static. At this, they will pull it on identically to all the sides, such as the Universe is homogeneous and there are no reasons to pull A on to some side more intensively. If we speed **A** up at acceleration torque, the speed of divergence in accordance with movement with the material points of the Universe will decrease, and speed of divergence to the side opposite will increase. Correspondingly in accordance with formula (1) gravitation to the side of movement will decrease, and to the opposite side will increase. Here are two models of inertial and gravitational mass. No doubt that at both cases the force focusing on **A**, is proportional to the charges of the parts of this material point, in other word, masses are proportional.

Crude estimate of masses

1) It is clear that gravitational mass should be taken from formula (1). If assume that there is **2n** charges with average charge **q** in the material point A. These charges interrelate with **2N** charges and average charge **q'**. If we take off the multipliers of uniquely defined, the formula (1) will be:

$$F = -f\frac{2uv}{c^2} = -k\frac{qnq'N}{r^2}\frac{2uv}{c^2} \qquad (2)$$

it is clear, that we may attribute only $M_D = Mqn$ (3)

to mass A

where M is some multiplier. At this $\Gamma = \frac{k}{M^2}\frac{2uv}{c^2}$ (4)

regards to the gravitation constant

2) At case of inertial mass we'll also take multipliers of uniquely defined off.

But instead of speed **v** we should take its change (we consider that only decreasing and increasing by equal value, though it is not so), connected with the acceleration of body **A**. This change **dv**, for short period of time t_0 .

We should notice that **v** also was determined for this short period of time. We consider that the number of charged particles in the Universe is **2P**, and their average charge is **Q** and they are in the average distance **R**.

Then for some body **D**:

$$M_{\mathrm{int}rt\_D} = \frac{F_{Univer}}{a} = k\frac{qnQP}{R^2}\frac{2u}{c^2} \tag{5}$$

(Explanation: inertial mass of the body **D** equals to force of gravity of the Universe, divided into acceleration – is conventional signs)

We have just to clarify these electric components of the bodies to compare inertial and gravitational masses. And would it be enough to give the description by charms for the exhaustible imposition of this model of the mass.

2.0. Red Shift and Metrics of the Universe in the Model of Two Spaces.

All the enumerated problems are solved with the model of two spaces elementary and without using unknown energies of open to question building of the manifolds with different scale multipliers and etc.

Different one-way speeds of light explains the appearance of Red shift elementary, the others will be more difficult. We'll consider our and some long-distance galaxy. We consider that two-way speeds of light are unchanged everywhere, so the radiant in these two galaxies in the relation of the two-way speed of light is unchangeable and has one wave-length, we'll mark it ΔL. Sure, meter is measured by two-way speed of light. That's why even when this speed of light will be changed, the meter is also be changed, and it'll be impossible to notice this change. Now we consider that the light is directed to our side from the area of the distant area at speed $c^- <$ **c** where **c** – is two-way speed of light, c^- - is one-way speed of light in (-).

The difference in time of the coming of leading edge and trailing edge of the wave is $\Delta t = \frac{\Delta L}{c^-}$, but, as it is known we conceive this time at the Earth as passing some way by the light signal with two-way speed of light. Probably for short distances one-way speeds of light differs from two-way speeds of light less, than for long distances.

That's why, we at the Earth, consider that the wave-length of light signal is

$$\Delta l = c\Delta t = \Delta L(\frac{c}{c^-}) \tag{6}$$

In other words the wave-length increased. Correspondingly frequency decreased and we received "Red shift", in which

$$z = \frac{\Delta l - \Delta L}{\Delta L} = \frac{c}{c^-} - 1$$

More than 100 years ago the process of synchronization of watches and the setting of synchronism in two points have been discovered by Poincare. Poincare set that all time interval between the sending signal from the point of synchronizing to the getting this

signal back may be called the interval of synchronism. So, we may choose not only the average point of this interval as it is done in Einstein work, but any point of this interval (interval is open). After choosing this point we may build the corresponded mechanics. But it is for one space. Space (+) and (-) with one-way speed of light should have synchronization with the point from this interval of time, at this, there should be an opportunity of setting of synchronization without motion to the opposite side. It is only possible for the accumulation point (the point of the closing of this interval). It is possible because Poincare considered the getting back signal and it needs time for its moving back. For two spaces getting back of the signal isn't needed. That's why we may also use the points closing the interval of the synchronism. In other words:
SYNCHRONIZATION: we consider that with the output of light signal (or signal that's analogical to it) zero is set up and with coming of light signal zero is set in the corresponded point of spaces (+) or (-).

Now we should build corresponded mechanics for the given spaces and write the expression for the interval.
Then in one synchronized point we set centre of coordinates and time in this point we mark as **q**. In other synchronized point we mark time as q_x . Then

B (+) there will be a correlation $q_x = q - \frac{R^+}{c^+}$ (7)

B (-) there will be a correlation $q_x = -q + \frac{R^-}{c^-}$ (8)

where and are Euclidean distances (lengths) between the considered points in the units singled out correspondingly with (one-way speed of light) c^+ and c^- in spaces (+) and (-), **R** is length, in units singled out with (two-way speed of light) **c**. Now only literal symbols of unknown quantities of one-way speeds and distances received with their help, as they can't be determined.
We'll consider now only space (-), that is the moving to the zero side or centre of coordinates. We'll assume that there is dependence of one-way speed of light on the coordinate **x**. We'll search this dependence as:

$$\frac{c^-}{c} = f = f(x^-) \tag{9}$$

Coordinate **x** is singled out with two-way speed of light, coordinate x^- is singled out with one-way speed of light for approaching.

At the beginning of the theme we agreed to consider Minkowsky space in two-way speeds of light, but change of a variable is done for every incoming space (+) and (-), that's why known interval of the space of events we'll write in new species:

$$dS^2 = c^2 dt^2 - dx^2 \tag{10}$$

$$dx = \frac{c}{c}\frac{c^-}{c^-}dx = (\frac{c^- dx}{c})\frac{c}{c^-} = \frac{c}{c^-}dx^- = \frac{dx^-}{f} \tag{11}$$

In the expression

$q_x = -q + \frac{x^-}{c}$ for the space of events (corresponded to Minkowski space) letter **q** means time at the observer point, or **t**, it means that time in the coordinates of one-way speed of light is:

$$t = \frac{x^-}{c} - q_x = \frac{1}{f}\frac{x^-}{c} - q_x \quad \text{or}$$

$$dt = -\frac{f'}{f^2} dx^- \frac{x^-}{c} + \frac{1}{f}\frac{dx^-}{c} - dq_x \qquad (12)$$

We'll set it in the formulae (10), the formulae (11) and (12). And consider only the space part of the interval:

$$dS^2 = c^2 (\frac{1}{f}\frac{dx^-}{c})^2 (1 - \frac{f'}{f} x^-)^2 - (\frac{dx^-}{f})^2$$

$$dS^2 = \frac{1}{f^2}(dx^-)^2 \frac{f'}{f^2}(x^-)[(x^-) f' - 2f] \qquad (13)$$

(we factor out in parentheses monomial factor and product the difference of squares)

We'll find solution according to the method of Occam's razor. It is clear that the easiest kind of the interval at the case: $f' = A = const$, I notice, that at this the formula:

$f = Ax^- + B$, где $B = const$

can be imagined of the form of a bit changed Hubble law, but which is attribute to the case of different one-way speeds of light. This law works at the case:

$A = -\frac{H}{c^2}$ и ***B=1***, where ***H*** – Hubble constant. So, one-way speed of light decreased when the distance increased. Or

$$f = 1 - \frac{H}{c^2} x^-$$

Square bracket in the formula of interval will be simplified:

$$[(x^- f' - 2f] = -2\frac{H}{c^2} x^- - 2 + \frac{H}{c^2} x^- = -(2 - \frac{H}{c^2} x^-)$$

Space elements of the interval or the metrics of the space due to this way is:

$$dr^2 = \frac{H}{c^2}(x^-) \frac{(2 - \frac{H}{c^2} x^-)(dx^-)^2}{[1 - \frac{H}{c^2}(x^-)]^4} \qquad (14)$$

It is clear that the Pythagorean proposition doesn't work, so one-sided metrics in one-sided coordinates is non-Euclidean. This metrics has a kind of metrics of space, described by the Lobachevskian geometry.

3.0. The Explanation of the Result of the Michelson Experiment and the Reckoning of the Average Speed of Light in the Model of "Two Spaces".

3.1. We'll consider the interval in new coordinates in details.
If we substitute in (10) expression (11) and (12), we receive the interval in one-way speed of light (OCC) in (-):

$$dS^2 = c^2 dq_x^2 - c^2\left(\frac{1}{fc} - \frac{f'}{f^2}\frac{x^-}{c}\right)dx^- dq_x + \frac{1}{f^2}(dx^-)^2 \frac{f'}{f^2}(x^-)[(x^-)f' - 2f]$$

Or

$$dS^2 = cdq_x^2[c - \frac{dx}{dq_x}\frac{1}{f}(1 - \frac{f'}{f}(x^-)] + (dx^-)^2 \frac{f'}{f^4}(x^-)[(x^-)f' - 2f] \qquad (15)$$

Taking into account:

$$f = 1 - \frac{H}{c^2}(x^-) \qquad (16)$$

$$dS^2 = cdq_x^2\left(c - \frac{dx}{dq_x}\frac{1}{[1 - \frac{H}{c^2}(x^-)]^2}\right) + \frac{H}{c^2}(x^-)\frac{(dx^-)^2(2 - \frac{H}{c^2}(x^-))}{[1 - \frac{H}{c^2}(x^-)]^4} \qquad (17)$$

This long formula only shows that in long distances space metrics is Lobachevsky metrics.

It isn't difficult to believe that for (+) we receive analogical formula (only space coordinate will be x^+ and it is defined with one-way speed of light for receding).

Now experiment of Michelson-Morley and physical sense of shortcut of dimension on motion are interesting. In fact the Special Theory of Relativity doesn't give physical reasons of shortcut and physical sense of this shortcut and it isn't clear what for the bodies and space should shorten their sizes. We can't explain it even by the observation from the other inertial reference system (IRS), because the procedure of the length measurement of Einstein would prevent it.
In short distances the interval is simplified:

$$dS^2 = cdq_x^2\left(c - \frac{dx^-}{dq_x}\right) + a*(x^-)*(dx^-)^2 \qquad (18)$$

Where

$$a = \frac{H}{c^2}$$

Then the space part of the interval will give space metrics (for simplifying of the listing in this part we'll use instead of x^{-} nomenclature $\boldsymbol{x}$):

$dr^2 = axdx^2$

$\boldsymbol{a}$ is scale multiplier, it's clear that further on we may set it to one.

or

$$dr = \sqrt{x}dx \qquad (19)$$

This formula shows what metrics should be really considered in short distances. Ordinary scale multiplier takes to the account the dimensionalities. The formula itself means that metrics is the distance between two points equals to $\sqrt{x}$ units of the identical intervals of coordinates **dx** or the same one - the units of measurement of the coordinates of one-way speed of light. Under condition that one point is in the beginning of the coordinates with the coordinate $\mathbf{x = 0}$, and the other has the coordinate $\mathbf{x}$.

Of course, we shan't copy the consideration (all the subpath of light signal in the coordinates, measured by the light are described in thousands of works), we'll at once write the formula with light watches moving from the observer at speed **U**. The coordinate is measure by the corresponded one-way speed of light, then we'll **take to the account formula (15) for each interval** (watch-length **L**) (on the analogy of the reckoning of the light watch of Lorentz) :

$$\sqrt{ct_1} = \sqrt{Ut_1} + \sqrt{L}$$

It's clear that all the meanings are taken in absolute magnitude.

or

$t_1 = \dfrac{L}{(\sqrt{c} - \sqrt{U})^2}$, on the analogy while moving to the opposite side:

$t_2 = \dfrac{L}{(\sqrt{c} + \sqrt{U})^2}$, total time of the moving of the signal is:

$$t = t_1 + t_2 = \frac{2L}{(c-U)} \frac{(c+U)}{(c-U)} \qquad (20)$$

Now analogically we'll consider known formula with crossing location of the light watch.

$$\sqrt{L^2} = \sqrt{(ct_3)^2} - \sqrt{(Ut_3)^2}$$

From here total time is:

$$t = 2t_3 = \frac{2L}{(c-U)} \qquad (21)$$

Clear, that the total time of the formula (20) and formula (21) differ by the scale:

$$N = \frac{(c+U)}{(c-U)} \tag{22}$$

It’s possible as well as in Special Theory of Relativity, to begin to invent that this is feature of the space and it is being shortened by unknown ways and **L** is being shortened too together with the space, but we may know what benefit will be from interim part of the formula (18), in fact, we consider even way time. It’s clear that interval (18) in short for cosmological measures distances and at constant speed **U** motions of glasses (motions of IRS), interim part of the interval will be:
$dq^2 = cdq_x^2(c-U)$, that gives (for approximating):

$$dq_- = dq_x\sqrt{c(c-U)} \tag{23}$$

It’s clear that the same time interval at speed of light for deletion gives:

$$dq_+ = dq_x\sqrt{c(c+U)} \tag{24}$$

It is also clear that the motion of light signal and the motion of the other IRS are considered in every case, that’s why for the case with experiment with light watch (or the same with the Michelson–Morley experiment) the necessary for us intervals of time will be:

$$dq_1 = dq_x\sqrt{c(c+U)} \tag{25}$$

$dq_x = dq_2\sqrt{c(c-U)}$ or

$$dq_2 = dq_x\frac{1}{\sqrt{c(c-U)}} \tag{26}$$

And the formula describing the time of full signal passing will be (I shan’t write it is clear anyway):

$$dq_{sum} = dq_x\frac{\sqrt{c(c+U)}}{\sqrt{c(c-U)}} = dq_x\frac{\sqrt{c+U}}{\sqrt{c-U}} \tag{27}$$

So, there is increasing of time unit in the direction to the motion of the running IRS.

But if there is this change and there is also the determination of metrics, connected with the unit of time. So, meter in the running IRS is increasing in corresponding number of times, that’s why our light watch contains these meters a bit less (correspondingly the shoulder in the Michelson–Morley experiment). So:

$$L' = L\frac{\sqrt{c-U}}{\sqrt{c+U}} \tag{28}$$

That’s why if we write **L** instead of **L'** in formula (20) and put the meaning by formula (28), there is the difference between (20) and (21) is multiplier **n**:

$$n = \frac{\sqrt{c+U}}{\sqrt{c-U}} \tag{29}$$

Temporal value of the passing the way by light signal in transverse and long direction differ by it. And this multiplier is explained by difference of time metrics in the longitudinal and thwart directions.

The short explanation:

In IRS that moves at the velocity of **U** relatively to the stationary observer there is anisotropy of time metrics in the direction of movement. This is because the stationary observer tries to measure in moving IRS. And only in Einsteinian version of space the position of the observer doesn't make any impact, in our version the position should be taken into account.

The anisotropy of time metrics causes the anisotropy of metrical units for measuring in this IRS from the viewpoint of stationary observer (because the meter is measured by the velocity of light and by the time). Both of these two factors take away the difference in time of passing longitudinal and thwart way by the signal in light hours (and accordingly in Michelson–Morley experiment) from the viewpoint of stationary observer.

3.2. Let's try to determine the formula of calculation of the average speed of light. This question is important because in case of measuring the length of the way of light signal by two-way speed, the lower limit of one-way speeds is occurring. This limit is in the formula:

$$c_{cp} = \frac{2c^+c^-}{c^+ + c^-}$$

And because of the existence of the limitation (lower limit) of the magnitude of the one-way speed of light, there can't be arbitrary relation of wave lengths (according to this theory) in radiation of distant and nearby galaxies. But these exactly relations could be observed.

In fact we should assume the average velocity determination and measure the distance in one-way speeds, as it was done for Michelson–Morley experiment:

$$S_+ = \sqrt{x^+} = \sqrt{c^+dt}$$

$$S_- = \sqrt{x^-} = \sqrt{c^-dt}$$

Then,

$$c = \frac{S_+ + S_-}{\frac{S_+}{c^+} + \frac{S_-}{c^-}} = \sqrt{c^+c^-} \tag{30}$$

- this formula already contains no lower limits for one-way speeds of light, and there can be anyone correlation of wave lengths. So there are no more contrarieties between the experiment and the theoretical statements. [2], [3], [4].

Now we can mark down z in one-way speed:

$$z = \frac{\Delta l - \Delta L}{\Delta L} = \frac{c}{\overset{-}{c}} - 1$$

$$z = \sqrt{\frac{\overset{+}{c}}{\overset{-}{c}}} - 1 \qquad (31)$$

Without explanations we may understand, that z can take any value. 10 and 20 values could be easily explained and there is no need for explaining of the appearance of such values by the local areas and scale multipliers as it is done now in cosmology. In other words, this value of the average velocity of light and corresponding possible values for z give the possibility to use ambient space of events.

4.0. The Reason of Occurring of Recession of the Material Points

We set the metrics of the Universe when it is one-way movement. This metrics is corresponded to the space with Lobachevskian geometry. There is well-known fact – movement in vestigial radiation. In Lobachevskian geometry we also know recession of copunctual lines in the two-dimensional subspace which are perpendicular to some other third line.

The conclusion of the cause of the two material points recession is clear from these first sentences. It's clear that the inertial system of counting is vestigial radiation. That's why two motionless material points should be considered indeed as moved on the dispersed right lines (from the standpoint of Lobachevskian geometry). It's clear that from the point of view of the observer connected with these points, we can't recognize the motion in vestigial radiation, but the divergence of the points in time we can easily recognize.

So, we received the needed divergence for the explanation of the appearance of so called "gravitational" attraction and we didn't need at this the entering of the metrics change in time. Really Big Bang isn't needed for the explanation of the divergence from the standpoint of "two spaces". Though all marked above doesn't cancel out the temporary metrics dependence and occurrence of Big Bang.

5.0. The explanation of "accelerated" divergence of galaxies.

Let's try to explain the "accelerated" divergence of the Universe.

The description of this acceleration is at mane web-sites, for sample [5] is explained well. .. Look at the Fig.1 and Fig.2.

We should clarified how will conduct itself Hubble constant in a time of development of the Universe and if this development may be explained by the received formulae the introducing of the dark energy isn't needed.

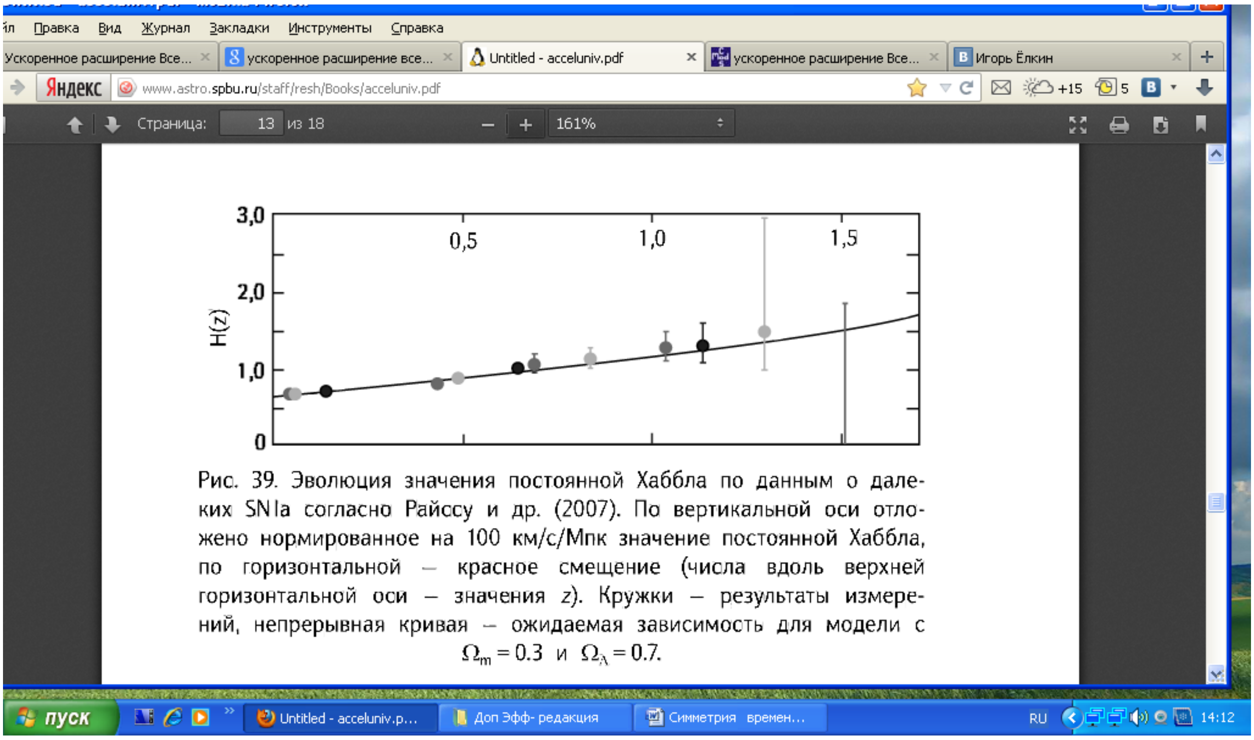
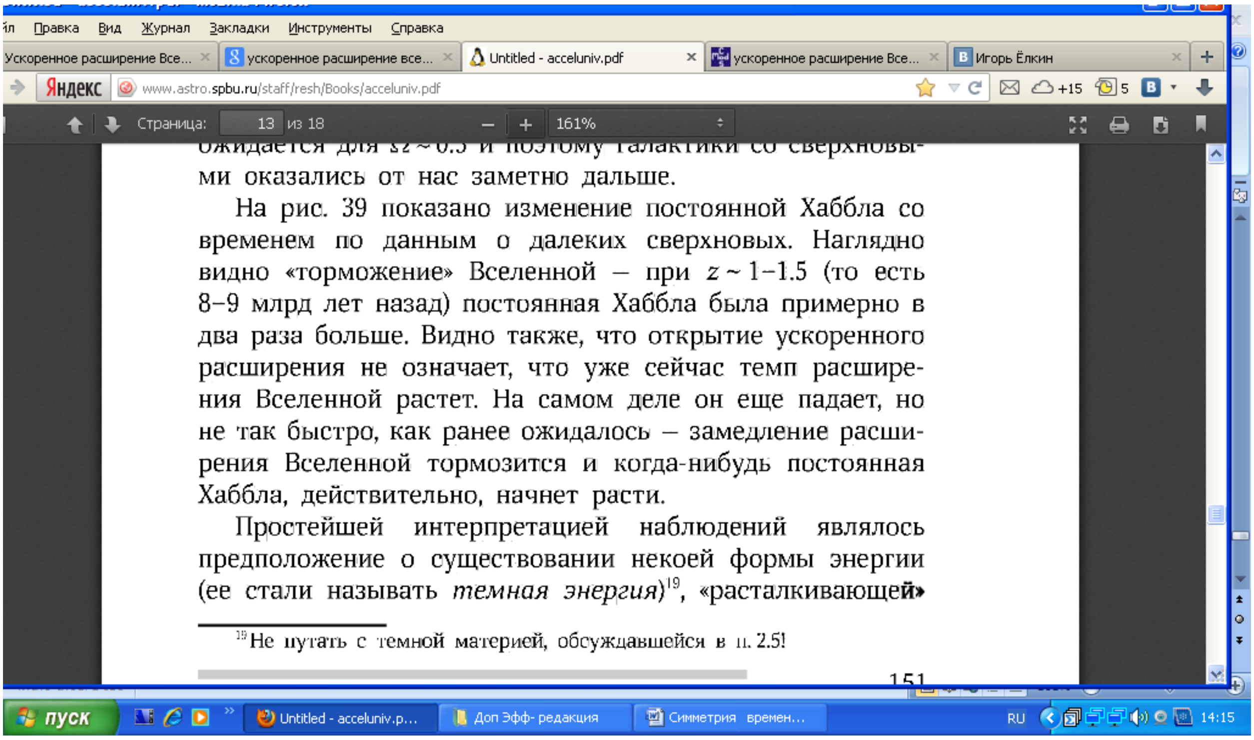


Рис. 39. Эволюция значения постоянной Хаббла по данным о далеких SN Ia согласно Райссу и др. (2007). По вертикальной оси отложено нормированное на 100 км/с/Мпк значение постоянной Хаббла, по горизонтальной — красное смещение (числа вдоль верхней горизонтальной оси — значения z). Кружки — результаты измерений, непрерывная кривая — ожидаемая зависимость для модели с $\Omega_m = 0.3$ и $\Omega_\Lambda = 0.7$.

Fig.1.


ми оказались от нас заметно дальше.

На рис. 39 показано изменение постоянной Хаббла со временем по данным о далеких сверхновых. Наглядно видно «торможение» Вселенной — при $z \sim 1$–1.5 (то есть 8–9 млрд лет назад) постоянная Хаббла была примерно в два раза больше. Видно также, что открытие ускоренного расширения не означает, что уже сейчас темп расширения Вселенной растет. На самом деле он еще падает, но не так быстро, как ранее ожидалось — замедление расширения Вселенной тормозится и когда-нибудь постоянная Хаббла, действительно, начнет расти.

Простейшей интерпретацией наблюдений являлось предположение о существовании некоей формы энергии (ее стали называть *темная энергия*)[19], «расталкивающей»

[19] Не путать с темной материей, обсуждавшейся в п. 2.5!

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Fig.2.

Text:

At the Fig. 39 we can see the change of Hubble constant with Time according to the data about distant Supernovas. “The brakeage” of the Universe is seen graphically - when z=1--- 1,5 (about 8 – 9 milliard years ago) Hubble constant was nearly twice a large.

We see also that the discovery of the accelerated extension doesn’t mean that the tempo of the extension of the Universe increases.

Really it decreases, but not so quickly as it was expected earlier – retardation of expansion of the Universe is slowing down and whenever Hubble constant will start to increase.

The simplest interpretation of the observation was the assumption about the existence of some form of energy (it was started to be called “dark energy”)
We may easily go without “dark energy”. It’s enough to look at the formula in part 1.0. (1):

$$Fcp = -f(1-\frac{u^2}{c^2})\frac{\frac{2uv}{c^2}}{(1-(\frac{uv}{c^2})^2)^2} \qquad (1)$$

It easily transfers in

$$F \to A(1-\frac{u^2}{c^2})\frac{u}{c} \to 0 \qquad (32)$$

$$u \to c$$

The scale of Red shift: from [6]:
z – coefficient from the correlation of wave-length.
H – Hubble constant
r_comov – distance in mega parsecs
time – years (with minus)

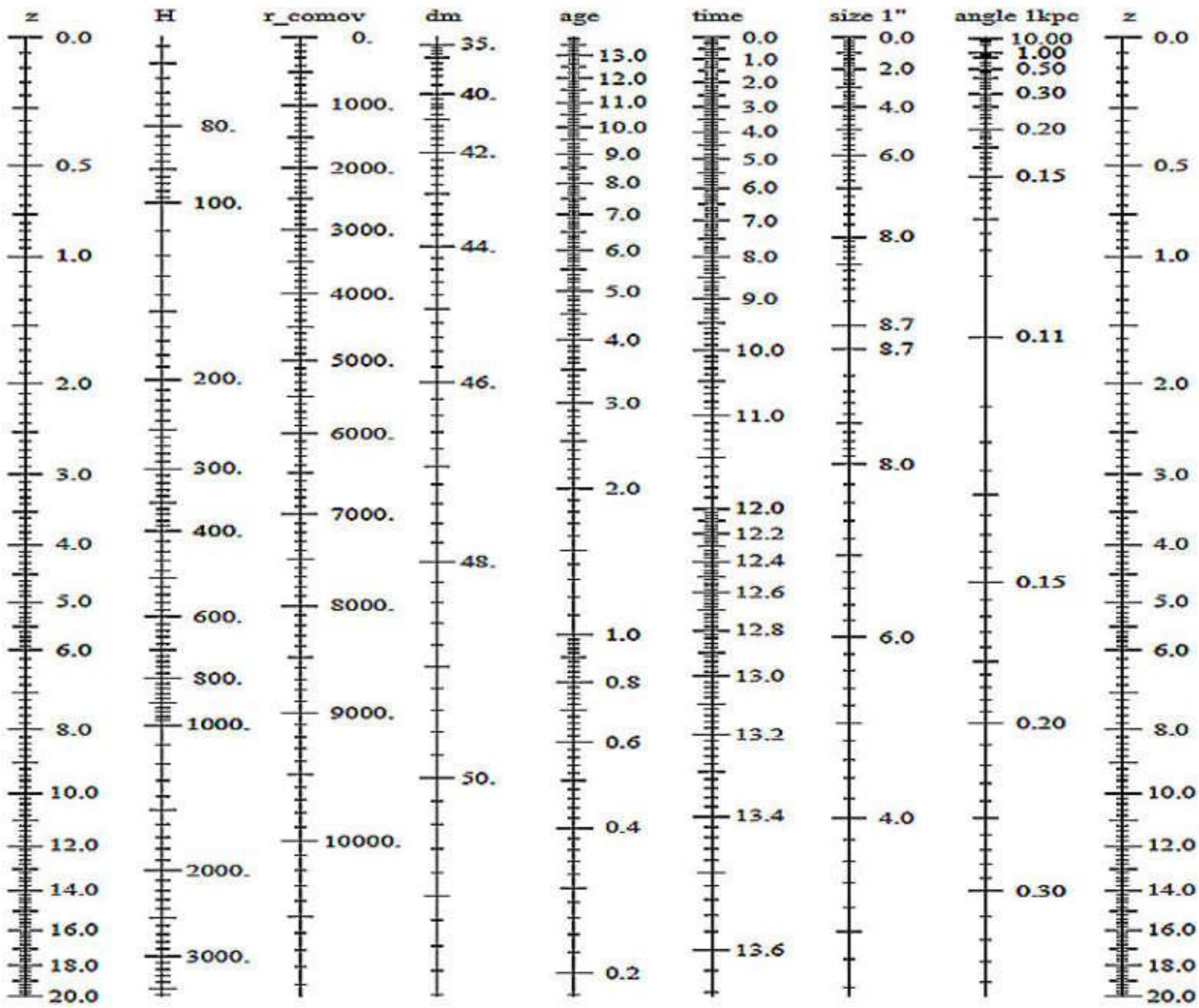

Fig. 3.

1) What factors do make an impact on the speed of recession of material objects?

a)First, it will be remembered that there is a constant recession caused by the geometry of the index R.

b) Mass gain with the distance of the index R^3

c) Decreasing of the gravitation with the distance of the index R^2

So, we see that recession is totally drown rein, when there is no additional factors, that make an impact on the force of gravitation.

2) The explanation of the additional factors that make an impact on the force of gravitation with a help of formulae (1) and (32):

It's easy to see that these formulae give first the decreasing of the force of gravitation of distant objects with increasing of the speed of these objects.

When $u = \frac{c}{\sqrt{3}}$ the force of gravitation begins to decrease, in limit it decreases to zero.

This decreasing of the force of gravitation is understood by our observers-astronomers as the appearance of some separating force that appears because of the activity of some dark energy.

It's difficult to define everything in one article, but it is clear that it is not possible to evaluate the speed using only red shift. Fig.3 shows us that if we'll take distance judgements of cosmologists, then on the distance of about 5000 – 7000 mega parsecs there are significant non-linear deflections. This is if we'll build the graph in axis of distance and age. Apparently, on these exactly distances the speed of recession begins to reach the value of $u = \frac{c}{\sqrt{3}}$, and on these distances gravity action begins to decrease according to the formula (1). Before this distances the gravity action should increase, but we can't see it because the data of dependence of the red shift on the force and on $\tilde{\eta}^{-}$ are combine with each other.

The Literature:

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