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12th March 2004

COMPLEMENT OF COSMOLOGY IN THEORY OF ETHER

Abstract:

In 2 preceding articles, (Thierry Delort, Theory of Ether, Physics Essays, 13,573 (2000)), and (Thierry Delort, Applications of Theory of Ether), we exposed fundamental elements of T.E (Theory of Ether);

In this article C.C.T.E (Complement of Cosmology in T.E), we propose a deepened study of phenomena linked to Astrophysics according to T.E. This article follows the article Applications of Theory of Ether (A.T.E), and it is necessary to have read it before to read the present article.

In particular we study according to T.E the observations concerning a supernova, presented in the article Perlmutter et al, Discovery of a supernova explosion at half the age of the Universe, Nature 391, 51-54 (1998), the evaluation of distances in the Universe, the temperature in the Universe , and the factors that we must take into account in order to obtain the age of the Universe using the law of Hubble.

So this article proposes some new fundamental ideas brought by T.E concerning astrophysics and in particular the Expansion of the Universe.

Key words: Theory of Ether-Explosion of a supernova- intergalactic distances-Expansion of the Universe-Law of Hubble- Age of the Universe-fossil radiation.

Contents

1. INTRODUCTION

In 2 preceding articles (Thierry Delort, Theory of Ether, Physics Essays, 13,573 (2000) and Thierry Delort, Applications of Theory of Ether), we exposed fundamental elements of a modern Theory of Ether (T.E). In this article we interpret new fundamental observations in astrophysics and we deepen T.E concerning astrophysics.

In particular we study the explosion of a distant supernova, according to the observations of Perlmutter (Perlmutter et al, Discovery of a supernova explosion at half of the age of the Universe, Nature 391, 51-54 (1998)). After this we study the variations of temperature in the Universe, and the problem of the experimental obtained distances superior to their theoretical prediction. At the end we study the origin of the perturbations of the Age of the Universe obtained using the Law of Hubble.

So this article is fundamental for the Theory of Ether concerning the interpretation of phenomena linked to astrophysics and in particular the Expansion of the Universe.

It is necessary to have read the article Applications of Theory of Ether before reading the present one (C.C.T.E). Nonetheless the article ELEMENTS OF COSMOLOGY IN THEORY OF ETHER (T.Delort) gathers what is necessary in the article APPLICATIONS OF THEORY OF ETHER in order to understand the present article.

2. POSTULATES AND THEORY

2.1 Recall

In a first article (Thierry Delort, Theory of Ether, Physics Essays, 13,573 (2000)), we presented the Theory of Ether (T.E) concerning phenomena linked to S.R (Special Relativity). We postulated the existence of an absolute fixed Referential E_A . According to this article, Galilean Referentials were Referentials driven with a constant velocity v and in translation relative to E_A. We saw that those Referentials were submitted to a contraction of times and lengths (in the direction of the motion) equal to (**Postulate 2**):

$$C(v) = \sqrt{1 - v^2 / c^2} \qquad (1)$$

In this first article, we also presented **Postulate 7**:

- If a photon has a length of wave λ and is in a region of the space submitted to a factor of expansion f, then its length of wave is submitted to the same factor of expansion f. It becomes:
  $\lambda' = \lambda \times f.$ (2)

- The Universe is like a swelling balloon whose borders move at velocity c.

We assumed also in the above cited articles, that according to T.E, a substance, called also Ether, fills the Universe. We studied more in details some of its fundamental properties in the article Application of Theory of Ether (A.T.E). We saw that this Ether substance should be a massic substance.

In this article A.T.E, we have introduced the interpretation of Astrophysics by T.E.

In particular, we interpreted fossil radiation, and we saw that a point of the Ether substance situated at a distance $\alpha R(t)$ ($0 \leq \alpha \leq 1$) from the center of the Universe, $R(t)$ being the radius of the Universe at time t, was driven with a constant velocity αc relative to the Absolute fixed Referential E_A. Consequently α was independent of t.

We then suppose that a galaxy in a point of the Ether substance is driven with a velocity approximately equal to the velocity of the point of the Ether substance coinciding with it. Then measuring the velocities of Galaxies we can observe the Expansion of the Universe.

We saw also , especially in the article A.T.E, that the earth was near the center of the Universe, consequently its velocity relative to E_A is approximately αc, with α<<1. (We saw that the velocity of the earth relative to E_A was approximately equal to 10^{-3} c).

In the present article Complement of Cosmology in Theory of Ether (C.C.T.E), we complete the interpretation of Astrophysics by T.E.

2.2 Time's contraction

We saw in Postulate 2 (article "Theory of Ether") , that a body driven with a velocity v relative to E_A (Absolute fixed Referential) was submitted to a contraction of its proper time of $C(v)= (1- v^2/c^2)^{1/2}$. This is generalized in astrophysics: We assume that a Galaxy driven with a velocity v relative to E_A is submitted to a contraction of its proper time of $C(v)$.

2.3 Annihilation of classical Doppler Effect

Let us suppose that a photon is emitted by a galaxy G_E and received in a galaxy G_R. In order to obtain the redshift $1+z$ of the received photon , we must take into account the phenomenon described in **Postulate 7**, and also the phenomenon of time contraction. We could have expected that we should have to add the classical Doppler Effect (in $1+v/c$) , but experimental observations bring us to admit that this effect is annihilated if the galaxy emitter and the galaxy receiver are at rest relative to the Ether substance, and this is indeed our hypothesis. So this is a new kind of interaction between the Ether substance and the photons, but we could remark that the **Postulate 7** also described a first kind of interaction between the Ether substance and the photons. The existence of such interactions is natural because the Ether substance is partly responsible of the transmission of photons.

Let us define a classical Doppler Effect compatible with phenomena occurring in our Referential (linked to earth) and also compatible with the previous phenomenon of annihilation:

Let P be a point of the Ether substance. Let us consider a Galilean Referential R' linked to P. Let R'_A be a Referential coinciding with R' but without contraction.

Let us suppose that we have a source driven with a velocity v_{SD} measured in R'_A. We suppose that it emits a photon making an angle θ measured in R'_A with its velocity v_{SD}.Then we have a classical Doppler Effect (measured in R'_A or E_A) having the usual expression:

$$\lambda' = \lambda (1 + v_{SD} \cos(\theta)/c) \qquad (3)$$

We will suppose that v_{SD} is of the order of the velocity of stars in galaxies ($v_{SD} \approx 10^{-3} c$)

We can define the same way an analogous classical Doppler Effect for the receiver.

2.4 Absorption's phenomenon

According to the present theory of Astrophysics, based on General Relativity (G.R), the measured experimental distances of distant galaxies are superior to distances predicted by the Theory. A hypothesis to explain this is the acceleration of the Expansion of the Universe because of a black energy. But this hypothesis does not have a theoretical justification. We will see that also in T.E the presently obtained distances are superior to distances predicted by T.E. But T.E provides a very simple and attractive hypothesis to explain that:

As the Ether substance has a mass, we can suppose that it absorbs a part (small) of photons travelling inside it. Consequently we receive less photons and this brings us to overestimate the distance of galaxies.

2.5 Temperature in the Universe

We saw in the article A.T.E that in each point of Ether we could associate a temperature T, and that in this point, the spectrum of radiation was identical to the spectrum of a black body relative to E_A. We also emitted the hypothesis that this temperature was not necessarily the same in all the Universe, and that it could increase with Energy, meaning when we go away from the center of the Universe.

3. APPLICATIONS

3.1 Interpretation of the observation of a supernova explosion

3.1.1 Observation

In an article (Perlmutter et al, Discovery of a supernova explosion at half the age of the Universe, Nature 391, 51-54 (1998)), the team of Perlmutter studied the explosion of a very distant supernova.

In particular they measured the spectrum emitted by the supernova in function of time. They also measured the redshift $1+z$ of this supernova. They found that the time between typical physical events was dilated from a factor $1+z$. To find this they observed that the curve giving luminosity in function of time was stretched by a factor $1+z$ relative to the curve of equivalent local supernova.

3.1.2 Theoretical interpretation by T.E

We suppose that a celestial object-emitter C , far of the earth ,emits a photon and that we receive this photon on the earth. We suppose that this object- emitter is driven with a velocity v_E relative to E_A. As exposed in the part 2. POSTULATES AND THEORY, we assume that the velocity v_R of the earth- receiver relative to E_A is very small : $v_R << c$. The hypothesis that C is far of the center of the Universe will make us consider that the velocity v_E of C is of the order of c, so $v_R << v_E$.

We also assume that C and the earth are driven with the same velocity as the point of the Ether substance coinciding with them.

We are going to prove that the observations of Perlmutter can be predicted by T.E:

To begin let us establish the expression of the redshift of the photons received on the earth:

We saw in the chapter **2. POSTULATES AND THEORY** that we must take into account the phenomenon of contraction of time.

This phenomenon is expressed by the ratio r_1 in the expression of the redshift $1+z$:

$$r_1 = \frac{\sqrt{1 - v_R^2 / c^2}}{\sqrt{1 - v_E^2 / c^2}} \qquad (4)$$

With the hypothesis that $v_R << c$, this ratio becomes:

$$r_1 \cong \frac{1}{\sqrt{1 - v_E^2 / c^2}} \qquad (5)$$

According to **Postulate 7**, we know that the length of wave of emitted photons increased by a factor r_2 with:

$$r_2 = \frac{D_R}{D_E} \qquad (6)$$

D_E distance between the object-emitter C and the earth-receiver at time of emission t_E of photons, and D_R distance between C and the earth at time of reception

t_R of photons, because the factor of Expansion of the Universe between t_E and t_R is f with:

$$f = \frac{D_R}{D_E} \qquad (7)$$

With our hypothesis that the earth is near the center of the Universe and that $v_R << v_E$:

$$D_R = D_E + v_E t \qquad (8)$$

With $t = t_R - t_E$ is the time measured in E_A between the emission and the reception of the photon.

The exact expression would be :

$$D_R = D_E + Vt \qquad (9)$$

With V velocity of moving away between the earth and C, but with our approximations $V \cong v_E$.

Moreover, the photons travelling at velocity c, and because $v_R << c$:

$$D_E \cong ct \qquad (10)$$

Finally, we have:

$$r_2 \cong \frac{ct + v_E t}{ct} = 1 + v_E / c \qquad (11)$$

We obtain:

$$1 + z = r_1 r_2 \cong \frac{1 + v_E / c}{\sqrt{1 - v_E^2 / c^2}} \qquad (12)$$

This simple formula is new in astrophysics, and is not due to classical Doppler Effect , because we saw in **2. POSTULATES AND THEORY** that this effect was canceled if the object-emitter and the object-receiver were at rest relative to the point of Ether substance coinciding with them. And this was our hypothesis.

Let us now consider 2 typical phenomena P1 and P2 linked to the explosion of a supernova. This means that for a supernova at rest relative to E_A, if T_{A1} and T_{A2} are times measured in E_A in which P1 and P2 respectively occur, T_{A2}- T_{A1} is the same as for all other equivalent supernovas.

For a supernova with a local time different from the Absolute time (time of E_A), we can assume that measured by a clock coinciding with the supernova, the proper time separating P1 and P2 remains always the same, so:

$T'_{E2} - T'_{E1} = T_{A2} - T_{A1}$ (13)

T'_{E1} and T'_{E2} being the times in which P1 and P2 occur in the supernova in motion measured by a clock coinciding with the supernova.

So if we measure in E_A the time separating P1 and P2 for the supernova in motion we have:

$$T'_{A2} - T'_{A1} = \frac{T'_{E2} - T'_{E1}}{C(v)} \qquad (14)$$

Where $C(v)$ is the time contraction for the supernova in motion, and T'_{A1} and T'_{A2} are times separating P1 and P2 measured by clocks fixed in E_A.

Moreover the velocity of the light relative to E_A is c . So if D is the distance of the supernova to the earth at time T'_{A1} (in which P1 occur), an emitted photon is received on the earth at time of reception T_{R1}:

$T_{R1} = T'_{A1} + D/c$ (15)

At T'_{A2} the new distance D' between the earth and the supernova is :

$D' = D + v_E\,(T'_{A2} - T'_{A1})$ (16)

Because again we neglect v_R and the supernova moves away from the earth at velocity v_E.

So if a photon is emitted from the supernova at time T'_{A2} (when P2 occurs), it is received on the earth at time T_{R2}:

$T_{R2} = T'_{A2} + D'/c = T'_{A2} + D/c + (T'_{A2} - T'_{A1})\, v_E/c$ (17)

And:

$$T_{R2} - T_{R1} = T'_{A2} - T'_{A1} + (T'_{A2} - T'_{A1})v_E/c$$

$$= (T'_{A2} - T'_{A1})\,(1 + v_E/c)$$

$$= (T'_{E2} - T'_{E1})\,(1 + v_E/c)$$

$$T_{R2} - T_{R1} = \frac{(T_{A2} - T_{A1})}{C(v_E)}(1 + v_E/c) \qquad (18)$$

And because we have $C(v_E) = (1 - v_E^2/c^2)^{1/2}$, we obtain:

$T_{R2} - T_{R1} = (T_{A2} - T_{A1})\,(1+z)$ (19)

So this is in agreement with the observations of Perlmutter.

3.2 Evaluation of distances in the Universe

We can evaluate the distance of a particular celestial object C measuring the received luminous flux. To begin with, if C is at rest relative to E_A, and F_A is the flux received at a distance R_A of C and F_B is the flux received at a distance R_B of C, measured by an observer at rest in E_A, we obtain by Energy conservation:

$$4\pi R_A{}^2 F_A = 4\pi R_B^2 F_B \qquad (20)$$

Let us now suppose that C is in a distant galaxy. We want obtain its distance from the earth. Again we neglect the velocity of the earth as in the previous Chapter **3.1 Interpretation of the observation of the a supernova explosion.**

We saw in this Chapter two important phenomena:

- Each photon which would have a length of wave λ_0 emitted by an object C at rest is in fact received with the length of wave $\lambda_0\,(1+z)$ by a receiver on the earth.
- Moreover, if 2 physical events would occur separated by a time t_0 in an object C at rest in E_A, the photons indicating them emitted by an object C in motion, are received on the earth separated by a time $t_0\,(1+z)$.

If we remark that the energy of each photon is inversely proportional to its length of wave, we obtain, taking into account the 2 previous phenomena that the flux received on the earth from the moving emitting object C is F' with:

$$F' = \frac{F}{(1+z)^2} \qquad (21)$$

F being the flux emitted by an object identical to C, at the same distance as C, but at rest in E_A. So obtaining F, we can obtain the distance D.

This expression is exactly the same as the one employed in the present theory based on General Relativity.

But it leads to distances that are higher than their theoretical predictions; Some physicists proposed the hypothesis on a black Energy accelerating the Expansion of the Universe, but this hypothesis is not only complex but also there is not yet any theory giving the nature and the origin of this black energy.

According to T.E, if we receive presently a photon from a galaxy, the distance of this galaxy and the earth at the time of emission of the photon cannot exceed $t/2$ (in light-years) , where t is the present age of the Universe.

Let us prove this result: As previously we suppose that the earth is near the center of the Universe , and is driven with a velocity $v_R << c$, that we will neglect.

Let us suppose that we receive presently, at t , a photon from an emitting galaxy G_E , situated at a distance D of the earth (or of the center of the Universe) , at the time of emission t_E.

Then we have:

$t = t_E + D/c$ (22)

Because D/c is the time taken by the photon to travel from G_E to the earth, between t_E and t .

Moreover we know that the velocity v_E of the galaxy is constant, so we have:

$D = v_E.t_E$ (23)

Because D is the distance covered by the galaxy from the beginning of the Universe till the time of emission t_E.

Consequently:

$t = t_E\,(1 + v_E/c)$

$$t_E = \frac{t}{1 + v_E / c} \qquad (24)$$

$$D = \frac{(v_E / c)}{1 + v_E / c}\,tc \quad . \qquad (25)$$

So with the usual notation $\alpha = v_E/c$,

$$D = \frac{\alpha.t.c}{1+\alpha} = \frac{t.c}{((1/\alpha)+1)} \qquad (26)$$

And $1/\alpha > 1$, so $D < tc/2$

So D is inferior to half the age of the Universe. We remark that using the expression of $1+z$, we can obtain v_E then D.

So we see that obtained experimental distances using the present method are also unacceptable for T.E. Nonetheless, there is in T.E a very simple possible explanation of this: Indeed, we know that the Ether substance filling all the Universe is massic.(It has a mass). Consequently it is possible that it absorbs some photons. Then the received luminous flux is attenuated and the distances obtained without taking in account this attenuation seem bigger than they are in reality.

So let us consider some photons travelling in the Universe. If D is the covered distance, we note $a(D)$ the proportion of photons not absorbed by the Ether substance.

Then we have if n is any number:

$a(nD) = (a(D))^n$ (27)

Consequently $a(D)$ must be an exponential law.Indeed, if

$$a(D) = exp\ (-k\ D) \qquad (28)$$

$$a(nD) = exp\ (-knD) = (exp(-kD))^n = a(D)^n \qquad (29a)$$

Here (Equation (27)), we supposed that the Ether substance was homogeneous, which is not true because we have seen that its absolute density decreased with time, and that elements of the Ether substance were driven with a velocity depending on the distance from the centre of the Universe.

Let us suppose in a first hypothesis that Ether substance is homogeneous with an absolute density ρ. So we suppose that elements of the Ether substance are at rest.

If $a(D)$ is the probability that a photon be not absorbed after covering a distance D, and if $dP_A(dD)$ is the probability for the photon to be absorbed after covering dD, we make the simplest hypothesis:

$$dP_A(dD)=adD \qquad (29b)$$

with a is an absorption constant depending only on the medium. (If the medium is homogeneous).
Then we have:

$$a(D+dD) = a(D)(1-dP_A(dD)) = a(D)(1-adD) \qquad (29c)$$

$$a(D)=exp(-aD) \qquad (29d)$$

D being the absolute distance.

If we make the simplest hypothesis that $dP_A(dD)$ is proportional to the quantity of crossed matter , then :

$$a=k_3\rho \qquad (29e)$$

With k_3 a numerical constant and ρ is the absolute density.So:

$$a(D) = exp\ (-k_3\rho D) \qquad (29f)$$

If we consider now that the photon crosses a portion of Ether substance driven with an absolute velocity v in the opposite direction of its own velocity , with the same hypothesis that $dP_A(dD)$ is proportional to the quantity of crossed matter, we obtain easily:

$$dP_A(dD)=k_3\rho\ (v+c)dt_A \qquad (29g)$$

dt_A absolute element of time for covering dD ($dD=cdt_A$)
Then:

$$a(D)=exp(-k_3\rho(1+v/c)D) \qquad (29h)$$

Consequently the absorption increases when we go away from the centre because of the 2 phenomena: Density of the Universe decreases with time (with a factor f^3), and the Ether substance is driven with a velocity opposed to the velocity of a photon propagating towards the centre of the Universe.

With this hypothesis, the flux received on the earth from the celestial object C is:

$$F' = \frac{Fa(D)}{(1+z)^2} \tag{30}$$

With D is the (expected) distance from C to the earth at the time of emission of the photon.

We see that $a(D)$ is inferior to unity , the experimental obtained flux is attenuated, and this makes the obtained distances neglecting $a(D)$ seem bigger than their real value.

In fact we can suppose that $a(D)$ (or the constant k) depends from the medium, meaning the density, temperature, etc of the Ether substance. For instance it would be logic that the higher is the density, the more important is the absorption.

3.3 Temperature in the Universe

We saw in the article Thierry DELORT, Applications of T.E, that we could define a temperature T in each point of the Universe, and that there was a blackbody radiation relative to the Absolute Referential E_A.

Moreover, we saw that if the expansion of the Universe was described by a factor f, then the temperature also decreased from a factor f: it became $T' = T/f$.

As we remarked in this article, the temperature is not necessarily the same in the entire Universe (at a defined age of the Universe), we could expect that it increases with the Energy, or equivalently when we go further and further from the center of the Universe. We saw that the Energy of an object driven with a velocity v relative to E_A was increased by a factor $1/C(v)$ relative to its Energy at rest. If we apply this to an element of the Ether substance driven with a velocity v_E, we see that the Energy of motion increases from a factor $1/C(v_E)$ in the Universe.

So if we admit that the temperature is not the same in all the Universe, the simplest hypothesis is that it increases from the same factor $1/C(v_E)$, v_E being the velocity of an element of the Ether substance coinciding with the point in which we measure temperature. We are going to study the temperature with this hypothesis:

Let us consider a celestial Object C (cloud of dust..;) situated at a distance $D(t_E)$ from the earth at a time t_E (measured in E_A) of emission of photons. We suppose that its velocity relative to E_A is $v_E >> v_R$. Considering that the earth is near the center of the Universe, we neglect its velocity v_R. Let us suppose that we can obtain from the aspect of C its temperature $T_E(t_E)$ at the time t_E of emission of the photon.

With our hypothesis of increasing temperature we have, if $T_0(t_E)$ is the temperature at time t_E on the earth:

$$T_E(t_E) = \frac{T_0(t_E)}{C(v_E)} = \frac{T_0(t_E)}{\sqrt{1 - v_E^2 / c^2}} \qquad (31)$$

Moreover, between t_E and t_0 (t_0 present age of the Universe), the Universe expands of a factor *f*:

$$f = \frac{D(t_0)}{D(t_E)} \qquad (32)$$

$D(t_0)$ distance between the earth and C at the present age (t_0)
$D(t_E)$ distance between the earth and C at time of emission t_E.

And we have as in the previous Chapters:

$$D(t_0) = D(t_E) + v_E(t_0 - t_E) \qquad (33)$$

$$D(t_E) = c(t_0 - t_E) \qquad (34)$$

Consequently:

$$f = \frac{D(t_0)}{D(t_E)} = 1 + v_E / c \qquad (35)$$

Consequently the temperature of the earth at the present time t_0 is:

$$T_0(t_0) = \frac{T_0(t_E)}{f} \qquad (36)$$

$$T_0(t_0) = \frac{T_E(t_E) C(v_E)}{f} \qquad (37)$$

$$T_0(t_0) = \frac{C(v_E)}{1 + v_E / c} T_E(t_E) \qquad (38)$$

$$T_0(t_0) = \frac{T_E(t_E)}{1 + z} \qquad (39)$$

According to the expression of $1+z$, Equation (12). It is possible to interpret the increasing of temperature in Equation (31) using the fact that Ether substance can be considered as obeying to the law of ideal gas.

3.4 Evaluation of the Age of the Universe –Different kinds of perturbation

3.4.1 Obtainment of the age of the Universe neglecting all perturbations

We suppose that a Galaxy emitter G_E emits a photon received by our Galaxy G_R . We suppose that G_R and G_E are at rest relative to their respective points of the Ether substance coinciding with them. Consequently we neglect classical Doppler Effect described in 2. POSTULATES AND THEORY. We saw in the article Thierry Delort, Applications of T.E, that because of the Expansion of the Universe G_E and G_R moved away at a constant velocity *V*, and consequently:

$$V = \frac{D}{t} \qquad (40)$$

With *D* distance between G_R and G_E at the age of the Universe t.
With the approximation that the redshift is:

$$1 + z = 1 + V/c \qquad (41)$$

This approximation is obtained the following way: Because of the phenomenon described in **Postulate 7**, the length of wave of the emitted photon is increased by a factor *f* , factor of expansion of the Universe between the time t_E of emission and the time t_R of reception. If D_E and D_R are respectively the distance of G_R and G_E at t_E and t_R, we have:

$$f = \frac{D_R}{D_E} \qquad (42)$$

Because G_E and G_R move away at velocity *V*:

$$D_R = D_E + V\,(t_R - t_E) \qquad (43)$$

And if we consider that G_R is at rest relative to E_A (Because it contains the earth, which is supposed to be near the center of the Universe):

$$D_E = c(t_R - t_E) \qquad (44)$$

And consequently:

$$f = 1 + V/c \qquad (45)$$

Then we obtain the red shift:

$$1 + z = f = 1 + V/c \qquad (46)$$

If *H* is the Hubble ‘s constant:

$$V = HD \qquad (47)$$

We obtain with the previous approximations:

$$t = \frac{1}{H} \qquad (48)$$

With t age of the Universe.

But if fact our approximations must be taken into account and we have different kinds of perturbations that we are going now to expose:

3.4.2 1^st^ kind of perturbation

In fact, in the formula $V=D/t$, t is the Age of the Universe at the time of emission t_E (corresponding to the measured distance D_E, distance between G_E and G_R at time of emission t_E). So in order to obtain the Age of the Universe, we must add to t_E the t_T time taken by light for going from G_E to G_R. And if t_0 is the Age of the Universe:

$$t_0 = t_T + t_E \qquad (49)$$

Neglecting the velocity of G_R relative to E_A (because we suppose that G_R is our Galaxy containing the earth:

$$t_T = \frac{D_E}{c} \qquad (50)$$

Moreover D_E is the distance between G_E and G_R at time t_E, and because they move away at constant velocity V:

$$D_E = Vt_E \qquad (51)$$

Consequently:

$$t_0 = t_E(1+V/c) = \frac{1+V/c}{H_E} \qquad (52)$$

H_E being the obtained experimental Hubble's Constant:

$$H_E = \frac{V}{D_E} = \frac{1}{t_E} \qquad (53)$$

This is the first kind of perturbation, we note that if $V<<c$, it is negligible, but for V/c = 10%, the perturbation of the Age of the Universe is also 10%.

3.4.3 Perturbation due to time contraction

In the Chapter **3.1 Interpretation of the observation of a supernova explosion** we saw that a factor $C(v_R)/C(v_E)$ had to be included in the expression of the redshift $1+z$, due to the contractions of time. (We recall: $C(v) = (1-v^2/c^2)^{1/2}$)

For instance let us suppose that v_R and v_E are the velocities of G_R and G_E in E_A, and that G_R and G_E are in the same radius of the Universe , so that $\mathbf{v}_E // \mathbf{v}_R$ and:

$V = v_E - v_R$ (54)

(We will see that the obtained perturbation depends only from V , with our approximation $v_R << c$)

So we must include in the redshift $1 + z$ the factor r_1:

$$r_1 = \frac{C(v_R)}{C(v_E} = \frac{C(v_R)}{C(V + v_R)} \qquad (55)$$

Supposing that $v_R^2/c^2 << 1$ and $V^2/c^2 << 1$, we obtain:

$$r_1 \cong 1 + \frac{(V^2/c^2)}{2} - \frac{Vv_R}{c^2} \qquad (56)$$

Consequently:

$$1 + z = (1 + V/c)r_1 \qquad (57a)$$

$$1 + z = 1 + (V/c)(1 + \frac{(V/c)}{2} - (v_R/c)) \qquad (57b)$$

So if V/c = 10%, the perturbation concerning V and the Age of the Universe is about 5%. As we said in the Chapter 2.POSTULATES AND THEORY, v_R is of the order of $10^{-3}c$ .We remark that provided that $v_R << V$, the expression of $1+z$ is in the same order in V^2/c^2. (When G_E and G_R are not on the same radius, and when we have not $\mathbf{v}_E // \mathbf{v}_R$).The correction due to v_R/c is of the order of v_R/c (10^{-3}) and is consequently negligible.

3.4.4 Perturbation due to the motion of the observer

We have made the approximation, with previous notations:

$D_E = c\ (t_R - t_E)$ (58)

But in fact, this is not true if the Observer is not at rest, meaning $v_R \neq 0$.

For instance in the previous case, if $\mathbf{v}_R // \mathbf{v}_E$, and the vectors $\mathbf{v}_R$ and $\mathbf{v}_E$ are in the same direction, G_R has moved at velocity v_R towards G_E from the time of emission t_E till the time of reception t_R. Consequently, we have:

$D_E = c(t_R - t_E) + v_R(t_R - t_E)$ (59)

And the correction of the redshift due to this perturbation is, instead of equation (41):

$1+z = 1 + (1 - v_R/c)V/c$ (60)

Of course, the expression changes when the vectors $\mathbf{v}_E$ and $\mathbf{v}_R$ do not have the same direction. Consequently , this leads of an uncertainty of the order of v_R/c (10^{-3}) concerning the Age of the Universe.

3.4.5 Perturbation due to the absorption of photon's phenomenon

In order to get H_E, the experimental Hubble's Constant, we need to evaluate D_E, distance between G_E and G_R at time of emission t_E. And we have seen in 2.Postulates and Theory and in 3.2. Evaluations of distances in the Universe, that the Ether substance absorbed photons. Consequently the distance obtained with the present method is superior to the real distance, and this effect increases when distances increase. So this implies a perturbation concerning the obtention of the Age of the Universe.

3.4.6 Perturbation due to classical Doppler Effect

We saw in Chapter 2.POSTULATES AND THEORY, the existence of a classical Doppler Effect of the order of $1 + v_{SD}/c$, with v_{SD} velocity of the source relative to the point of the Ether substance coinciding with it; We assumed that this velocity was of the order of $10^{-3}\,c$. Consequently there is an uncertainty of the order of v_{SD}/V concerning velocity V using the redshift $1+z$,and consequently concerning the Hubble's Constant (from which we obtain the Age of the Universe) due to this classical Doppler Effect.

3.4.7 Case of the earth

In fact we saw that those perturbations were canceled if the distance between G_E and G_R was very small. But the problem is that it is not true for the classical Doppler Effect, which is more important if V , velocity of moving away between the 2 Galaxies, (or equivalently D_E) is small.

If we take into account only perturbations due to dilatation of time (3.4.3) and the perturbation described in (3.4.2), neglecting other perturbations, then we have to increase the obtained experimental age of the Universe(inverse of the experimental Hubble constant) of about $1.5v/c$.

For instance if we take $v/c=10\%$, and if we obtain the Hubble constant equal to 1/15 billion years, the age of the Universe is in reality between 16 and 17 billion years.

4. DISCUSSION

To begin with let us comment the new theoretical elements brought in this article:

The fact that the Ether substance absorbs a part of photons is very understandable. It is a massic substance (substance having a mass), and consequently it could absorb photons, as any massic medium (atmosphere, water…). As we said, the experimental distances obtained with the presently admitted theory, based on General Relativity, are also superior to their value predicted by this Theory. There is the hypothesis of a black energy accelerating the Expansion of the Universe, but the nature and origin of this black energy are completely unknown, and the hypothesis of absorption is much more attractive and simpler.

It is necessary to assume that the classical Doppler Effect is annihilated when the emitter or the receiver of the photon are at rest relative to the Ether substance in order to explain observations. This effect permits to interpret the observations of Perlmutter. Also in absence of this effect of absorption, velocities obtained using the redshift would be divided by a factor 2 , and consequently the Age of the Universe (obtained using the Law of Hubble) would be doubled . This effect indicates a new kind of interaction between the Ether substance and the photons, and the existence of such interactions is natural, because the Ether substance is a medium partly responsible of the transmission of photons. We saw another kind of such interaction in Postulate 7.

In this article, we saw that most of the obtained results were due to the fact that the earth is near the center of the Universe. We presented in the article A.T.E (Applications of T.E) several experimental observations which also implied that the earth was near the center of the Universe. If it was not the case, we could not have interpreted the observations of Perlmutter, observations of temperature in distant galaxies or have neglected the velocity of the Galaxy receiver in order to get the Age of the Universe using the Law of Hubble.

In this article and the previous article A.T.E, we saw that T.E permitted an interpretation of astrophysics much more attractive than the interpretation of the present Theory based on General Relativity. Let us summarize the main aspects of T.E that make it more attractive than G.R (Concerning its interpretation of Astrophysics):

We saw that in T.E, the form of the Universe is very simple and unique. On the contrary in the classical theory, many different topologic forms are possible, most of them very complex. Moreover, mathematics used in T.E to interpret astrophysics are very simple, they do not need the use of complex tensors as in astrophysics. We also proposed a very simple expression of the redshift 1+z (See 3.1 Interpretation of the Observation of a supernova explosion), which does not exist in the classical Theory. We remark that according to T.E, the Universe is flat whatever be the density, and according to G.R, the Universe is flat only if the density is equal to the critical density, and nothing explains why the real density is equal to the critical density, because the Universe is flat.

Moreover, contrary to G.R, T.E does not need the complex phenomenon of inflation to explain the isotropy of the fossil radiation, and to interpret the existence of a privileged Referential for this fossil radiation. We saw also in the article A.T.E that T.E permits to obtain an Age of the Universe of around 15 billion years in agreement with the age of the oldest stars, contrary to G.R , in which the obtained age is around 10 billion years. Also according to T.E, the Universe is finite, and the velocities of Galaxy are always inferior to *c*. According to G.R, the Universe is not necessarily finite, it is often admitted that it is infinite because the Universe is flat and in that case, some galaxies can move away at velocities much superior to *c* ,because of the Law of Hubble.

We saw also that T.E interprets the overestimation of intergalactic distances without the need of an hypothetical black energy accelerating the Universe, and also the origin of black mass and the constant velocities of stars in galaxies.

5. CONCLUSION

So in this article we showed how T.E interpreted new phenomena in astrophysics.

As in the preceding article A.T.E (Thierry Delort, Applications of T.E), we saw that mathematics necessary to interpret phenomena linked to astrophysics are much simpler than those needed in the classical Theory based on G.R. Despite of this, the new obtained results are much more precise, we obtain a very simple new formula of the redshift 1+z for photons received on the earth.

We also gave a simple interpretation of the overestimation of distances in the Universe, and this explanation is so far the only one to be complete. To end in IV) discussion , we gathered the main points that make T.E more attractive than G.R in order to interpret astrophysics. (simplicity and unicity of the model, Age of the Universe in agreement with the age of oldest stars, flat Universe, no need of inflation phenomenon…)

Résumé

Dans 2 précédents articles, (Thierry Delort, Theory of Ether, Physics Essays ,13,573 (dec 2000), et (Thierry Delort, Applications of Theory of Ether)(A.T.E) , on a exposé les éléments fondanentaux d'une Théorie de l'Ether moderne.

Dans le présent article, Complement of Cosmology in Theory of Ether, on approfondit l'étude des phénomènes liés à l'asrophysique par la T.E. Cet article est la suite de l'article A.T.E qu'il est nécessaire d'avoir lu avant (le présent article).

Dans cet article, on interprète par la T.E l' observation de l'explosion d'une supernova dans une galaxie éloignée, à partir de l'article Pelmutter et al,Discovery of a supernova explosion at half the Age of the Universe, Nature 391,51-54 (1998), et aussi l'évaluation des distances dans l'Univers, la température dans l'Univers et les facteurs intervenant dans l'étude de l'age de l'Univers à partir de la loi de Hubble.

Ainsi, cet article propose des idées fondamentales et nouvelles apportées par la T.E sur l'astrophysique et notre connaissance de l'Univers.

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