Title :ETHER,DARK MATTER AND TOPOLOGY OF THE UNIVERSE
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Abstract:

The idea of the existence of ether has been abandoned after the theory of relativity was accepted. It appears that the existence of an ether, compatible with the main points of the classical standard Cosmological model, permits to solve some enigmas of the present Cosmological model that are very important, for instance the enigma connected to dark matter or to fossil radiation. In this article we show how the existence of ether, being compatible with the classical standard Cosmological model, permits to solve those enigmas. In particular we show how it can give the nature of dark matter, the origin of its invisibility, the curve of velocities of stars in galaxies (constant) and the baryonic Tully-Fisher's law. We will also justify a very simple topological form of the Universe and the position of our galaxy inside this Universe. We will also give the possible nature of the enigmatic dark energy.
Key words: Tully-Fisher's law, dark matter, fossil radiation, ether.

1.INTRODUCTION

Before the theory of Relativity be accepted, the idea of the existence of an Ether was admitted. It was admitted that a medium at rest filled all the space, in which propagated electromagnetic waves, and defining an absolute Referential.

After the Michelson and Morley experiment, Einstein proposed the following Principle of Special Relativity: "All the physical laws have the same expression in all the inertial frames (Galilean Referentials)."

If this Principle was true, then the existence of an ether seems to be useless, because we cannot detect it.

In fact we are going to see how the existence of ether is fundamental in Cosmology, and moreover how some observations in Cosmology connected to fossil radiation contradict the Principle of Special Relativity.

So we admit all the cosmological standard model, in particular the following fundamental points:

1.The Universe is isotropic (observed from our galaxy) and in expansion.

2.The factor of expansion 1+z interacts with the length of wave of photons and with intervals of time exactly the same way as in classical Cosmology. Moreover, it is obtained using the equations of general Relativity used in classical Cosmology (2nd model).

3. The Big-Bang existed, and fossil radiation comes from the Big-Bang.

In this article, we will use basic theoretical elements of the classical standard Cosmological model [(5)(6)].

We will also make 2 fundamental hypothesis expressing the existence of ether:

A.At any point of the space, it exists a very particular local Referential, called "local Ether". Those local referentials define absolute time (indicated by clocks at rest in those referentials) that is the age of the Universe, and local distances (indicated by rules at rest in the local Referentials). If D is the local distance covered by a photon within an absolute time T, D=cT. (This means that locally the velocity of light relative to this local Ether is equal to c and we obviously admit that physical laws have their classical expressions expressed in the local Ether).

B.The vacuum is filled by a substance, called “ether-substance”. It owns a mass and can be modeled as an ideal gaz.
We see that the points 1,2,3 of classical Cosmology (and experiments connected to Relativity) are a priori compatible with the hypothesis A,B of the existence of Ether. We see also that there are 2 kinds of ether: The 1^{st} kind is an absolute Referential, the 2^{nd} kind is a substance filling all the vacuum. In fact we will see that our interpretation of dark matter brings us to obtain a spherical Universe. This Universe is isotropic observed from our galaxy.

We are going to show how those hypothesis A and B permit to solve enigmas connected to dark matter and to fossil radiation.

2. DARK MATTER

2.1 Nature of Dark matter-Its invisibility.

If we admit that the ether-substance has a mass, then it is clear that dark matter could be constituted of ether-substance. So this gives the nature of dark matter and the origin of its invisibility, because it constitutes what we call the vacuum.

2.2 Curves of velocity of stars in galaxies.

If we model the ether-substance as an ideal gas, and if we consider that galaxies are concentrations of ether-substance, we obtain that the velocity of stars is independent of their distance to the center, this constituting an enigma of classical Cosmological standard model.

So we make the following hypothesis that the ether-substance can be modeled as an ideal gas:

An element of Ether-substance with a mass m, a volume V, a pressure P and a temperature T verifies the law, k_0 being a constant:

$$PV=k_0mT \qquad (1)$$

Which means, setting $k_1=k_0T$:

$$PV=k_1m \qquad (2)$$

Or equivalently, ρ being the density of the element:

$$P=k_1\rho \qquad (3a)$$

We then emitted the hypothesis that a galaxy could be modeled as a concentration of Ether-substance presenting a spherical symmetry, at a constant and homogeneous temperature T.
We then considered the sphere S(r) (resp.the sphere S(r+dr)) that is the sphere inside the concentration of Ether-substance with a radius r (resp. r+dr) and whose the center is the center O of the galaxy. S(O,r) is the full sphere of radius r and of center O.

S(O,r) (full sphere)

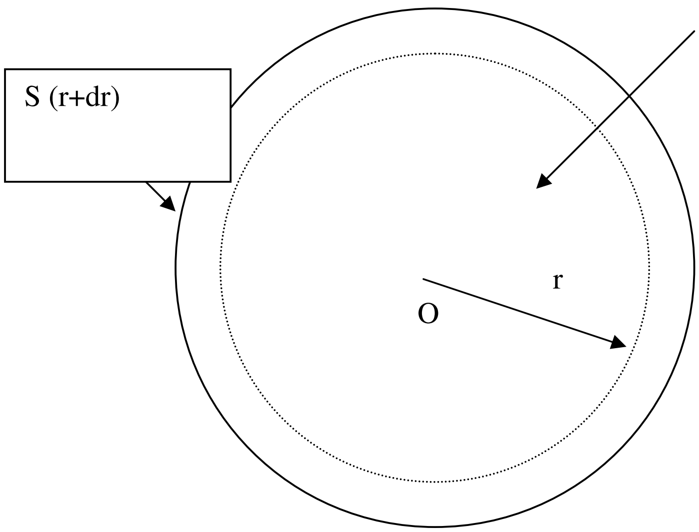

Figure 1:The galaxy concentration of ether-substance

The mass M(r) of the full sphere is given by:

$$M(r) = \int_0^r \rho(x) 4\pi x^2 dx \qquad (3b)$$

We then consider the following equation (4) of equilibrium of forces on an element of Ether-substance with a surface dS, a width dr, situated between the 2 spheres S(O,r) and S(r+dr):

$$dSP(r+dr) + \frac{G}{r^2}(\rho(r) dSdr)(\int_0^r \rho(x) 4\pi x^2 dx) - dSP(r) = 0 \qquad (4)$$

Eliminating dS, we obtain the equation:

$$\frac{dP}{dr} = -\frac{G}{r^2}(\rho(r))(\int_0^r \rho(x) 4\pi x^2 dx) \qquad (5)$$

And using the equation (3), we obtain the equation:

$$k_1 \frac{d\rho}{dr} = -\frac{G}{r^2}(\rho(r))(\int_0^r \rho(x) 4\pi x^2 dx) \qquad (6)$$

We then verify that the density of the ether-substance ρ(r) satisfying the preceding equation of equilibrium is:

$$\rho(r) = \frac{k_2}{4\pi r^2} \qquad (7)$$

The constant k_2 being given by, G being the Universal attraction gravitational constant:

$$k_2 = \frac{2k_1}{G} = \frac{2k_0 T}{G} \qquad (8)$$

Using the preceding equation (7), we obtain that the mass M(r) of the sphere S(O,r) constituted of Ether-substance is given by the equation:

$$M(r) = \int_0^r 4\pi x^2 \rho(x) dx = k_2 r \quad (9)$$

We then obtain, neglecting the mass of stars in the galaxy, that the velocity v(r) of a star of a galaxy situated at a distance r from the center O of the galaxy is given by $v(r)^2/r = GM(r)/r^2$ and consequently :

$$v(r)^2 = Gk_2 = 2k_1 = 2k_0 T \qquad (10)$$

So we obtain in the previous equation (10) that the velocity of a star in a galaxy is independent of its distance to the center O of the galaxy, solving the 3rd enigma concerning dark matter. (We previously solved the enigma of the nature of dark matter and of its invisibility).

We note that the theoretical elements of the new Cosmology permitting to obtain the equations (7)(8)(9)(10) are compatible with Special and General Relativity Principles.

2.3 Tully-Fisher's law.

2.3.1 Recall.

We remind that the Tully-Fisher's law is the following:
Tully and Fisher realized some observations on spiral galaxies. They obtain that the luminosity L of a spiral galaxy is proportional to the 4th power of the velocity v of stars in this galaxy. So we have the Tully-Fisher's law for spiral galaxies, K_1 being a constant:

$$L = K_1 v^4 \qquad (11)$$

But the baryonic mass M of a spiral galaxy is proportional to its luminosity. So we have also the law for a spiral galaxy, K_2 being a constant:

$$M = K_2 v^4 \qquad (12)$$

This 2nd form of Tully-Fisher's law is known as the *baryonic Tully-Fisher's law*.

We remind that the Tully-Fisher's law (11) is not verified in general for galaxies that are not spiral galaxies. But the observations of Mc Gaugh [(1)] show that the baryonic Tully-Fisher's law (12) seems to be true for all galaxies. This constitutes a new major enigma for the classical Cosmology, but we are going to see how we can derivate this law from the existence of ether-substance.

2.3.2 Theory of quantified loss of calorific energy (by nuclei).

We saw in the previous equation (10) that according to the new Cosmology, the square of the velocity of stars in a galaxy is proportional to the temperature of the concentration of Ether-substance constituting this galaxy. So if we determine this temperature T, we then obtain the squared velocity of the stars in this galaxy. So we need to try to determine T:

-A first possible idea is that the temperature T is the so called "Temperature of the fossil radiation". But this is impossible because it would imply that all stars of all galaxies are driven with the same velocity and we know that it is not the case.
-A second possible idea is that the temperature T is due to the absorption by the concentration of Ether-substance constituting the galaxy of a fraction of the photons emitted by the stars of this galaxy. But if it was the case, the temperature and consequently the velocity of the stars of the galaxy would only depend on the luminosity of the galaxy, and we should have a law analogous to the Law of Tully-Fisher (11) and we know that it is not the case.
-A third possible idea is that in any galaxy, each baryon interacts with the Ether-substance constituting the galaxy, and consequently it occurs for each baryon a loss of calorific energy communicated to the Ether-substance.
A priori we could expect that this loss of calorific energy for each baryon (transmitted to the Ether-substance) depend on the temperature of this baryon, but if it was the case, the total calorific loss for all baryons would be extremely difficult to calculate and moreover we would not obtain that the total calorific loss depend on the baryonic mass of the galaxy.

The final idea is that indeed it occurs a calorific loss for each atom (transmitted to the Ether-substance), but that this loss is quantified, depending only on the number of the nucleons of the nucleus of the atom. This loss should be very low, but the calorific capacity of the Ether-substance being also very low, it can involve an appreciable temperature of the concentration of Ether- substance constituting the galaxy.
So we make the following hypothesis:

HYPOTHESIS OF QUANTIFIED CALORIFIC LOSS (OF BARYONS):
We make the following Hypothesis Ca):
-Each nucleus of atom in a galaxy is submitted to a loss of calorific energy, transmitted to the concentration of Ether-substance constituting the galaxy.
-This loss of calorific energy depends only on the number of nucleons constituting the nucleus (It is independent of its temperature). So if p is the power corresponding to the loss of calorific energy for a nucleus of atom with n nucleons, it exists a constant p_0 (loss of calorific energy per nucleon) such that:

$$p=np_0 \qquad (13)$$

According to the equation (13), the total power corresponding to the loss of calorific energy by all the atoms in a galaxy is proportional to the number of nucleons of the whole of those atoms, and consequently to the baryonic mass of this galaxy. So if m_0 is the mass of one nucleon, M being the baryonic mass of the galaxy, we obtain according to the equation (13) that the total power P_r corresponding to the calorific energy received by the concentration of Ether-substance constituting the galaxy from all the atoms is given by the following equation, K_3 being the constant p_0/m_0:

$$P_r=(M/m_0)p_0=K_3M \qquad (14)$$

Concerning the preceding Hypothesis of quantified loss of calorific energy, it is important to remark:
-The loss of calorific energy of a baryon transmitted to the Ether-substance is a quantum phenomenon, consequently it is not surprising that the power corresponding to the loss of calorific energy of a baryon be quantified.

-In physics of thermal transfer, the calorific loss of one or several particles usually depend on their temperature. But it is always only thermal transfers from atoms towards other atoms that are considered, and consequently it is not compulsory that it be also the case for transfers between atoms and Ether-substance.
-It is possible that this hypothesis be true only for atoms whose temperature be superior to a given temperature T_S. Moreover, their temperature must be superior to the local temperature of the Ether-substance.
-The great simplicity of this hypothesis permits to obtain very easily the total power corresponding to calorific energy received by the concentration of Ether-substance (Equation (14)). If the loss of energy of a nucleus of atom depended on its temperature, then it would be incomparably more complicated, and maybe impossible, to obtain a simple expression giving this total power.
-This hypothesis is a priori compatible with the Special and General Relativity Principles, and also with classical Quantum Physics.

2.3.3 Obtainment of the baryonic Tully-Fisher's law.

In agreement with the previous model of galaxy, we model a galaxy as a concentration of Ether-substance presenting a spherical symmetry (and consequently being itself a sphere), at a temperature T and immerged inside a medium constituted of Ether-substance at a temperature T_0 and with a density ρ_0.

In order to obtain the radius R of the concentration of Ether-substance constituting the galaxy, it is logical to make the hypothesis of the continuity of $\rho(r)$: R is the radius for which the density $\rho(r)$ of the concentration of Ether-substance is equal to ρ_0. So we have the equation:

$$\rho(R)=\rho_0 \qquad (15)$$

Consequently we have according to the equations (7) and (8):

$$\frac{k_2}{4\pi R^2} = \rho_0 \qquad (16)$$

$$\frac{2k_0 T}{G} \times \frac{1}{4\pi R^2} = \rho_0 \qquad (17)$$

So we obtain that the radius R of the concentration of Ether-substance constituting the galaxy is given approximately by the equation:

$$R = (\frac{2k_0 T}{4\pi G\rho_0})^{1/2} = K_4 T^{1/2} \qquad (18)$$

The constant K_4 being given by :

$$K_4 = (\frac{2k_0}{4\pi G\rho_0})^{1/2} \qquad (19)$$

We can then consider that the sphere with a radius R of Ether-substance constituting the galaxy is in thermal interaction with the medium at a temperature T_0 in which it is immerged. We make the hypothesis C)b):

The thermal interaction between ether-substance constituting the galaxy and surrounding intergalactic ether-substance is a convection phenomenon.

We know that if φ is the thermal flow of energy on the borders of the sphere, the power P_l lost by the sphere of Ether-substance constituting the galaxy is given by the equation:

$$P_l=4\pi R^2\varphi \qquad (20)$$

But we know that for a convection phenomenon between a medium at a temperature T and a medium at a temperature T_0 the flow φ between the 2 media is classically given by the expression, h being a constant depending only on ρ_0:

$$\varphi=h(T-T_0) \qquad (21)$$

Consequently the total power lost by the concentration of Eher-substance is:

$$P_l=4\pi R^2 h(T-T_0) \qquad (22)$$

We can consider that at the equilibrium, the thermal power P_r received by the concentration of Ether-substance constituting the galaxy is equal to the thermal power P_l lost by this concentration. Consequently according to the equations (14) and (22), M being the baryonic mass of the galaxy, we have:

$$K_3M=4\pi R^2 h(T-T_0) \qquad (23)$$

Using then the equation (18) :

$$K_3M=4\pi K_4^2 hT(T-T_0) \qquad (24)$$

Making the approximation $T_0<<T$:

$$M=4\pi\frac{K_4^2}{K_3}hT^2 \qquad (25)$$

Consequently we obtain the expression of T, defining the constant K_5 :

$$T=\left(\frac{K_3}{4\pi K_4^2 h}\right)^{1/2}M^{1/2}=K_5M^{1/2} \qquad (26)$$

And then according to the equation (10) :

$$v^2=2k_0T=2k_0K_5M^{1/2} \qquad (27)$$

So :

$$M = (\frac{1}{2k_0 K_5})^2 v^4 \qquad (28a)$$

So we finally obtain :

$$M=K_6 v^4 \qquad (28b)$$

The constant K_6 being defined by:

$$K_6 = (\frac{1}{2k_0 K_5})^2 = \frac{4\pi K_4^2 h}{4k_0^2 K_3}$$

$$K_6 = \frac{4\pi h}{4k_0^2 K_3} \times \frac{2k_0}{4\pi G\rho_0}$$

$$K_6 = \frac{m_0 h}{2k_0 G\rho_0 p_0} \qquad (28c)$$

So we obtain the baryonic Tully-Fisher's law (12), with $K_2=K_6$. It is natural to assume that h depends on ρ_0. The simplest expression of h is $h=C\rho_0$, C being a constant. With this relation, K_6 is independent of ρ_0, and we can use the baryonic Tully-Fisher's law in order to define candles used to evaluate distances in the Universe.

2.4 Temperature of the ether-substance.

So we saw that in our interpretation of dark matter, according to the equation (10), the temperature of the ether-substance constituting a galaxy is proportional to the squared velocity of the stars in this galaxy.
We have seen that this temperature could not be the temperature of fossil radiation, because it would then imply that the velocity be always the same.
We could also suppose that this temperature is superior to the temperature of fossil radiation, considering that this temperature of fossil radiation is the temperature T_0 used in equation (21), but then we find a new problem:
According to observation, the velocities of stars for different galaxies can vary with a factor 10. This implies that the temperature of galaxies vary with a factor 100. Consequently if in the equation (21) T_0 was the temperature of fossil radiation (2,73 °K), the temperature of some galaxies should be more than 300°K, which seems to be impossible.
So we have the possible explanation :

The temperature T_0 in equation (21) is far less than the temperature of fossil radiation.

The previous explanation is possible considering that the ether-substance does not interact with fossil radiation.

2.5 Form of the Universe

If the Universe was completely isotropic, we could expect by symmetry that the thermal flow inside the ether-substance through a great surface be nil. Consequently the temperature of the ether-substance inside a great sphere of the Universe (For instance with a radius of 5 billion years) should increase and tend to a uniform temperature of the ether-substance inside the sphere. We know that it is not the case because galaxies have not the same temperature and moreover we admitted that the temperature of the intergalactic ether-substance is by far inferior to the temperature of the ether-substance inside galaxies.

In the case in which the Universe is a sphere, we avoid this paradox. Indeed we can consider that in the borders of the Universe (supposed to be spherical), there is a phenomenon of thermal convection: T being the temperature of the intergalactic ether-substance, supposed to be uniform, we can consider that there is a convective thermal transfer between a medium at a temperature T and a medium at a temperature $T_0=0$. Then the expression of the thermal flow lost by the Universe at its borders is, k being a constant:

$$\varphi=k(T-T_0)=kT \qquad (28d)$$

M being the baryonic mass of the Universe, we obtain from equation (14) that the equation of thermal equilibrium at the borders of the universe is:

$$K_3M = 4\pi R^2\, \varphi = 4\pi R^2\, kT \qquad (29a)$$

So we see that if the Universe increases from a factor f, according to the Equation (32) the temperature T of the intergalactic ether-substance diminishes from a factor f^2. Here we supposed that k is independent of the density of the intergalactic ether-substance. If we had supposed that $k=C_2\rho_0$, ρ_0 being the mass density of the intergalactic ether-substance and C_2 being a constant, it is very easy to obtain that if the Universe increases from a factor f, then T also increases by a factor f which is impossible.

We remark that our thermal model is valid even if the galaxy is at rest relative to the local “sea” of ether substance in which it is immerged. Indeed elements of the ether substance constituting the concentration of the ether substance in a galaxy are not dissolved in the “sea” of ether substance surrounding the galaxy. So we have a convective thermal transfer.

So we see how our model of dark matter brings us to obtain an Universe that is not completely isotropic. Nonetheless, it is logical to assume that it is isotropic observed from the center of the spherical Universe, admitting that the Universe presents a spherical symmetry.

2.6 Law of Hubble-redshift (1^{st} model)

If we consider a photon emitted from a point A at an absolute time t_A (We remind that t is the age of the Universe) and arriving at a point B at a time t_B, then we will call time-back distance the sum of elementary local distance covered by the photon between t_A and t_B $D=c(t_B-t_A)$.

Indeed according to the hypothesis A, we know that if the photon covers an elementary local distance dD within an interval of absolute time dt, we have dD=cdt. If we sum all those elementary distances and absolute intervals of time we obtain $D=c(t_B-t_A)$.

We consider the simple model of a Universe swelling as a balloon . Such a model with borders moving at a constant velocity c and the velocity of light being equal to c relative to an absolute Referential is completely described in [(3) (4)]. But in the model exposed in this present article, borders of the Universe do not move precisely at the constant velocity c and the velocity of light is equal to c relative to a local Referential.

So we make the 4^{th} hypothesis D:

The universe is like a swelling sphere whose borders move at a constant velocity C (1st model) or in agreement with the equations of General Relativity (2nd model). Points of this swelling sphere are origins of the local ether (See hypothesis A in 1.INTRODUCTION).

According to the 1st model that we are going to expose, the Universe is like a swelling balloon whose borders move at the absolute velocity C. This model is very simple but despite of its simplicity it is in agreement with most Cosmological observations. Moreover, it will help a lot to understand the 2nd model. We remind that defining an absolute Referential whose the origin is fixed in the point O center of the spherical Universe, this Referential defines "absolute distances" and "absolute velocities". The time of this Referential being the time of the local ethers, we will call "absolute ether" this absolute Referential. So the velocity C is measured in the absolute ether. In the model of the swelling balloon, at a point A of a radius [O,P] of the spherical Universe with OA=aOP (OA and OP absolute distances), the local ether in A is driven with a velocity v_A=aC in the direction **OP**. So this velocity $\mathbf{v_A}$ is constant. If the Universe is submitted to a factor of expansion f, the point A of the swelling balloon becomes the point A(t) belonging to the radius [O,P(t)] of the swelling sphere with OA(t)/OA=OP(t)/OP=f and (OP(t))//(OP).

Let us suppose that from a point P at the present age of the Universe t, we observe a point Q situated at a time-back distance D of P. We know that a photon coming from Q and arriving at P at the time t was emitted at an absolute time t_Q=t-D/c. We know that at the time t_Q the radius of the Universe was equal to Ct_Q and at the time t it was equal to Ct. Consequently the factor of expansion of the Universe between t_Q and t is (according to the 1st model:

$$1+z=t/t_Q=t/(t-D/c). \qquad (29b)$$

When D/ct<<1 we obtain z=D/ct and consequently the Hubble's constant is equal to 1/t. The above equation is very simple and can easily be verified. For instance taking t=15 billion years , we know that for z=0.5, D=5 billion light years and we have 1+z=t/(t-D/c). For z=9 we obtain D=13.5 billion years.

It is important to remark that D is not the luminosity distance, but the time-back distance that we defined as the distance that is the sum of elementary local distance covered by a photon.

We can define a luminosity distance, a commoving distance, an angular diameter distance that are completely analogous to those distances in classical Cosmology.

For instance let us suppose that we are at time t_0 in the center O of the Universe, and we observe a galaxy with a redshift z_0. We suppose that this galaxy (observed with the redshift z_0) is at a point P of the swelling sphere.

Then according to our definition of the time-back distance, the time- back distance of P is (observed at t_0 in O):

$$D_{TB} = \int_{z0}^{0} cdt(z, z+dz) \qquad (29c)$$

With dt(z,z+dz) is the absolute time taken by the photon (emitted by the galaxy) between the redshifts z and z+dz.

z being any redshift between z_0 and 0, we know that the photon covers the local distance cdt(z,z+dz) during the absolute time dt(z,z+dz). We know that this distance is increased by the factor 1+z when the photon has reached O at time t_0. Consequently the effective distance between P(t) (position of P at time t) and O is the commoving distance:

$$D_C = \int_{z0}^{0} c(1+z)dt(z, z+dz) \qquad (29d)$$

From this expression of D_C we can easily define the luminosity distance D_L and the angular diameter time distance D_A:

$D_L=(1+z)D_C$

$D_A=D_C/(1+z)$ (29e)

In order to get dt(z,z+dz) we can use the very simple relation: $t_0/t=1+z$. We remark that in our definition , there are the same relations between D_{TB},D_C,D_L,D_A as in classical Cosmology.

We took an age of the Universe approximately equal to 15 billion years corresponding to a Hubble's constant H=1/t approximately equal to 65 km/sMpc^{-1} despite that it is generally admitted that the Hubble's constant H is approximately equal to 72km/sMpc^{-1} corresponding to a time t=1/H approximately equal to 13,5 billion years.

But we have several possible explanations for this:

First we saw in the equation (29b) that we have z=D/tc only for D/tc<<1.

Secondly in order to estimate the Hubble's constant, we do not use the time-back distance but the luminosity distance (We know that they are approximately equal for D/tc<<1).

Thirdly many astrophysicists disagree with a Hubble's constant approximately equal to 72 km/s Mpc^{-1} and find a Hubble's constant approximately equal to 65km/sMpc^{-1}. For instance Tammann and Reindl [(8)] in a very recent article (October 2012), after having reminded that astrophysicists disagree concerning the estimation of Hubble's constant, then give a possible origin of the mistake leading to obtain a Hubble's constant approximately equal to 72 km/s Mpc^{-1}, and finally find themselves a Hubble's constant of 63,7 (+- 2.3) km/sMpc^{-1}.

There is also a second possibility justifying the 1st model: It is possible that H be equal to 72km/s Mpc^{-1}. In this case the age of the universe is t=1/H=13.6 billion years. Then according to the 1st model a redshift of z=0.5 corresponds to a time-back distance of 4.7 billion years and a redshift of z=9 corresponds to a time-back distance of 12.4 billion years, so those time back distance are superior to those predicted by the classical Cosmological theory (4.9 and 13.2 billion years) by a factor of 5% to 7%. We cannot exclude this possibility.

So we see that the 1st model is in agreement with most Cosmological observations.

2.7 Topology of the Universe(1st model).

It is important to remark that according to the 1st model, C is not a priori equal to c. But we may expect that C is strictly superior to c but is of the order of c (Maybe 2c or 3c). It is generally admitted that the furthest galaxies observed presently from our galaxy are at a distance of approximately 43 billion years. If this reveals to be true C is approximately equal to 3c.

The fact that we observe from our galaxy an isotropic Universe indicates that our galaxy should be close to the center O of the spherical Universe. We remark that according to the 1st model we cannot observe galaxies at the very beginning of the Universe (age of the Universe close to 0). This would explain why we presently cannot observe time-back distances superior to 14 billion years despite that according to the value of Hubble's constant the age of the Universe is equal to 15 billion years.

We remark that the Universe could be homogeneous but not compulsory. It could explain why we do not observe traces of quasars and blue dwarfs in the neighborhood of our galaxy. Nonetheless the Universe must be isotropic observed from its center.

We can obtain an estimation of C, absolute velocity of the borders of the Universe, the following way:

We suppose that at time t_E, a photon is emitted from the borders of the Universe towards the center O of the spherical Universe. We call x(t) the distance at t age of the Universe between O and the photon. According to our model, if v(t) is the velocity of the point of Ether-substance coinciding with the photon at an age of the Universe t, we have the relation:

$$x(t)=v(t)t \qquad (29f)$$

Moreover, according with our model, remarking that the absolute velocity of the photon at time t is equal to v(t)-c:

$$x(t+dt)=x(t)+(v(t)-c)dt \qquad (29g)$$

So we obtain successively:

$$v(t+dt)(t+dt)=v(t)t + (v(t)-c)dt \qquad (29h)$$

$$\frac{d}{dt}(v(t)t) = v(t) - c \qquad (29i)$$

$$\frac{d}{dt}(v(t)) = \frac{-c}{t} \qquad (29j)$$

$$v(t)=-c\mathrm{Log}(t)+K \qquad (29k)$$

With the initial condition $v(t_E)=C$, we obtain the constant K and we finally get:

$$V(t)=-c\mathrm{Log}\,(t/t_E)+C \qquad (29l)$$

Consequently, the photon reaches O (with v(t)=0) at time t with:

$$t/t_E=\exp\,(C/c) \qquad (29m)$$

If t is the age of the Universe t_0 (meaning that the photon is observed at the present age of the Universe) we have:

$$t_0/t_E=\exp(C/c) \qquad (29n)$$

t_E represents the lowest age of the Universe that we can observe at the present age of the Universe t_0.

In order to get C, we have also the equations, z_0 being the greater redshift that we can observe (corresponding to an age of the Universe t_E):

$(1+z_0)=t_0/t_E$ (29o)

Moreover, we know that the greatest commoving distance D_0 that we can observe at time t_0 meaning the absolute distance between O and the borders of the Universe at time t_0 is related with C by:

$D_0=Ct_0$ (29p)

Presently, we know that the greatest commoving distance that we can observe is approximately D_1=35 billion years, and the greatest observed redshift is z_1=10.

We are sure that $D_0>D_1$ and $z_0>z_1$, which gives C>2,3. If we admit that D_0 is of the same order as D_1 (which is natural), we obtain that C is of the order of 3. It is very possible that C be much greater than 2,3, for instance C=10. In that case, we could possibly observe the Universe when its age was only 1 million years .

2.8 Fossil radiation(1st model).

If photons were absorbed by the borders of the spherical Universe, we would easily obtain that presently we could not observe fossil radiation. Consequently we admit that photons simply recoil when they reach the borders of the universe. Considering a beam of photon of black body radiation at a temperature T reaching the borders of the Universe, we can obtain that the recoil keeps unchanged the angles of anisotropies. Consequently at the present age of the Universe we can observe anisotropies of temperature due to fluctuations of density of the Universe when the age of the Universe was only 40 million years with an identical angle.

Let us justify why the angles of anisotropies remain unchanged:

We suppose that initially, at the age of the universe t_0 (t_0 is approximately 40 millions years), there are in all the Universe spheres of heterogeneity with a diameter D, in which there is a black body radiation.

We admit the following law of reflection :If the trajectory of a photon is along a radius of the spherical Universe, when the photon recoils against the internal surface of the spherical Universe, if its initial local velocity was **v**, it becomes –**v**. Consequently the photon remains on the same radius. Indeed we remark that if a photon has a local velocity **v** parallel to the absolute velocity (that is along a radius of the spherical Universe), then the photon remains along this radius (we admit that the local velocity of a photon remains the same).

Consequently if the sphere of heterogeneity is initially at a distance h of O, we observe it from O (meaning observing photons coming to O along the radius of the spherical Universe) making an angle of D/h, even considering photons that have recoiled against the internal surface of the spherical Universe. We remark that the smallest angle that we can observe is D/R, R radius of the Universe at time t_0.

In the case in which an observer is situated at a point O' close to O, we then consider the Referential R' whose the origin is O' and whose the axis are parallel to the axis of the absolute Ether R that we defined previously. We then can define local Referentials that are analogous to local ethers that we defined previously. We then remark that R' behaves exactly as R. If we generalize the law of reflection, admitting that if the trajectory of a photon is along the radius of a sphere whose the center is O', when it reaches the borders of the Universe, if its initial local velocity (relative to the previous local Referentials) was **v**, it becomes –**v**. So we also obtain that the photon remains on the same radius. We obtain that from O' we also observe (observing the photons whose the trajectory is along the radius of the sphere whose the center is O') the sphere of heterogeneity making an angle of D/h.

It is useful to consider intuitively all the photons emitted by the sphere of heterogeneity driven with the same local velocity **c** or equivalently with their local velocity **c** belonging to a very small solid angle $d\Omega$ such that we can make the approximation that all local velocities are parallel. Then the photons belong to a sphere $S(t,d\Omega)$ that coincides with the sphere of heterogeneity at time $t=t_0$. The sphere $S(t,d\Omega)$ is driven with a local velocity **c**, and if the Universe is submitted to a factor of expansion f between t_0 and t, then the diameter of this sphere becomes fD. Then the sphere $S(t,d\Omega)$ contains photons distributed as the radiation of a black body with a temperature T/f (We remind that T is its temperature at $t=t_0$).

Because photons recoil against the borders of the Universe , we should expect to be able to observe the images of galaxies reflected by the borders of the Universe. But in order to explain why we do not observe the images of reflected galaxies we have 3 possible explanations:

Let t be the present age of the Universe, t_O the earliest age of the Universe that we can observe at time t in the center O of the spherical Universe, t_G the time in which appeared the first galaxies, and t_D the dark age in which the Universe was not transparent to the light of galaxies. We know that t_D is of the order of 1 billion years and if we admit that oldest galaxies are 13.5 billions years old t_G is of the order of 1.5 billion years (taking t =15 billion years).

It is easy to obtain that if $t_G>t_O$ or $t_O<t_D$ then we cannot observe the image of galaxies reflected by the borders of the Universe. Because in both case we obtain that the images of reflected galaxies arrive in O center of the spherical Universe after t. For instance we can have t_O=1 billion year and t_G=1.5 billion years, or t_O=1.5 billion years and t_D=2 billion years.

We know that it is admitted that at the dark age, the light emitted by galaxies was absorbed despite that the fossil radiation was not absorbed. A third possible explanation would be that it is also the case for the borders of the Universe, that would reflect fossil radiation but not light of galaxies.

2.9 2nd model of swelling balloon.

So we saw that the 1st model of the swelling balloon, despite of its simplicity, is compatible with most of Cosmological observations .

Nonetheless, according to the equation (29d), with $t_0/t=1+z$, the commoving distance between O center of the Universe and a point with a redshift z is $D_C=t_0Log(1+z)$. Consequently with z=10, D_C is between 30 and 35 billion years (depending on the value of the age of the Universe), and we know that the true value is approximately 34 billion years. So we see that the 1st model is apparently in agreement with every classical astronomical observation.

Nonetheless, we can propose a 2nd model compatible with the classical equations of General Relativity used in classical Cosmology. So in our 2nd model, we keep the same topological form of the Universe (swelling balloon) and also the classical equations of General Relativity used in classical Cosmology, that are used to get the factor of expansion 1+z.

Consequently we have the equation, $1+z(t_1,t_2)$ factor of expansion of the Universe between the ages t_1 and t_2:

$$1+z(t_1,t_2)=f(t_1,t_2) \qquad (29q)$$

So $f(t_1, t_2)$ is obtained using the equations of general Relativity. (In the 1st model,$f(t_1,t_2)=t_2/t_1$)

Then if $R(t_1)$ is the radius of the Universe at time t_1, and $t_2>t_1$, the expression of the radius $R(t_2)$ is:

$R(t_2)=R(t_1)(1+z(t_1,t_2))=R(t_1)f(t_1,t_2)$ (29r)

So we obtain that at time t_2 the velocity of the borders of the Universe is (t_1 being a constant):

$$V(t_2)=\frac{d(R(t_2))}{dt_2} \quad (29s)$$

As for the 1st model, if A(t) is a point of a radius [O,P(t)] of the spherical Universe, then A(t) is the origin of a local Ether if we have the relation, a being a constant:

$OA(t)=aOP(t)$ (29t)

Moreover, as a consequence of the previous equation, if f is the factor of expansion of the Universe between t_1 and t_2:

$OA(t_2)/OA(t_1)=OP(t_2)/OP(t_1)=f$ (29u)

Consequently, the absolute velocity of A(t) (and consequently of the local ether whose the origin is in A(t)) is, if V(t) is the absolute velocity of P(t):

$V_A(t)=aV(t)$ (29v)

(We remind that as for the 1st model, we define an absolute Referential whose the origin is O center of the Universe. Absolute velocities are velocities measured in this absolute Referential).

In order to obtain the largest redshift that could be theoretically be observed, or equivalently the earliest age of the Universe that could be theoretically be observed, we proceed in a way completely analogously as for the 1st model:

We consider a photon emitted at time t_E from a point $P(t_E)$ situated on the border of the Universe in the direction of O center of the Universe. We suppose that at time t the photon coincides with the point A(t) with OA(t)=a(t)OP(t). So we get the equations:

$x(t+dt)=x(t)+(V_A(t)-c)$ (29w)

Or equivalently:

$a(t+dt)R(t+dt)=a(t)R(t)+(a(t)V(t)-c)$ (29x)

We see that this previous equation is analogous to the equation (29h).

In the 2nd model, fossil radiation is interpreted completely the same way as for the 1st model, photons recoiling on the borders of the Universe in the direction of their arrival.

The enigmatic dark energy used in classical Cosmology to justify the obtainment of the factor of expansion (equation (29q), could be the thermodynamic energy of the ether-substance, that we modeled as an ideal gas. We remind that dark energy is not necessary in the 1st model.

We remark that in our both models Universe is isotropic only observed from the center of the Universe, contrary to the models of classical Cosmology in which it is isotropic observed from any point. Moreover, in our both models, the Universe is flat, and apparently does not need the phenomenon of inflation. The concept of ether-substance is important in order to justify the spherical form of the Universe. Indeed if the space was not filled by a substance it would not have been possible to delimit the borders of the Universe: In our both models borders of the Universe constitute the limit between the ether-substance and the "nothingless").

We see that our both models contradict the famous Cosmological Principle because the Universe is not isotropic observed from most of the points of the Universe (except from the center O). We remind also that according to our both model, the space is not compulsory homogenous. This could explain why there were more quasars in the past and more blue galaxies: It is possible according to our both models that quasars and blue galaxies were more numerous closer to the borders of the Universe. As a consequence, they appear to be more numerous in the past.

3.LOCAL ETHER AND ISOTROPY OF FOSSIL RADIATION

We know that fossil radiation is quasi isotropic in a Referential that is not interpreted in classical Cosmology. If an particular Referential (local ether) exists (Hypothesis A), then it is natural to assume that it is the Referential in which fossil radiation is quasi isotropic.

More precisely we know that in classical Cosmology we have the following fluctuations of temperature:

$$(\frac{\Delta T}{T}) = \frac{1}{4\pi}\sum_{l} l(2l+1)C_l \qquad (30)$$

In the previous expression l=1 is the dipole contribution, corresponding to the motion of our Referential linked to the earth relative to a particular Referential. Considering that this particular Referential is the local ether defines completely this Referential, that has none particular meaning in the classical Cosmology.

We also remark that if we consider the law:

"The fossil radiation is isotropic in the Referential R",

we know that this physical law is true for only one Referential, which contradicts the Principle of Special Relativity and is in agreement with the hypothesis A of the existence of Ether.

4.DISCUSSION

So we see that the existence of Ether as defined in the hypothesis A and B appears to be fundamental in order to interpret fossil radiation, the dark matter and the form of the Universe. It is very remarkable that this existence of ether is compatible with the classical standard model of Cosmology. We remark that our interpretation of dark matter as being ether-substance is compatible with Special and General Relativity, but that Special Relativity appears to be contradicted by the observation of a Referential in which fossil radiation is quasi isotropic. The enigmatic dark energy could be the thermodynamic energy of the ether-substance.

We remark that we obtained Hubble's constant and the expression of the redshift due to expansion of the Universe in a new way without using the equations of general relativity. Our model does not need the concept of fossil radiation in order to interpret the quasi-isotropy of fossil radiation that is observed presently, because in our model, the radius if the Universe was only 40 million years at the beginning time when the fossil radiation could travel toward us because the Universe became transparent to fossil radiation. We remind that we established a complete theory of physics with the existence of a local ether [(2)(3)(4)(5)(6)(7)], but it is not useful in order to understand this article.

5.CONCLUSION

So we saw how the existence of an ether, as being both a substance and an absolute Referential compatible with the classical Cosmological standard model, permitted to interpret fundamental phenomena connected to dark matter and to fossil radiation. In particular we successfully interpreted the nature of dark matter, the origin of its invisibility, the curve of velocities of stars in galaxies, the baryonic Tully-Fisher's law and the Referential is which fossil radiation is isotropic. We also justified that it is very likely that the universe has a spherical form and that our galaxy is very close to the center of the Universe.

Références :

1. Stacy Mc Gaugh, A Novel Test of Modified Newtonian Dynamics with Gaz rich Galaxies, Physical Review Letter, open archives arXiv.
2. Thierry Delort, Théories d'or , Editions Books on Demand, Paris (2011)
3. T.Delort,Theory of Ether, Physics Essays 13,4 (2000).
4. T.Delort, Applications of Theory of Ether,Physics Essays 17,3 (2004)
5. D.J Raine,E.G Thomas,An introduction to the science of Cosmology,Institute of physics, London (2001).
6. J.V Narlikar, An introduction to Cosmology, Cambridge University press,Cambridge (2002)
7. Thierry Delort, Théorie de l'Ether-Théorie quantique des variables absolues, site Internet archives or viXra (2011)
8. G.A Tammann and B.Reindl, Astronomy and Astrophysics 549(2013) (on arXiv)

Résumé:

L'idée de l'existence del'Ether a été abandonnée après que la théorie de la Relativité ait été acceptée. Il apparait que l'existence de l'Ether, compatible avec les principaux aspects de la Cosmologie classique, permet de résoudre des enigmes trés importantes, liées par exemple à la masse sombre et au rayonnement fossile. Nous justifierons aussi dans cet article une forme trés simple de l'Univers, la position de notre galaxie dans cet Univers, et nous obtiendrons simplement l'expression de la constante de Hubble ainsi que celle du décalage vers le rouge dû à l'expansion de l'Univers.