If space was at the origin of the laws of physics?

Unification of gravitation, black matter and black energy

Expression of the universal constants c and G

A theory doesn't pretend to be the truth but simply proposes a possible explanation to a natural phenomenon.

Introduction

What is our universe made of? To my knowledge, the universe consists of two main substances: matter and space in which swim all body matters. However, the very existence of space is as mysterious and strange as that of matter. What are the properties of this space? What is it made of? How did it appear?

My first thoughts lead me to suppose that each body has its own space. A space that is part of the body and that constantly accompanies it in its movement. Imagine that every time you move, you walk with your own space that is attached in relation to you. You form with your own space an indivisible unity. However, when you cross your neighbor, your own spaces coexist parallelly while having its proper existence. This means that you live the events in a unique way in your space. Nevertheless, when an event takes place in your own space, it also takes place in all their own spaces juxtaposed with yours.

Now, imagine that an electromagnetic wave on its own, is a vibration of space. Therefore, light, which is a wave, moves in a velocity c in a vacuum. As a result, the speed of light perceived by an observer is always equal to c regardless of the speed of the observer. Indeed, at a precise position of space corresponds a multitude of own spaces that coexist. When a vibration takes place at a precise moment and position, it affects all own spaces whether they are moving in relation to each other or not. But once this vibration is transmitted, each space conveys the information in its own space. This would explain the invariance of the speed of light regardless of the frame of reference of the observer.

Space would have a priori a determining role in our laws of physics. I am deeply convinced that space is at the origin of the mass, the inertia, the gravity and the expansion of the universe. But then? Would it be possible to unify these 4 laws using a theory that involves only the properties of space?

First, let us start by stating the basic principles that will be used in the rest of this study.

I. Statement of Principles

1. Principle of universal equilibrium

Either a stable state that is characterized by magnitudes that seek to recover its original or natural state. A system is in a state of equilibrium or imbalance when it is respectively in a stable or unstable state. This may be a disturbance defined by an action that unbalances or balances the state of a system.

Any perturbation P of the state of a system systematically generates another perturbation P' and a resistance R to the perturbation P.

A system tends to return to a state of equilibrium that corresponds to its most stable state: its original or natural state. This stability is obtained by the equilibrium of the set of parameters (or quantities) which define the state of a system.

When it undergoes an imbalance disruption Δ_D, another equilibrium disturbance Δ_E is born to suppress the perturbation Δ_D.

If resistance to a disturbance didn't exist, then a system would rebalance instantly. When a system evolves to a stable or unstable state, a certain amount of time elapses. Resistance therefore characterizes the time required for a system to balance itself. The higher the resistance, the higher the time required for the equilibrium of the system.

Statement of the law of universal equilibrium

All physical phenomena generate a law in the form: $\Delta_E = R_E . \Delta_D$

Δ_E : equilibrium disturbance

R_E: the equilibrium resistance

Δ_D : imbalance disruption

From this principle arises from numerous sub-principles including that of the spatial imbalance: Any spatial variation of a magnitude G_D, causing an imbalance, will induce a temporal variation of an equilibrium magnitude G_E in order to stabilize the system.

This law is written in the following form : $\frac{d\overrightarrow{G_E}}{dt} = R_E.\overrightarrow{grad}(G_D)$

2. Principle of universal constants

All the constants that appear in the equations of physics depend on their environment and their center. Their universal characters can only be derived from the direct magnitudes of the universe. If not, how could these constants be valid in every point of the space of the universe?

Constants are only a reflection of our misunderstanding of the universe around us. All constants, whether universal or not, can be expressed by the magnitudes that characterize their environment.

Statement of the principle of universal constants

All the universal constants are defined by quantities that characterize the universe itself (radius, mass, ...)

Now, I am going to expose some properties of space.

<u>II. Space Properties</u>

The very existence of space seems fascinating and strange to me. The space in which the bodies swim contains a lot of mystery. What is it made of? What are its properties. How does it behave on the bodies around him? Is this space at the origin of the laws of physics?

The mode of displacement of an electromagnetic wave and the invariance of the acceleration of light allowed me to define certain properties of space.

1. Center of propagation of an electromagnetic wave

It is my hypothesis that the electromagnetic wave is a vibration of space itself. The propagation of this wave finds its support of displacement directly of the space. We also know that this wave moves in velocity c in a vacuum.

2. Invariance of the speed of light and specific space

The acceleration of light does not depend on the observer's frame of reference. Whatever the acceleration of the observer, the acceleration of light c is constant. How do you explain the invariance of this acceleration?

Imagine that each observer has its own volume of space attached to it. This own space, which is fixed in relation to the observer, follows him constantly in his movement.

But according to my initial hypothesis, the electromagnetic wave is a vibration of its own space. Suppose now that an observer creates a disturbance in his own space, then all the other own spaces that are juxtaposed there, also undergo the same perturbation.

As we saw earlier, this disturbance moves at the acceleration of light c in the own space of each observer. Whether the latter moves or not, his own space remains fixed. As a result, the observer sees the light moving at a constant acceleration c. Each observer lives their events in their own space that is fixed and dedicated to them.

A material object has its own space fixed to it. Consequently, the object does not move in its own space but in the space owned, formed by all the other bodies that surround it. In addition, the volume of the owned space created by the object depends on its mass. If we consider that the mass m_C of a body generates a specific volume of spherical space, then its radius is given by the following relation : $r_P = \sqrt[3]{\frac{m_C}{\frac{4}{3}\pi\rho_U}}$, where ρ_U is the density of the universe.

When we study a physical phenomenon, then the problem of the choice of space owned arises. What space owned should be considered for our study? It is necessary to distinguish the proper space of each object and the global owned space formed by the totality of each space.

What is the physical relationship between the body and its own space? Does the body undergo an action on the part of its own space?

3. Space density

Imagine an isolated body of mass Mc with its own space. The local spatial density ρ_E of this space owned is defined by the distribution of the mass m_C occupied in a spherical volume of space of radius r_E and of origin the center of gravity of the body mass m_C. Spatial density is expressed in the following form:

$$\boldsymbol{\rho_E = \frac{m_C}{\frac{4}{3}\pi {r_E}^3}}$$

This density, which represents the energy contained in space, is induced by the presence of the mass of the body in space. Mass and space are both a manifestation of a spatial state characterized by a force: mass is a force, just as space is a force. These forces are generated, according to the equilibrium principle, by disturbances of equilibrium and imbalance. The universe is composed of a set of disturbances which are conserved and which are transmitted from system to system. The two elements that constitute the universe, namely matter and space, are the result of a state of space that manifests itself in the form of spatial surface tension.

4. Spatial surface tension

The presence of a body in space generates a spatial surface tension T_E which is given by the following law:

$$\mathbf{T_E = \frac{4}{3}\pi r_E{}^2 \rho_E c^2}$$

T_E is the force exerted on a point of the space which is situated on the spherical surface of a radius r_E.

r_E is the distance between the point of space considered and the center of gravity of the body.

ρ_E is the spatial density induced by the presence of the mass m_C of the body: it corresponds to the spatial density defined previously.

it is the acceleration of light in a vacuum

The tension of space does not act like a traditional force, it is not directly applicable on a body with the law of Newton $\vec{F} = m\vec{a}$. Space acts on the body by potential difference. It is a latent force that manifests as a flow through the spatial variation of the surface tension.

5. Flow of a physical quantity

According to the principle of spatial imbalance, any variation of a magnitude in space implies a displacement which manifests itself in the form of a vector flow according to the law : $\frac{d\overrightarrow{G_E}}{dt} = R_E.\overrightarrow{\text{grad}}\,(G_D)$

This principle gives us the expression of the following spatial voltage flow: $\overrightarrow{\emptyset_E} = k_E.\overrightarrow{\text{grad}}T_E$ with k_E which corresponds to the resistance to flow and which is a universal constant. Now the voltage depends only on the spatial variable r and the spatial density, so the flow relation becomes : $\emptyset_E = k_E\frac{dT_E}{dr}$. Moreover, in order to find the accelerations caused by the phenomena of gravitation and expansion of the universe, it seems advisable to consider Φ_E as an acceleration: which implies that the constant k_E is a ratio of a distance by a mass.

Let M_U and R_U respectively be the mass and radius of the universe. According to the principle of universal constants, k_E is expressed according to the magnitudes of the universe: it seems natural to fix $k_E = \frac{R_U}{M_U}$. Now, I have shown, in the part «IV Relationship between magnitudes and universal constants» presented below, that $\frac{M_U}{R_U} = \frac{c^2}{G}$ (G is the gravitational constant and c is the acceleration of light in the vacuum).

I put $k_E = \frac{1}{\mu_U} = \frac{R_U}{M_U}$, the flow of displacement thus becomes :

$$\mathbf{\emptyset_E = \frac{1}{\mu_U}\frac{dT_E}{dr}} \quad \textbf{with } \mathbf{\mu_U = \frac{M_U}{R_U} = \frac{c^2}{G}}$$

This flow corresponds to the universal acceleration that space causes on a body.

III. Application to the laws of physics

Universal gravitation, the expansion of the universe and dark matter have their origins in spatial tension. These laws of physics manifest themselves in the form of universal acceleration through the flow of motion.

By knowing the distribution of the visible mass in the universe, we can determine the spatial density at each point of the universe. Once the spatial density is determined at a time t, we can follow the dynamics of each body moving in the universe.

But for this, it is necessary to understand how the spatial density is organized according to the visible mass.

The study of body acceleration, for known physical phenomena, allows me to express spatial densities. These particular cases will inform me about the link between the visible mass of a body and the induced spatial density.

First, let us express the general form of spatial density and then apply it to specific cases such as gravitation, expansion of the universe, and dark matter.

1. Universal acceleration and spatial density

The relations $\emptyset_{\mathbf{E}} = \frac{G}{c^2}\frac{\mathbf{dT_E}}{\mathbf{dr}}$ and $T_E = \frac{4}{3}\pi r_E{}^2\rho_E c^2$ allow me to define a differential equation of the universal acceleration ∅_E that I present here. below:

$$\emptyset_{\mathbf{E}} = \frac{\mathbf{4}}{\mathbf{3}}\boldsymbol{\pi}\mathbf{G}\left(\mathbf{2r}\boldsymbol{\rho}_{\mathbf{E}} + \mathbf{r^2}\frac{\mathbf{d}\boldsymbol{\rho}_{\mathbf{E}}}{\mathbf{dr}}\right)$$

r is the radial position which originates from the central point of the studied clean space

The resolution of this differential equation allows me to obtain a general expression of the spatial density :

$$\boldsymbol{\rho}_{\mathbf{E}} = \frac{\lambda(\mathbf{r})}{\mathbf{r^2}} + \boldsymbol{\rho}_{\mathbf{0}}\left(\frac{\mathbf{r_0}}{\mathbf{r}}\right)^{\mathbf{2}} \text{ with } \lambda(\mathbf{r}) = \frac{\mathbf{1}}{\frac{4}{3}\boldsymbol{\pi}\mathbf{G}}\int \emptyset_{\mathbf{E}}\mathbf{dr}$$

ρ_0 and r_0 are constants

2. Universal gravitation

This particular case allowed me to define the spatial density in the case of an isolated body / paired space.

Let a compact body of mass m_C, radius r_C and density ρ_C. In the case of the attraction of an object, which is in the proper space outside the associated compact body, the flow displacement is given by the gravitational acceleration which is : $\emptyset_E = -G\frac{m_C}{r^2}$.

The resolution of the differential equation, completed by the condition $\rho_E(r_C)=\rho_C$, makes it possible to define the spatial density. In the case of universal gravitation, the spatial density has the following form : $\rho_E = \frac{m_C}{\frac{4}{3}\pi r^3}$

3. Expansion of the universe

First, I will define the spatial density in order to express the Hubble H variable. The expression I will demonstrate below corresponds to a solution of the Einstein equation in the case of the expansion of the universe of a spherical space.

In the case of the expansion of the universe the flow of displacement, which is given to us by Hubble's law, is $\Phi_H = H^2.r$.

r is the distance that separates 2 bodies that are sufficiently distant on the scale of the universe and H is the Hubble variable. This acceleration is directly deduced from the distance velocity of 2 bodies expressed by Hubble's law: v = H.r.

The resolution of the differential equation gives, in the case of the expansion of the universe, the expression of the following spatial density : $\rho_E = \frac{H^2}{\frac{8}{3}\pi G} + \rho_0 \left(\frac{r_0}{r}\right)^2$

$$\rho_E = \frac{H^2}{\frac{8}{3}\pi G} + \rho_0 \left(\frac{r_0}{r}\right)^2$$

$$\rho_E \left(\frac{8}{3}\pi G\right) = H^2 + \rho_0 \left(\frac{r_0}{r}\right)^2 \left(\frac{8}{3}\pi G\right)$$

$$H^2 = \frac{8}{3}\pi G \rho_E - \frac{8}{3}\pi G \rho_0 \left(\frac{r_0}{r}\right)^2$$

Now, on the scale of the universe, ρ_E corresponds to the distribution of the mass of the universe in its own space: therefore $\rho_E = \rho_U$.

In the proper space of the universe, ρ_E tends to ρ_U when r tends to its radius R_U. Moreover, we have shown in the part "IV. Relationship between quantities and universal constants ", that : $H^2 = \frac{4}{3}\pi G \rho_U$

If one places oneself in the boundary conditions ($r = R_U$), then:

$$H^2 = \frac{8}{3}\pi G \rho_U - \frac{8}{3}\pi G \rho_0 \left(\frac{r_0}{R_U}\right)^2 = \frac{4}{3}\pi G \rho_U$$

$$\frac{8}{3}\pi G \rho_0 \left(\frac{r_0}{R_U}\right)^2 = \frac{4}{3}\pi G \rho_U$$

$$\rho_0 \left(\frac{r_0}{R_U}\right)^2 = \frac{\rho_U}{2}$$

$$\rho_0 {r_0}^2 = \rho_U \frac{{R_U}^2}{2}$$

This boundary condition allows me to determine : $\rho_0 {r_0}^2 = \rho_U \frac{{R_U}^2}{2}$

I get a completely defined expression of the Hubble H variable:

$$H^2 = \frac{8}{3}\pi G \rho_E - \frac{4}{3}\pi G \rho_U \left(\frac{R_U}{r}\right)^2$$

I also demonstrated, in the part "IV. Relationship between quantities and universal constants", that $R_U = \frac{c}{H}$. Moreover, $H^2 = \frac{4}{3}\pi G \rho_U$. I deduce that $c^2 = \frac{4}{3}\pi G \rho_U {R_U}^2$ and therefore : $\frac{4}{3}\pi G \rho_U \left(\frac{R_U}{r}\right)^2 = \left(\frac{c}{r}\right)^2$

I get a new form of the Hubble variable :

$$\mathbf{H^2 = \frac{8}{3}\pi G\rho_E - \left(\frac{c}{r}\right)^2}$$

This relation is identical to one of the solutions of the Einstein equations in the case of the expansion of the universe: $H^2 = \left(\frac{\frac{dR}{dt}}{R}\right)^2 = \frac{8}{3}\pi G\rho_E - k\left(\frac{c}{r}\right)^2$

The expression of the Hubble H variable found in this study corresponds to the solution of general relativity in the case of a spherical curvature universe.

4. Black matter

In this part, I will try to define the distribution of the visible mass of a part of a galaxy. By comparing with the experimental data, we will be able to confirm or refute the precise link between the visible mass and the spatial density. I think that the study of rotation curves, galaxies and clusters of galaxies can lead us to better understand the distribution of spatial density as a function of the visible mass.

We place ourselves in the case where the speed of rotation V0 of a galaxy is constant. The displacement flow, which corresponds to the centripetal acceleration, is expressed as:

$$\emptyset_N = -\frac{{V_0}^2}{r}$$

For this case, the resolution of the differential equation gives us the expression of the spatial density below:

$$\rho_E = \frac{{V_0}^2}{\frac{4}{3}\pi G}\frac{\ln\left(\frac{r}{r_C}\right)}{r^2} + \rho_0\left(\frac{r_0}{r}\right)^2$$

The spatial density ρ_E is defined by the distribution of a form of energy in space. This density depends on all the bodies in the universe. Each material body is associated with an energy that is distributed in space.

In the case of an isolated body of mass m_C and center of gravity 0, the density which is at a distance r from center 0 is given by the following relation: $\rho_E = \frac{m_C}{\frac{4}{3}\pi r^3}$

The distribution of the visible matter in the universe informs us on the distribution of the spatial density ρ_E and vice versa.

Each body Ci of mass mi brings a density of energy in each point of the space. The sum of the energy densities of each of these bodies at a point M forms a local spatial density.

I suppose that the visible mass dmi_V, which is in the volume of the sphere of radius r and thickness dr, is distributed in the form of spatial density homogeneously in the ball of radius r_i and of origin the center of the own space studied. Which implies that the local spatial density $\rho_E = \sum \frac{dmi_V}{\frac{4}{3}\pi r_i^3}$

Let $m_v(r)$ be the visible mass of a galaxy as a function of the radial distance r of its center of gravity. I define its density $\rho_V(r)$ by the following relation: $\rho_v(r) = \frac{m_v(r)}{\frac{4}{3}\pi r^3}$.

Then the visible mass of the galaxy included in the volume of the sphere of radius r and thickness dr is: $dm_V(r) = \rho_V(r).4\pi.r^2dr$

Or $\rho_E = \sum \frac{dm_V(r)}{\frac{4}{3}\pi r^3}$

I make an approximation by expressing this relation in the following integral form:

$$\rho_E = \int_0^r \frac{\rho_V(r)4\pi r^2}{\frac{4}{3}\pi r^3} dr$$

$$\rho_E = \int_0^r \frac{3\rho_V(r)}{r} dr$$

$$\frac{d\rho_E}{dr} = \frac{3\rho_V(r)}{r}$$

We can therefore express the distribution of the density of the visible matter using the following relation : $\rho_V(r) = \frac{r}{3}\frac{d\rho_E}{dr}$

This expression allows me to obtain the following equation of the visible mass:

$$\rho_V(r) = \frac{{V_0}^2}{4\pi G}\frac{\left(1 - 2\ln\left(\frac{r}{r_0}\right)\right)}{r^2} - \frac{2}{3}\rho_1\left(\frac{r_1}{r}\right)^2$$

The analysis of the rotational speeds of various spiral galaxies leads me to state that r_0 is the radius of the galaxy R_G. In addition, the limit condition $\rho_V(R_G) = \frac{M_G}{\frac{4}{3}\pi R_G^3}$ makes it possible to determine the expression of $\rho_1 r_1^2$. I therefore get : $\rho_1 r_1^2 = \frac{3{V_0}^2}{8\pi G} - \frac{9}{8\pi}\frac{M_G}{R_G}$

Which allows me to deduce the shape of the visible mass in a galaxy:

$$\rho_V(r) = -\frac{{V_0}^2}{2\pi G}\frac{\ln\left(\frac{r}{R_G}\right)}{r^2} + \frac{3}{4\pi}\frac{\frac{M_G}{R_G}}{r^2}$$

Moreover $\rho_V(r) = \frac{m_V(r)}{\frac{4}{3}\pi r^3}$, therefore $\frac{m_V(r)}{r} = \frac{M_G}{R_G} - \frac{2}{3G}V_0^2\ln\left(\frac{r}{R_G}\right)$

However, according to the theory MOND: $V_0^2 = \sqrt{M_G G a_0}$ (with $a_0 = 1{,}2.10^{-10}$ m.s^{-2}). The distribution of the visible mass in a galaxy is therefore expressed in the following form :

$$\boldsymbol{\frac{m_V(r)}{r} = \frac{M_G}{R_G} - \frac{2}{3G}\sqrt{M_G G a_0}\ln\left(\frac{r}{R_G}\right)}$$

I compared the mass distribution of this expression with that of the baryonic mass, laboriously, on the rotational curves of some spiral galaxies. The mass distributions are identical to a coefficient close to the order of 1. We should also take into account the mass of gases, dust and all the particles present in a galaxy to obtain a precise result.

In addition, a numerical simulation would allow us to know the spatial density, precise in each point of a galaxy, according to the distribution of the visible mass. Thus we could precisely determine the rotational speed of the bodies of a galaxy without the intervention of dark matter.

The spatial superficial tension makes it possible to unify the laws of cosmology: universal gravitation, expansion of the universe and dark matter. But it also helps to understand the origin of mass-energy equivalence.

5. Equivalence between spatial voltage work and E = mc²

I said before that the mass was the result of a force like space. I am going to calculate the work done by the tension on the ray r_c of a particle of mass m_c:

$$W_T = \int_0^{r_c} T_E dr$$

$$W_T = \int_0^{r_c} \frac{4}{3}\pi r^2 \rho_E c^2 dr$$

$$W_T = \frac{4}{3}\pi c^2 \int_0^{r_c} r^2 \rho_E dr$$

Or $\rho_E = \frac{m_C(r)}{\frac{4}{3}\pi r^3}$

$$W_T = \frac{4}{3}\pi c^2 \int_0^{r_c} r^2 \frac{m_C(r)}{\frac{4}{3}\pi r^3} dr$$

$$W_T = c^2 \int_0^{r_c} \frac{m_C(r)}{r} dr$$

If we assume that the mass mc in the particle is distributed in a linear way: $m_c(r) = \mu.r$ with μ constant. Then the work of tension becomes:

$$W_T = c^2 \int_0^{r_c} \frac{\mu.r}{r} dr$$

$$W_T = c^2 \mu \int_0^{r_c} dr$$

$$W_T = c^2 \mu.r_c$$

Now $m_c = m_c(r_c) = \mu.r_c$, so $W_T = c^2 m_c$

We finally obtain: $W_T = W_T = m_c.c^2$

We find the mass-energy equivalence relation: $E = m.c^2$.

The energy that is contained in a mass corresponds to the work of the spatial superficial tension carried out on the radius of the body

IV. Relationship between quantities and universal constants

I. Assumptions and definitions

The density of the universe is constant while the space is expanding. This means that the mass of the universe is also expanding. Imagine a universe whose mass is constantly increasing. This extra mass causes an increase in the volume of the space that pushes the bodies outwards. This phenomenon would explain, among other things, the expansion of the universe. According to my postulate, it seems interesting to me to take as mass flow the relation between the mass and the time of Planck.

This hypothesis reinforces the notion of own space that associates a volume of space with a mass. But if the space of the universe is expanding, this notion of own space implies that the mass must be too.

We also suppose that the universe is spherical.

2. Calculation of the magnitudes of the universe

I determine a mass flow d_{m_p} of Planck that I suppose constant in time:

Let m_p be the mass of Planck and t_p the time of Planck.

$$d_{m_p} = \frac{m_p}{t_p}$$

d_{m_p} = 4,037256.10^{35} kg.s^{-1}

The mass flow allows us to calculate the mass of the universe.

Let M_U be the mass of the universe at a moment t

Let H_0 be the Hubble constant at a time t: this value corresponds to the period during which the universe is expanding. I take the value H_0 = 2,380x10-18 s^{-1}. The mass of the universe is expressed as follows:

$$M_U = \frac{d_{m_p}}{H_0}$$

M_U = 4,037256 x10^{35} / (2,380x10^{-18})

M_U = 1,696x10^{53} kg

The tension of the space does not apply directly to the body, however it applies to the own space itself. Therefore, the mass of the universe creates a tension of space that acts on the surface of the end of the universe. If we apply Newton's law to the isolated system which is the universe, then we obtain:

$M_U.a_U = T_U$

to is the acceleration of the expansion of space and not the acceleration of the mass of the universe

You are the tension that applies to the surface of the universe.

Let ρ_U be the density of the universe and R_U the radius of the universe.

We thus obtain:

$$M_U a_U = \frac{4}{3}\pi R_U^2 \rho_U c^2$$

$$M_U a_U = \frac{4}{3}\pi R_U^2 \frac{M_U}{\frac{4}{3}\pi {R_U}^3} c^2$$

$$a_U = \frac{c^2}{R_U}$$

But the speed of light c is constant and R_U increases with time, so decreases with time. Moreover, the expansion of the universe gives us the expression at = H_0^2. R_U.

So we get $\frac{c^2}{R_U} = H_0^2.R_U$

$c^2 = H_0^2.\ R_u^2$

c = H_0. R_u ou c = - H_0. R_u. I will, in this study, consider that it is positive.

But the acceleration c is constant and Ru increases with time, so H_0 decreases with time. This relationship will allow us to calculate the radius of the universe.

We note that the speed of expansion at the edge of the universe is constant, and that it is worth the speed of light in the vacuum, while its acceleration decreases in time. And if the acceleration c was not constant insofar as it is defined by the characteristics of the universe!

$R_U = \frac{C}{H_0}$

$R_U = 2{,}997925.10^8 / (2{,}380.10^{-18})$

$R_U = 1{,}26.10^{26}$ m

We consider that the mass of the universe is contained in a spherical volume of radius Ru. Let's express the density of the universe:

$\rho_U = \frac{M_U}{V_U}$

$\rho_U = \frac{M_U}{\frac{4}{3}\pi R_U^3}$

$\rho_u = 1{,}696x10^{53} /[4/3\pi(1{,}260x10^{26})^3]$

$\rho_u = 2{,}026.10^{-26}$ kg/m^3

Let's now express the Hubble H variable. We have previously shown that:

$T_U = \frac{4}{3}\pi R_U^2 \rho_U c^2$ and $R_U = \frac{C}{H_0}$, therefore $T_U = \frac{4}{3}\pi \left(\frac{C}{H_0}\right)^2 \rho_U c^2$

$T_U = \frac{4}{3}\pi \left(\frac{1}{H_0}\right)^2 \rho_U c^4$

We have also shown in the section "3. Equivalence force of Planck / spatial tension of the universe" that $T_U = F_P = \frac{c^4}{G}$, therefore :

$T_U = \frac{4}{3}\pi \left(\frac{1}{H_0}\right)^2 \rho_U c^4 = \frac{c^4}{G}$

$H_0{}^2 = \frac{4}{3}\pi \rho_U G$

3. Planck force equivalence / spatial tension of the universe

We know that : $T_E = \frac{4}{3}\pi r_E{}^2 \rho_E c^2$

I will apply this relationship to the entire R_U radius universe. I suppose the universe is homogeneous, so the density of the universe ρ_U is constant at the universe scale.

$T_U = \frac{4}{3}\pi R_U{}^2 \rho_U c^2$

$T_U = 4/3.\pi.(1{,}26.10^{26})^2 x 2{,}026.10^{-26} x (2{,}997925.10^8)^2$

$T_U = 1{,}21.10^{44}$ N

You are the tension at one point of the surface at the end of the universe.

I now calculate Planck's strength

$F_P = \frac{c^4}{G}$

$F_P = (2{,}9979246.10^8)^4/(6{,}674.10^{-11})$

$F_P = 1{,}21.10^{44}$ N

Note that the spatial surface tension corresponds exactly to the strength of Planck T_P.

4. **Expression of constants G and c**

According to the principle of universal constants, all universal cosmological constants are defined by the magnitudes which characterize the universe, namely:

M_U : masse de l'univers

R_U : rayon de l'univers

T_U : période d'expansion de l'univers

We assume that $T_U = H_0$

Now $H_0^2 = \frac{4}{3}\pi\rho_U G$, $H_0 = \frac{1}{T_U}$ and $\rho_U = \frac{M_U}{\frac{4}{3}\pi R_U^3}$

Therefore $\left(\frac{1}{T_U}\right)^2 = \frac{4}{3}\pi \frac{M_U}{\frac{4}{3}\pi R_U^3} G$

$$\mathbf{G = \frac{R_U^3}{M_U T_U^2}}$$

We have also expressed previously that $c = R_u.H_0$, so we get:

$$\mathbf{c = \frac{R_U}{T_U}}$$

$G = \frac{R_U^3}{M_U T_U^2}$ and $c = \frac{R_U}{T_U}$ gives us the following relation:

$$\mathbf{\frac{c^2}{G} = \frac{M_U}{R_U}}$$

Conclusion

The understanding of space and mass will allow us to reveal certain mysteries that hides our universe. It is certainly important to conduct studies on the constituents of matter and mass. However, it seems to me essential to know better the space around us because it plays a determining role in our universe.

This publication aims to put into perspective the influence of space on the laws of physics. To do this, I introduced the concept of own space which translates that any material body forms a pair "mass / volume of space": the space and mass of a body are generated in pairs. Therefore, a body can't exist without its own space, and a space can't exist without mass. Moreover, the body is fixed in its own space: this implies that a material object moves in the space formed by the set of own spaces of the objects that are nearby.

According to my theory, the presence of a material body causes a spatial density that corresponds to an energy distributed in space. This density generates an action of space on the bodies that manifests itself in the form of spatial surface tension. This tension is at the origin of all the laws of physics (gravity, expansion of the universe, mass, inertia, energy, dark matter, ...). Universal gravitation, the expansion of the universe, and dark matter are expressed as universal acceleration, which results from the variation of the superficial space tension. The energy $E = mc^2$ corresponds to the work done by the spatial surface tension on a particle. The other parts of the study which concern the elementary particles, the electric charge, the mass, the inertia, the space energy and the gravitational lenses will be the object of complementary publications.

We are only at the beginning of a new era of physics: the physics of space. This new physics consists in defining the properties and the characteristics of the space which appear in particular by natural phenomena.

Space abounds with an unsuspected mystery that could enlighten us on many things about the universe. Particle physics and space physics are, I believe, the key to understanding our universe!