Alternative to inflation. Variable speed of light cosmological model with Lorentz and fine structure constant invariance maintained

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Abstract: It is shown that the extreme homogeneity of the early universe can be ensured if the initial phase of cosmic evolution occurs in a regime where all the constants of physics are associated with space and time scale factors, through a generalized gauge phenomenon that guarantees the invariance of all the equations of physics, thus constituting an alternative to inflation. The fine-structure constant and Lorentz invariance are then preserved. It is conjectured that this phenomenon occurs when, in the past, the distance between hadrons becomes on the order of their Compton length. This concept is extended to the pair of universes in the Janus Cosmological model.

1 – **Introduction**.

Today, it is no exaggeration to say that cosmology and astrophysics are experiencing an unprecedented crisis. For decades, by equipping the Standard Model with the two new components of dark matter and dark energy, scientists have tried to salvage it. By reintroducing the cosmological constant L into the equation of general relativity, which is considered to represent a constant negative energy content, the model was able to account for a constant acceleration of the expansion, following an exponential law with respect to time. But in 2025, the DESI collaboration [1] showed that this acceleration had been greater in the past, a phenomenon that the Standard Model is no longer able to account for. Conversely, the Janus Cosmological Model (JCM), corresponding to its system of coupled field equations, has been able to do so since 2014 [2].

(1) $$R_{\mu\nu} - \frac{1}{2}\,\mathrm{R}\,g_{\mu\nu} = \chi\left(T_{\mu\nu} + \sqrt{\frac{\bar{g}}{g}}\;K_{\mu\nu}\right)$$

(2) $$\bar{R}_{\mu\nu} - \frac{1}{2}\,\bar{R}\,\bar{g}_{\mu\nu} = -\,\chi\left(\bar{T}_{\mu\nu} + \sqrt{\frac{g}{\bar{g}}}\;\bar{K}_{\mu\nu}\right)$$

The following is the expansion law, the exact solution of the JCM field equations system. [2].

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(3) $$a(u) = \alpha^2 \cosh^2 u$$

(4) $$t(u) = \alpha^2 \left(1 + \frac{sh2u}{2} + u \right)$$

Here is the corresponding curve:

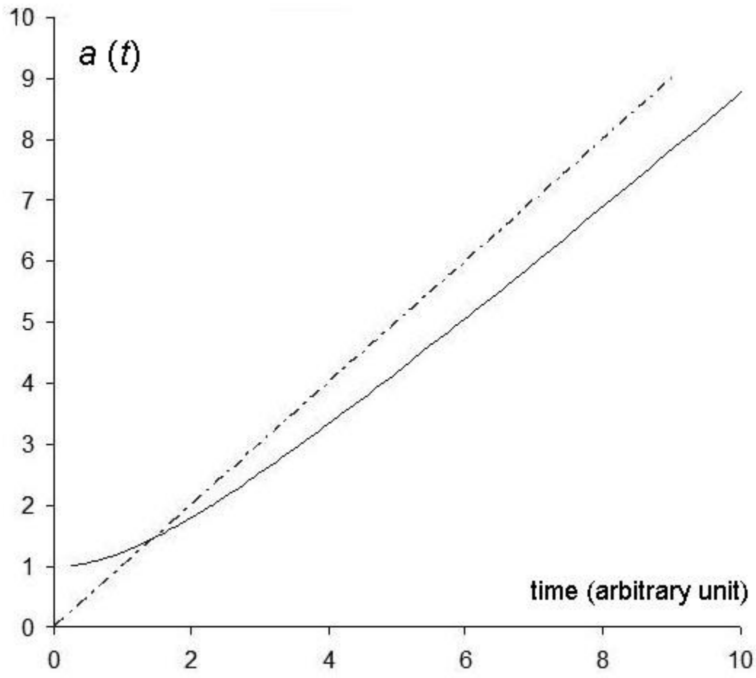

Fig.1 : Loi d'expansion Janus, sous forme de solution exacte [2].

Figure 2 shows the evolution of the acceleration:

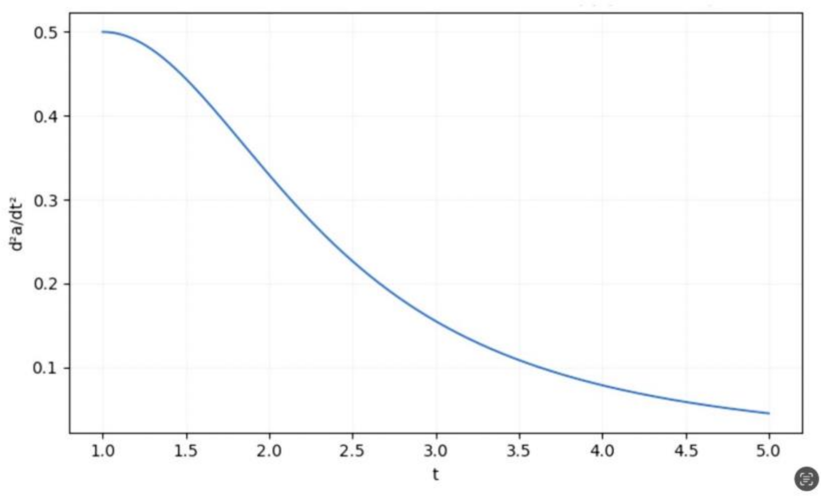

Fig.2 : Evolution of the acceleration [2].

It is known that in the late 1980s, the discovery of the extreme homogeneity of the early universe, the CMB, immediately presented a major problem. The diagram below illustrates this.

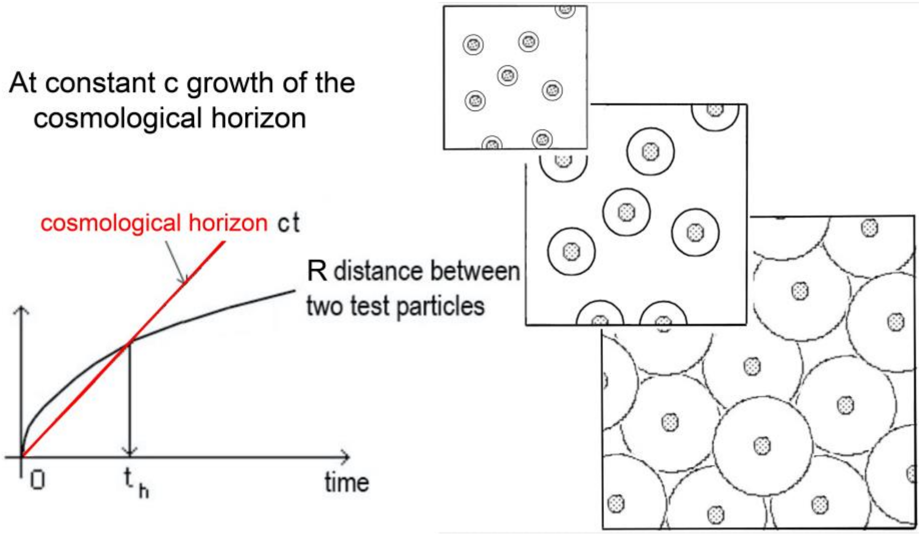

Fig.3 : The problem of the homogeneity of the early universe.

For over three decades, the inflation model has been the scientific community's answer to this problem. Between 10^{-36} and 10^{-32} seconds, the universe, populated by inflatons, would have undergone an expansion by a factor of 10^{26}. At the end of this phase, these inflatons would have given rise to the menagerie of particles we know. Unfortunately, we have no description of the entirety of this scenario. An alternative solution would be to consider that the speed of light could vary, for example, by imagining that c varies as $t^2/3$. That is, as the spatial scale factor a of the universe. Homogeneity would then be ensured at all epochs:

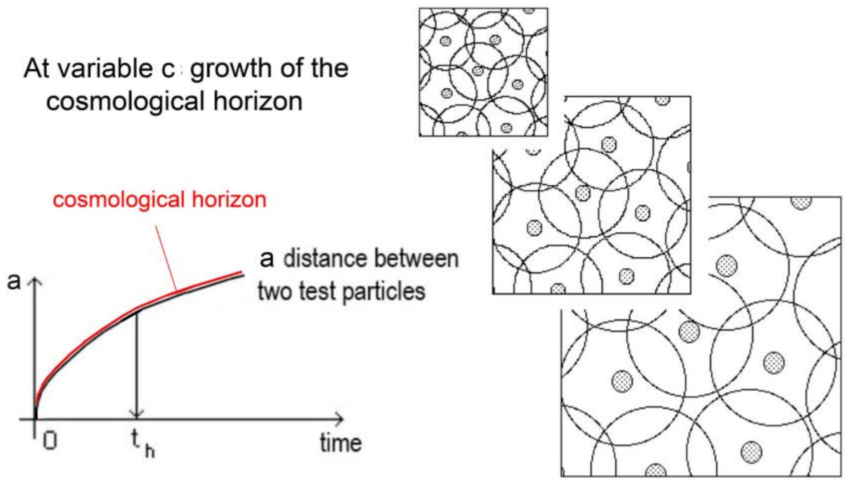

Fig.4 : Homogeneity ensured by a variation in the speed of light.

But this formula immediately raises a whole host of problems. The formation of atoms requires the invariance of the fine-structure constant, which is then no longer guaranteed.

(5) $$\alpha = \frac{e^2}{4\,\pi\,\varepsilon_0\,\hbar\,c}$$

There is another objection, of a purely geometric nature. Special relativity imposes local invariance with respect to the Lorentz group. This group is a subgroup of the Poincaré group, the isometry group of Minkowski space. The relativistic length is given by the Lorentz metric:

(6) $$ds^2 = c^2 dt^2 - dr^2 - r^2(\,d\theta^2 + sin^2\theta\, d\varphi^2\,)$$

Its invariance is thus immediately broken if we admit that c can vary.

The constants of physics are limited in number:

- Speed of light : c
- Planck constant: $\hbar$
- Unitary electric charge : e
- Magnetic permeability of vacuum μ_0
- Unitary masses.

The dielectric constant of free space, ε_0, can be deduced from the relation:

(7) $$c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$$

A solution was considered as early as 1988 [3] and extended in 1995 [4], without attracting much attention. Is this vision feasible? Yes, if these variations leave the equations of physics, Maxwell's equations, the Navier-Stokes equations, quantum equations, etc., invariant. To achieve this, it is also necessary to introduce scaling factors for time and space, which, in particular, leave the Lorentz metric invariant. The representation of the state of the universe at a given time can only be understood if observational data supports such a model. The fact that, on the one hand, high-energy photons in cosmic radiation can transform into pairs composed of matter and antimatter particles, and on the other hand, that these same pairs can annihilate, re-emitting photons, combined with the discovery of the residual background radiation at 2.7 Kelvin, lends credence to the vision of a primitive state at very high temperatures where these syntheses and annihilations occur at a frenetic pace. Since cosmic expansion is also an observed phenomenon, it is confirmed that matter represents a fraction of these pairs that have survived annihilation, at a rate of one in a million. Even though the lack of observations of primordial antimatter means we only have half the picture, this leads scientists to believe that their description of the cosmic past can extend beyond the first hundredth of a second, down to the first thousandth of a second, as Steven Weinberg noted in his famous book "The First Three Minutes" [5]. However, everything before that remains purely speculative. We are thus approaching a kind of frontier that physics faces. And it is the same frontier that makes the description of hyperdense states, such as those found at the heart of neutron stars, uncertain. Calculations then show that the average distance separating hadrons then reaches their Compton length:

(8) $$\lambda_C = \frac{\hbar}{m\,c}$$

If we consider that the density could then increase, the solution is to consider that these hadrons could fragment into smaller components, the occurrence of free quarks. The increasing power of our colliders led us to hope for the appearance of objects representing even higher energy condensations. But we were forced to acknowledge that, here again, physical reality seemed to elude us. Thus, we must consider that there might be a limit to this volumetric concentration of energy, by considering a different evolutionary model. The toy model below will allow us to illustrate this idea.

2- **Schema of the evolution of a hyperdense state in a regime of** "**variable constants**".

Masses are local concentrations of curvature. Imagine a closed universe containing eight masses. The image of such a universe is then a blunt cube. The total curvature of this cube is 4π. These eight blunt vertices of this cube are eighths of a sphere, each concentrating a curvature equal to $\pi/2$. These elements are joined by surfaces devoid of curvature, which are quarter-cylinders and flat sections. These latter elements represent the "void" that separates these eight masses. The expansion of this universe, having the topology of the S^2 sphere, results from the dilation of the flat segments. Here we find the standard model where photons bear the brunt of the expansion, their wavelength following the rate of cosmic dilation.

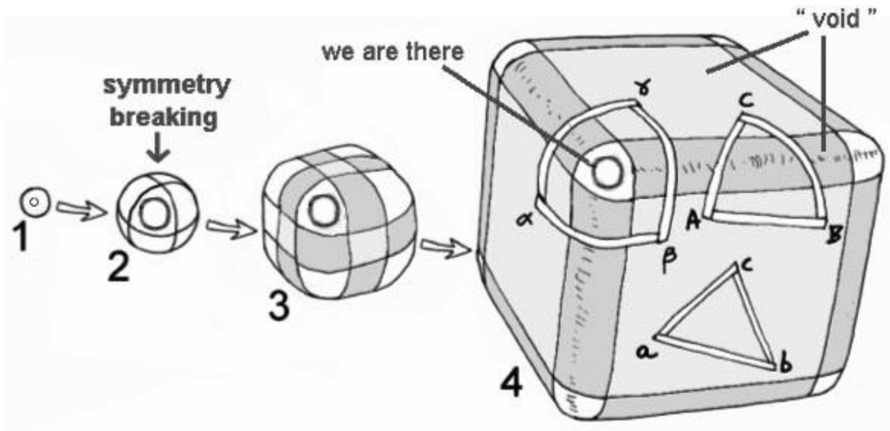

Fig.5 : A toy model to illustrate the evolution

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From this perspective, masses can be likened to "frozen space".

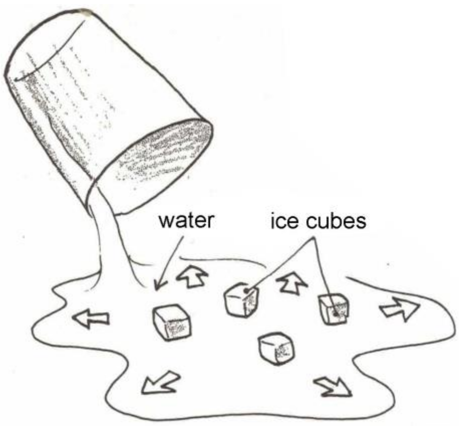


Fig.6 : Didactic model where masses are represented by ice cubes.

When we look back into the past of this universe, we observe that in state 3, the eight-eighths of a sphere come into contact. This is equivalent to the moment when masses come into contact, when the distance separating them becomes on the order of their Compton wavelength. Instead of seeing these "masses" fragment into smaller elements, we can then imagine the transition to a regime with variable constants, where the Compton wavelength would vary as the spatial scale factor *a*:

(9)
$$\lambda_C = \frac{\hbar}{m\,c} \sim a$$

We will place all of this in the context of the Janus cosmological model, where we will then have two sets of constants and scale factors.

3 – Construction of an evolution diagram in a variable constant regime.

In the Janus model ([6], [7]) the extension of the unsteady solution in the radiative era, using FRLW metrics, produces a compatibility condition of the equations which, always in the form of a generalized energy conservation. In the radiation dominated era :

(10)
$$E = \rho\, c^2\, a^4 + \bar{\rho}\, \bar{c}^2\, \bar{a}^4 = Cst$$

The expansion, with E < 0, is then always accelerated in the positive population. It should be noted in passing that any description of the corresponding cosmic history, prior to decoupling, can only be conjectural, given that we have no measurements corresponding to this period. Our claim to reconstruct the corresponding physical conditions in our powerful accelerators remains illusory in the sense that if the energy of the components is present, an essential parameter is missing: the density. The model is profoundly asymmetrical, on all sides. The only tangible data concern the abundance of primordial light elements and the facies of the primordial radiation. This had proved to be very homogeneous, we will attempt to construct a model that accounts for this state. We will reduce the description of the two species to eight quantities. For the positive species, these are:

(11)
$$\left\{ \hat{c}, \hat{h}, \hat{G}, \hat{m}, \hat{e}, \hat{\mu}_o, a, \hat{t} \right\}$$

They are :

- Speed of light $\hat{c}$
- Planck's constant $\hat{h}$
- Gravitational constant $\hat{G}$
- Mass $\hat{m}$
- Electric charge $\hat{e}$
- Magnetic permeability of vacuum $\hat{\mu}_o$
- Spatial scale factor a
- Time scale factor $\hat{t}$

Noting that the vacuum dielectric constant $\hat{\varepsilon}_o$, μ_o , can be deduced from $\hat{c}$ and $\hat{\mu}_o$.
What constraints will we impose to construct the relations that link them?

- Maintain Lorentz invariance.
- The fact that the Compton length will vary like the space gauge a
- That this generalized gauge process leaves all physics equations invariant.

And, in the negative world:

(12) $$\left\{ \hat{\bar{c}} , \hat{\bar{h}} , \hat{\bar{G}} , \hat{\bar{m}} , \hat{\bar{e}} , \hat{\bar{\mu}}_o , \bar{a} , \bar{\hat{t}} \right\}$$

The first six behave like constants in the equations of our physics. The quantities a , $\hat{t}$ and $\bar{a}$, $\hat{\bar{t}}$ are scale factors of space and time in both worlds. We will first assume that the negative and positive worlds obey the same physical laws, and are therefore governed by the same equations, Dirac, Maxwell, etc. We therefore consider generalized gauge laws linking these eight quantities, which leave all the equations of our physics invariant, while conserving energy in all its forms. We will detail the calculations for the positive sector. A similar calculation is carried out in the negative world. There are two ways to proceed. One, the more complicated, consists of considering all the equations of physics: the Maxwell, Boltzmann, Schrödinger, or Dirac equations, introducing the gauge variations of the eight quantities with which they are constructed, and then searching for the generalized gauge law that then leaves them invariant. We will proceed more simply. Let's consider the field equation for positive masses:

(13) $$R_{\mu\nu} - \frac{1}{2} R \, g_{\mu\nu} = \chi \, T_{\mu\nu}$$

In the line element :

(14) $$ds^2 = g_{\mu\nu} \, dx^\mu dx^{\mu\nu}$$

The coefficients of the metric tensor are simple dimensionless numbers. Since the coefficients of the Ricci tensor are constructed with second derivatives, if we consider a gauge fluctuation we will have:

(15) $$\hat{R}_{\mu\nu} \propto a^{-2}$$

If the coefficients of the source tensor are densities, for example, in its mixed form, in:

(16) $$T_\mu^{\ \nu} = \begin{pmatrix} \rho & 0 & 0 & 0 \\ 0 & -p/c^2 & 0 & 0 \\ 0 & 0 & -p/c^2 & 0 \\ 0 & 0 & 0 & -p/c^2 \end{pmatrix}$$

Then :

(17) $$\hat{T}_\mu^{\ \nu} \propto \hat{\rho} \propto \hat{m} \, a^{-3}$$

In a gauge variation of the field equation it is written:

(18) $$\hat{R}_{\mu\nu} - \frac{1}{2} \hat{R} \, g_{\mu\nu} = \chi \, \hat{T}_{\mu\nu}$$

Considering Einstein's constant as an absolute constant, its invariance will be ensured if:

(19) $$\hat{m} \propto a$$

To this hypothesis of invariance we will add that of conservation of energies. Thus:

(20) $$\hat{m}\,\hat{c}^2 = Cst$$

Which gives us the gauge law:
(21) $$\hat{c} \propto a^{-1/2}$$

From the invariance of Einstein's constant, expressed as:

(22) $$\chi = -\frac{8\pi G}{c^2}$$

We derive the gauge relation:
(23) $$\hat{G} \propto \hat{c}^2$$

Whence :

(24) $$\hat{G} \propto a^{-1}$$

To ensure the conservation of energy in the form of:

(25) $$\frac{m\,c^2}{\sqrt{1 - v^2/c^2}}$$

The speeds must follow the gauge variations:

(26) $$\hat{v} \propto \hat{c} \propto a^{-1/2}$$

Combining these relationships we obtain a Jeans length varying as *a*.

We also want the metric to be invariant, that is, in spherical coordinates, that:

(27) $$d\hat{s}^2 = \hat{c}^2\hat{t}^2 d\tau^2 - a^2(d\xi^2 + \xi^2 d\theta^2 + \xi^2 sin^2\theta\, d\varphi^2)$$

Which results in:
(28) $$a = \hat{c}\,\hat{t}$$

This gives a variation of gauge of the metric according to a conformal metric:

(29) $$d\hat{s}^2 = a^2(d\tau^2 d\xi^2 - \xi^2 d\theta^2 - \xi^2 sin^2\theta\, d\varphi^2)$$

Lorentz invariance is ensured. Combining with the previous relation we obtain the gauge relation linking *a* and $\hat{t}$:

(30) $$\hat{t} \propto a^{3/2}$$

4 – **Alternative to the inflation model**.

In this gauge variation the evolution of the cosmological horizon becomes:

(31) $$horizon = \int \hat{c}(\hat{t})\, d\hat{t}$$

Let us express the horizon in terms of the space factor a, with $\hat{c} \propto a^{-1/2}$ et $\hat{t} \propto a^{3/2}$:

(32) $$d\hat{t} \propto \frac{3}{2}\, a^{1/2}\, da$$

We get :

(33) $$horizon \propto \int da = a$$

By considering a description of cosmic evolution with:

- A variable speed of light

- Preserving Lorentz invariance

- With conservation of energy

We obtain a cosmological horizon that grows at the same time as the universe itself, thus ensuring its homogeneity at all epochs, without needing to invoke the cumbersome and unclear ad hoc assumptions of the various inflation models. We have seen that our conceptual starting point lies at the moment when the distance between baryons becomes smaller than their Compton length. This must therefore follow the gauge phenomenon, that is, that:

(34) $$\hat{\lambda} = \frac{\hat{\hbar}}{\hat{m}\,\hat{c}} \propto a$$

Which gives us the gauge variation law of Planck's constant:

(35) $$\hat{\hbar} \propto \hat{t} \propto a^{3/2}$$

If we want the fine structure constant to behave like an absolute constant:

(36) $$\hat{\alpha} = \frac{\hat{e}^2}{4\pi\hat{\varepsilon}_o\,\hat{h}\hat{c}} = Cst$$

We get:

(37) $$\frac{\hat{e}^2}{\hat{\varepsilon}_o} \propto a$$

But the “constants” $\hat{c}$, $\hat{\mu}_o$, and $\hat{\varepsilon}_o$ are linked by $\hat{c} = (\hat{\mu}_o \hat{\varepsilon}_o)^{-1/2}$. We can opt to take $\hat{\varepsilon}_o$ as an absolute constant, not participating in these gauge fluctuations. Under these conditions :

(38) $$\hat{e} \propto \sqrt{a}$$

(39) $$\hat{\mu}_o \propto a$$

So we have all our gauge relationships. Let's group them together by expressing all these variations in terms of the space scale factor a:

(40) $$\hat{c} \propto \frac{1}{\sqrt{a}} \qquad \hat{h} \propto a^{3/2} \qquad \hat{G} \propto \frac{1}{a} \qquad \hat{e} \propto \sqrt{a} \qquad \hat{m} \propto a \qquad \hat{t} \propto a^{3/2} \qquad \hat{\mu}_0 \propto a$$

We can then easily verify that all the equations of our physics are invariant under this generalized gauge transformation. All forms of energy are conserved. All characteristic lengths vary as a and all characteristic times vary as $a^{3/2}$, that is to say as $\hat{t}$. The redshift measurement is a measure of the energy loss of the photons. However, in this phase with "variable constants", their energy remains constant. So in the matter era, when these redshifts are measured, the gauge variation phenomenon has already ended, which means that all the constants have stabilized by taking the values that we know today. We could then, using logarithmic coordinates, give a schematic appearance of such variations:

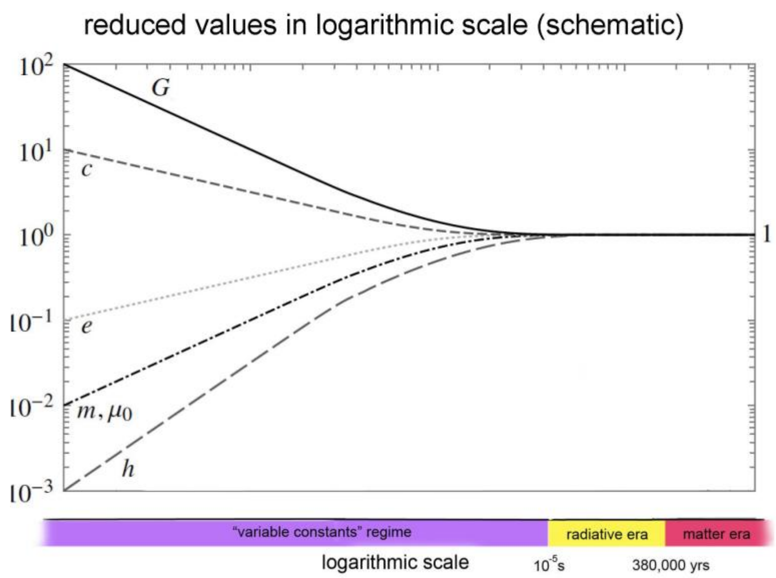


Fig.7 : Schematic evolution of constants..

Thus, there are three phases in cosmic evolution. Moving progressively back in time, we find two phases where the constants of physics behave as invariant elements: the matter-dominated era and the radiation-dominated era, with the transition between the two occurring around 380,000 years ago. Going further back in time, we place a new regime change around 10^{-5} seconds, when the average distances between hadrons become on the order of their Compton length. Here, we suggest the shift to a regime with variable constants, an alternative to the inflationary model. As with the latter theory, we have only one observational confirmation, but a crucial one: the extreme homogeneity of the early universe. At the end of this phase with variable constants, the constants of physics take on the values we know today.

5 – **In the negative sector**.

We have assumed, as suggested by group theory [7], that the laws of physics are the same in the negative world. This is therefore governed by the following parameters [4]. A similar approach therefore leads to the gauge laws:

$$(41) \quad \hat{\bar{c}} \propto \frac{1}{\sqrt{a}} \qquad \hat{\bar{h}} \propto a^{\frac{3}{2}} \qquad \hat{\bar{G}} \propto \frac{1}{a} \qquad \hat{\bar{e}} \propto \sqrt{a} \qquad \hat{\bar{m}} \propto a \qquad \hat{\bar{t}} \propto a^{\frac{3}{2}} \qquad \widehat{\bar{\mu}_0} \propto a$$

The Janus cosmological model [6] is based on an action where two equal and opposite Einstein constants are present:

$$(42) \qquad \chi = -\frac{8\pi\hat{G}}{\hat{c}^2} \qquad \bar{\chi} = -\chi = +\frac{8\pi\hat{\bar{G}}}{\hat{\bar{c}}^2}$$

Which gives :

$$(43) \qquad \frac{\hat{G}}{\hat{c}^2} = \frac{\hat{\bar{G}}}{\hat{\bar{c}}^2} = Cst$$

The Janus model is deeply asymmetrical and its dynamics are predominantly dominated by negative masses. Hence the acceleration of the expansion of positive masses under the effect of a predominantly negative energy. This implies that this asymmetry extends to space scale factors:

$$(44) \qquad \bar{a} << a$$

The gauge relationship:

$$(45) \qquad a\,c^2 = \bar{a}\,\bar{c}^2$$

Gives:

$$(46) \qquad \bar{c} >> c$$

6 – **Different space scale and light velocities in the two sectors.**

Consider two points A and B in positive spacetime. They coincide with points $\bar{A}$ and $\bar{B}$ on the adjacent negative sheet. They can be located using common dimensionless coordinates $\{\tau, \xi, \theta, \varphi\}$ which are those of the manifold of which these folds represent the double covering. Consider a path at $\Delta\theta = \Delta\varphi = 0$. The distances traveled will be different, depending on whether we consider these paths to be made in the positive sheet or in the negative fold:

$$(47) \qquad \Delta\bar{l} = \bar{a}\,\Delta\xi << \Delta l = a\,\Delta\xi$$

Furthermore, the movements in the negative fold are limited by the speed of negative energy photons $\bar{c}$, large compared to c. There is therefore a double time saving, concerning travel times, both on the distance and on the limitation of the speed. As mentioned in [6], the passage from one sheet to the other does not cause the inversion of proper time, but that of the time coordinate, which is accompanied by the inversion of the mass. This article shows that the ratio between the cosmological horizons of the two sheets is like the ratio of the two scale factors. As mentioned in [8] gravitational instability also manifests itself before decoupling, during the radiative era, but the equivalent of the corresponding Jeans length is then of the order of the horizon. Within the same sheet these fluctuations therefore escape observation. This means that an observer made of negative mass could not observe such fluctuations. But these fluctuations would then leave their mark in the positive world and this phenomenon would correspond to the weak fluctuations of the CMB in the positive world. See figure 7.

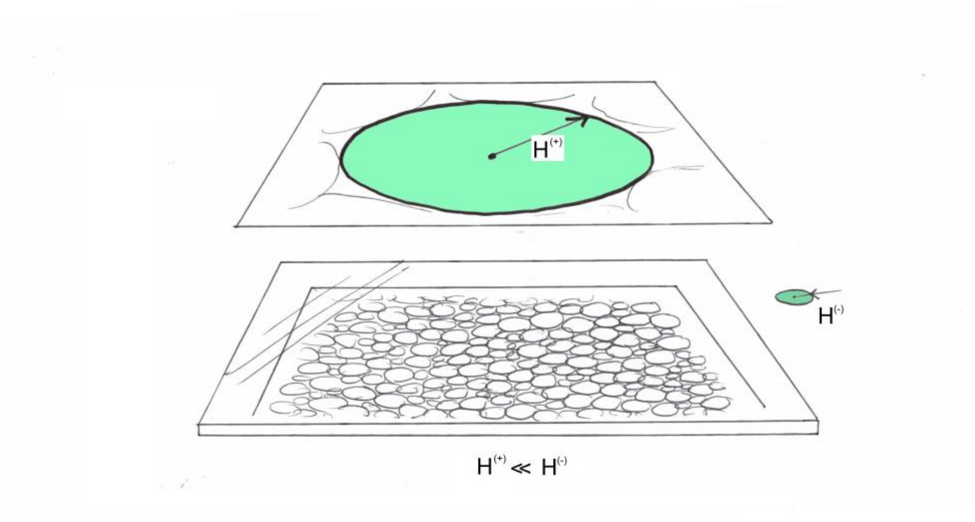


Fig. 8: Our interpretation of the CMB inhomogeneity. $H^{(+)}$ and $H^{(-)}$ are the cosmological horizons of the two universes [8].

Thus the characteristic wavelength of these CMB fluctuations would give the value of the cosmological horizon in the second universe, at the time considered. By retaining a value of the order of a hundredth, we obtain the following orders of magnitude:

(48) $$\frac{\bar{a}}{a} \cong \frac{1}{100} \qquad \frac{\bar{c}}{c} \cong 10$$

This results in a gain of a factor of 1000 in travel time. The problem would then be to find a way to reverse the mass of a vehicle of mass M without having to devote Mc^2 energy to it!

7 – On the asymmetry of the universe, according to the Janus model.

A future article will show how this arises exponentially from the instability of the system of field equations, in its phase with variable constants, this divergence being interrupted as soon as the expansion puts an end to this process.

(49)

$$\text{(fully symmetrical system)} \rightarrow \{ \hat{c}, \hat{G}, \hat{h}, \hat{m}, \hat{e}, \hat{\mu}_o, a, \hat{t} \}$$
$$\text{(fully symmetrical system)} \rightarrow \{ \hat{\hat{c}}, \hat{\hat{G}}, \hat{\hat{h}}, \hat{\hat{m}}, \hat{\hat{e}}, \hat{\hat{\mu}}_o, \hat{\hat{a}}, \hat{\hat{t}} \}$$

Fig. 9: Diagram of the appearance of asymmetry in the phase with variable constants

A priori these fluctuations could produce not only asymmetries between adjacent sheets but also generate the coexistence of what have been called "baby universes", constituting a so-called "Multiverse"([9],[10],[11]) The universe would thus be made up of a succession of "pairs of universes" with their own set of scale factors and constants. But the physical laws that govern them would remain identical to ours. Thus, even if these structures can never be the subject of observational confirmations, their contents would deviate from the phantasmagoria imagined in the literature.

8 – A different conception of time.

For a century now, the history of the universe has been the subject of all kinds of conjecture. It was initially a huge surprise to discover, with cosmic expansion, that the universe had not always been as it appeared to us from a limited distance. The discovery of primordial radiation confirmed the hypothesis of an past extremely dense and hot state. Today we must keep in mind that the only direct observational data, from these messengers, photons, limit our direct perception of the past to 380,000 years. The existence of primordial radiation has reinforced the theory of a fantastic annihilation around the first hundredth of a second. Before that, it is the unknown and the domain of all speculation. Some ask the question "what was there before the Big Bang?" The Janus model begins by providing a strange answer, derived from the topology of space-time, according to this model, as a two-fold covering of a P4 projective. The 2D didactic image is then that of the peeling off of a layer of paint applied to the single face of a Möbius strip at a half-turn [6].

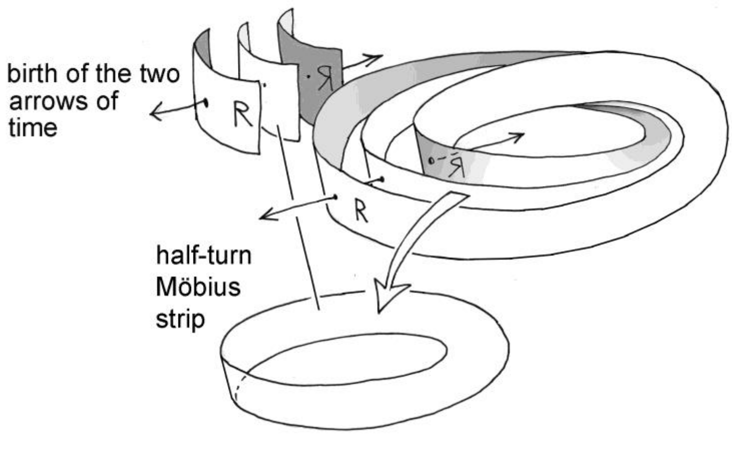
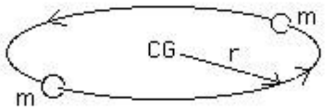


Fig.10: The birth of two opposing arrows of time.

We see, then, that in this model, the universe appears to emerge from an achronous structure, which is also spatially inorientable, and that two arrows of time, from a time that does not yet exist, materialize simultaneously in two opposite directions. Moreover, the interaction between these two regions, equipped with opposing time coordinates, is immediate. How can we speak in these conditions of a pre-Big Bang? The answer to such a question is then more the responsibility of the philosopher than the physicist. In one of these two layers, arbitrarily termed "positive," extremely rich structures will form, leading to living beings, beings endowed with consciousness, who will question the world in which they are immersed, while the other layer will vegetate, remaining amorphous. To go back in time, one needs a clock, even if it is conceptual. In Einsteinian cosmology, we consider two masses, point-like, "very close to each other," orbiting around a common center of gravity, assuming that, by some miracle, this structure could persist. Time is a number of revolutions. It is the revolution of the Sun, completing its quasi-circular orbit in its galaxy, it is the revolution of the Earth around the Sun, the revolution of this Earth on itself, that of the second hand on the dial of the watch. In this model, instant zero is reached in a finite number of revolutions. But everything changes, in a regime of variable constants.



$$\text{period} = \frac{2\pi r^{3/2}}{G\,m} \approx t \qquad \Delta n \approx \int_{t_1}^{t_2} \frac{dt}{t} = \text{Log}\, t_2 - \text{Log}\, t_1$$

$$\text{if } t_1 \longrightarrow 0 \text{ then } \Delta n \longrightarrow \infty$$

Fig.11 : The conceptual clock in the phase with variable constants

If we then evaluate the number of turns up to the moment when the time coordinate reverses, we find an infinite value and we find the paradox of Achilles and the tortoise!

9 - **Conclusion :**

A journal editor will immediately ask, "To which referee can I entrust such an article?" For over three decades, numerous authors have published articles reporting a variable speed of light, always with the aim of explaining the extreme homogeneity of the early universe. But since none of them considered, on the one hand, joint variations of all these constants, and on the other hand, the inclusion of variations in spatial and temporal scale factors in this process, they cannot guarantee the invariance of the fine-structure constant. It is therefore pointless to cite their articles, as these are contradicted by observational constraints. Although the technique used as the basis for this article was introduced 38 years ago, it garnered no attention in the scientific community, which preferred to focus on the inflation model and its various variants. But we are forced to conclude that, more than three decades later, this approach remains at the level of a mere conjecture. A general situation exists in the field of cosmology. The same observation can be made regarding string theory, dark matter, dark energy, and black holes [12], which behave like veritable attractors, dragging the scientific community into the equivalent of the "Sargasso Sea," where nothing moves or progresses. The field is clearly facing the imperative of a paradigm shift. The ideal reviewer for this article will therefore be a theoretical physicist open enough to consider an approach necessarily far removed from the mainstream. The Janus cosmological model [6] goes in this direction. The present study complements this model by describing the primitive phases of the evolution of the positive and negative sectors through regimes with variable constants. Such an approach leads to an alternative interpretation of CMB fluctuations, considered as the impact, on the positive sector, of the gravitational fluctuations at work in the negative sector. This then allows for a determination of the ratio of scale factors and the speed of light in the two sectors. This will be revisited and expanded upon in the following article. The defining characteristic of this Janus model is its extreme asymmetry, both with respect to its physical parameters—distance, density—and with respect to the values of the physical constants. The origin of this asymmetry lies in the instability of the system during its phase with variable constants. This creates a whole set of pairs of universes, equipped with pairs of potentially very different sets of constants. This aligns with the fashionable idea of the multiverse, a pretext for the wildest speculations. However, it should be noted that while the pairs of constant sets are different, the laws of physics—that is, the equations that govern the phenomena—remain the same. Therefore, the evolutions in these "baby universes" will not differ from what we observe. This phase with variable constants constitutes a mathematically unexplored domain. It is conjectured that instabilities could give rise to the supermassive objects found in large numbers at the center of galaxies, and it is difficult to see how a simple accretion phenomenon could give rise to such monsters.

As a final conclusion, we would say that hoping that the simple, meticulous census of the increase in the precision of measurements and observations, while neglecting this vector of innovation represented by the bubbling of ideas and theoretical work, can be the sole guarantor of the progress of knowledge, is equivalent to considering continuing one's journey on one leg, using only one of one's two legs.

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