Evolution of the Universe

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Abstract: This paper will provide some well based scientific arguments that time is neither a product of space nor an illusion; instead time is in a state of constant motion. That motion inflated space from the very beginning, the Big Bang, and it still does so now. We will name it "temporal motion" and provide a detailed explanation to why this concept is far more accurate than the current concept of "repulsive gravity" that dominates in the cosmic inflation studies. Temporal motion inflates space and creates the relationship between space and time known as the space-time continuum; time is dominant in this relationship since its motion started the initial inflation of space, giving birth to the Universe, and continues to inflate space. Evolution will be explained as one of the basic laws of physics.

Introduction

Some of the unexplained problems in physics can be explained and proven in a relatively simple way if we apply the logic of General Relativity on other fields of physics. The simplest way is to use “temporal motion” instead of “repulsive gravity” to explain the inflation of space from the initial inflation, often called “cosmic inflation”, to the present time.

We use a (-,+,+,+) metric, where (-) marks the dimension of time (t) as usual. Even in the simplest form of a (R^4) flat spacetime with (t, x, y, z) we have a metric:

$$(1)\ ds^2 = -c^2dt^2 + x^2 + y^2 + z^2$$

We will proclaim that temporal motion inflates space; the inflation is its equivalent of what a trajectory is for spatial motion. Temporal motion has a velocity ($-c$) which is impossible for spatial motion but necessary for temporal motion. Although it is difficult to form equations for a motion with negative velocity, it is possible.

Cosmological model

The Universe will be represented as homogenous and isotropic. Isotropy means that the metric must be diagonal since it will be show that space is allowed to be curved. Therefore we will use spherical coordinates to describe the metric.

The metric is given by the following line element:

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

where we measure (θ) from the north pole and at the south pole it will equal (π).

In order to simplify the calculations, we abbreviate the term between the brackets as:

$$(3)\ d\omega^2 = d\theta^2 + \sin^2\theta\, d\varphi^2$$

because it is a measure of angle, which can be thought of as “on the sky” from the observers point of view. It is important to mention that the observers are at the center of the spherical coordinate system.

Due to the isotropy of the Universe the angle between two galaxies, for the observers, is the true angle from the observers’ vantage point and the expansion of the Universe does not change this angle.

Finally, we represent flat space as:

$$(4)\ ds^2 = dr^2 + r^2d\omega^2$$

Robertson and Walker proved that the only alternative metric that obeys both isotropy and homogeneity is:

$$(5)\ ds^2 = dr^2 + f_K(r)^2 d\omega^2$$

where ($f_K(r)$) is the curvature function given by:

$$(6)\ f_K(r) = \begin{cases} K^{-1/2}\ for\ K > 0 \\ r\ for\ K = 0 \\ K^{-1/2} \sin h\left(K^{1/2} r\right)\ for\ K < 0 \end{cases}$$

which means that the circumference of a sphere around the observers with a radius (r) is, for ($K \neq 0$), not anymore equal to ($C = 2\pi r$) but smaller for ($K > 0$) and larger for ($K < 0$).

The surface area of that sphere would no longer be ($S = \left({}^{4\pi}/_{3}\right) r^3$) but smaller for ($K > 0$) and larger for ($K < 0$). If ($r$) is ($r \ll |K|^{-1/2}$) the deviation from ($C = 2\pi r$) and ($S = \left({}^{4\pi}/_{3}\right) r^3$) is very small, but as (r) approaches ($|K|^{-1/2}$) the deviation can become rather large.

The metric in the equation (1) can also be written as:

$$(7)\ ds^2 = \frac{dr^2}{1 - Kr^2} + r^2 d\omega^2$$

If we determine an alternative radius (r) as:

$$(8)\ r \equiv f_K(r)$$

This metric is different only in the way we chose our coordinate (r).

We can now build our model by taking for each point in time a RW space. We allow the scale factor and the curvature of the RW space to vary with time. This gives the generic metric:

$$(9)\ ds^2 = -dt^2 + a^+(t)^2[dx^2 + f_K(x)^2 x^2 d\omega^2]$$

the function ($a^+(t)$) is the spatial scale factor that depends on time and it will describe the spatial expansion of the Universe. We use (x) instead of (r) because the radial coordinate, in this form, no longer has meaning as a true distance.

Temporal Motion

Temporal motion needs three equations for a trajectory to successfully explain inflation since inflation can only occur in three spatial dimensions, unlike expansion that can happen in one or two dimensions.

We will evade the difficulty of negative velocity by establishing a “negative factor” ($d\text{Д}$) which has no dimension or numerical value, it is only a ($-$) although if the necessity arises it can be given an arbitrary value of (-1) for mathematical needs.

We write a simple equation of motion:

$$(10)\ \delta \twoheadrightarrow = \delta \int d\text{Д}\, L(a(t), \dot{a}(t))$$

Where ($\twoheadrightarrow$) is the symbol for temporal motion, ($a(t)$) is the three-dimensional trajectory/inflation and ($\dot{a}(t)$) is the velocity that equals (c) the speed of light. However, due to the negative factor the velocity is:

$$(11)\ \dot{a}^{-}(t) = -c$$

And the trajectory describing inflation ($a(t)$) becomes ($a^{-}(t)$) and functions as:

$$(12)\ a^{-}(t) \begin{cases} \twoheadrightarrow (x) = \log_{\lim\limits_{x\to\infty}\left(\frac{1}{x}+1\right)^{x}}(x) \\ \twoheadrightarrow (y) = \log_{\lim\limits_{y\to\infty}\left(\frac{1}{y}+1\right)^{y}}(y) \\ \twoheadrightarrow (z) = \sum\limits_{i=1}^{n} \pi y_i + \delta x_i \end{cases}$$

where we use the ($\twoheadrightarrow (z)$) function to make z-frames for every individual frame from (1) to (n).

When we draw the functions, we get an image:

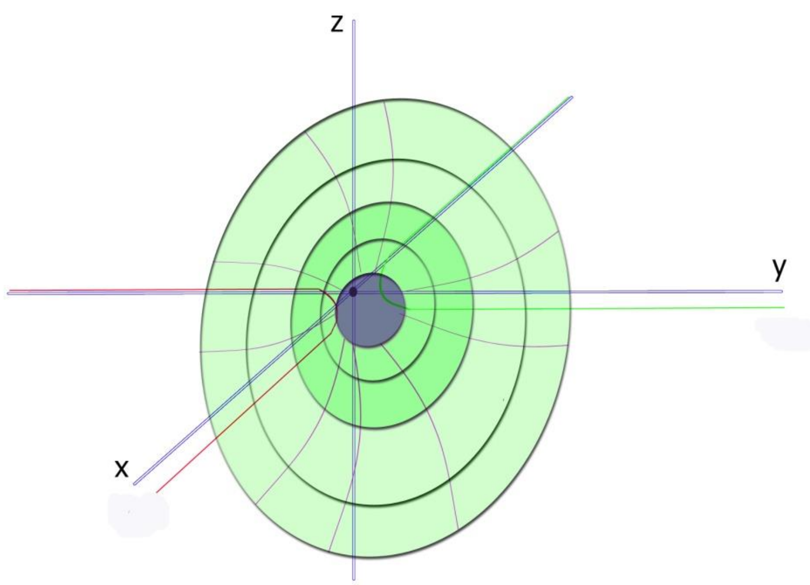

Figure 1: Functions $\twoheadrightarrow (x)$ is red, $\twoheadrightarrow (y)$ is green and $\twoheadrightarrow (z)$ are the ellipses from 1 to n.

When we remove the coordinate system it looks like this:

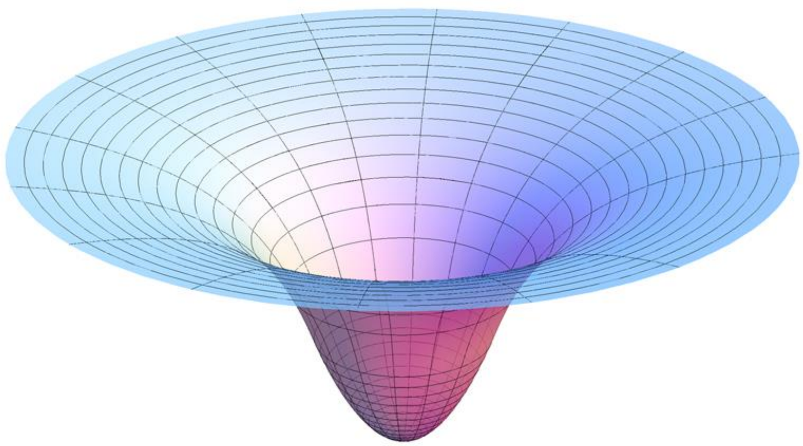

Figure 2: Trajectory of temporal motion.

These are the temporal equations, however they aren't independent but instead they are aligned with the spatial scale factor ($a^+(t)$) forming a relationship:

$$(13)\ a_-^+(t) = a^+(t) + a^-(t)$$

which is the relationship of space and time known as the spacetime continuum.

It is one of the simplest relationships in physics however also the most important one since all the fundamental forces function in a reverse way than temporal motion, most notably gravitation which is a reaction to temporal motion, its opposite.

Fundamental forces

Due to the relationship of space and time fundamental forces also have their temporal equations, which are the same for all of them.

$$(14)\ F_f(t) \begin{cases} \twoheadrightarrow (x) = \log_{\lim\limits_{a^- \to 0}\left(\frac{1}{\alpha_x}+1\right)^{x/\alpha_x}}(x) \\ \twoheadrightarrow (y) = \log_{\lim\limits_{a^- \to 0}\left(\frac{1}{\alpha_y}+1\right)^{y/\alpha_y}}(y) \\ \twoheadrightarrow (z) = \sum_{i=1}^{n} \pi y_i + \delta x_i \end{cases}$$

All the forces are centralized due to ($a^- \to 0$) and have two components. We will draw an imaginary temporal line to represent the axis. Angles (α_x) and (α_y) are the angles between the imaginary line, the axis, and dimensions (x) and (y).

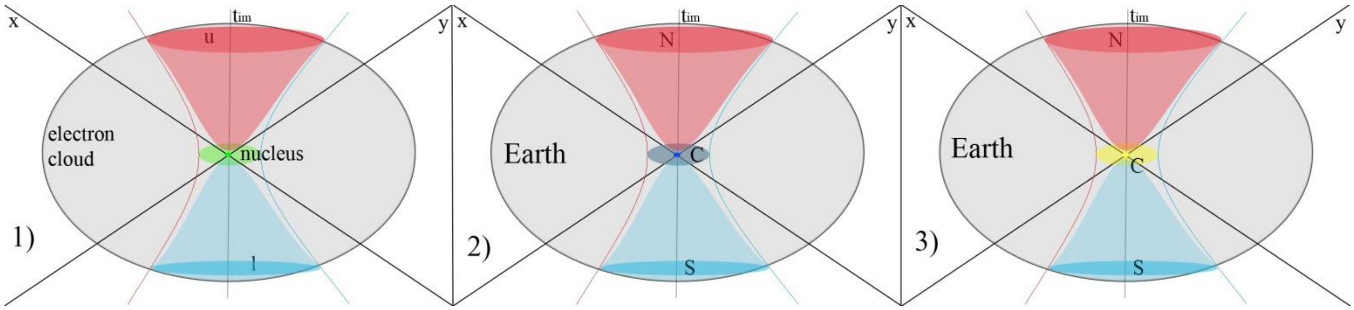

Figure 3: Temporal equations for 1) Nuclear force 2) Electromagnetic force 3) Gravitational force

There are three fundamental forces:

1) The Gravitational force which consists of the temporal (weak) gravitational component and the spatial (strong) gravitational component.

When we draw an ellipse to represent a celestial body we get an image of the temporal equations.

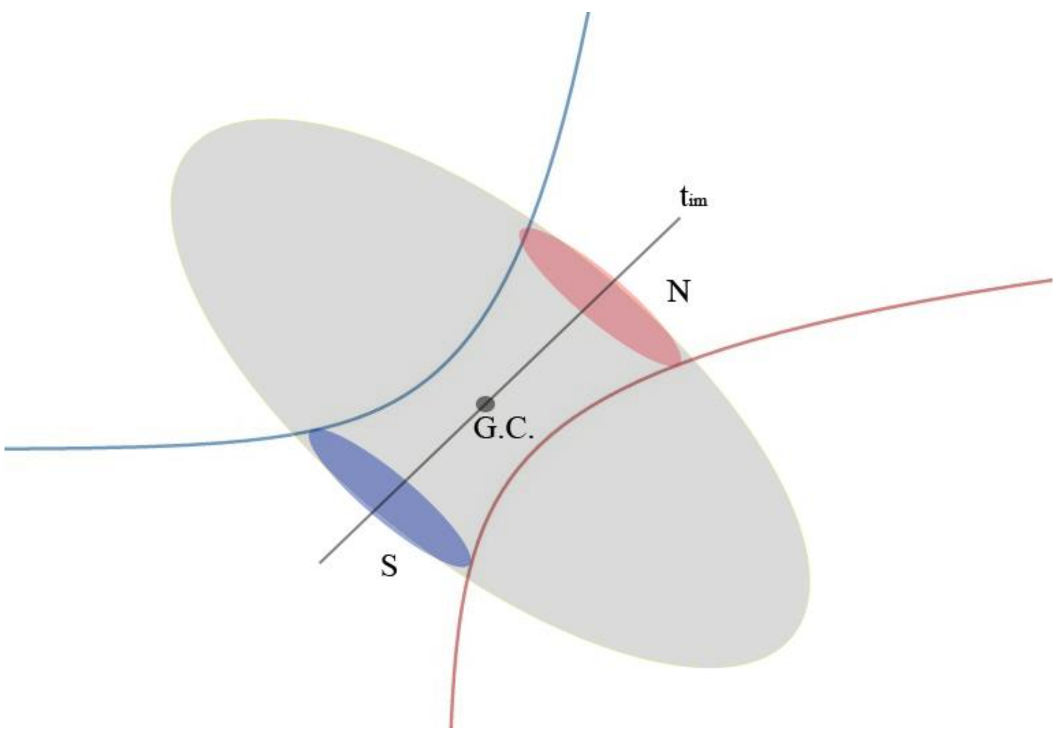

Figure 4: Gravitational force

The spatial (strong) gravitational component is in the center of the field. This gravitational center is very small, much smaller than a nucleus of an atom, approximately so small that it is on the Planck scale ($\ell_P = 1.616198\text{x}10^{-35}\text{m}$).

On this scale gravity is significantly stronger than any other force, even the strong nuclear force.

Any body that falls under the influence of a gravitational field of a celestial body will instantaneously react to its gravitational center regardless of the distance from the center. The body will react by gaining its own center of weight. A good example for this is a stick, holding a stick by its end takes more effort than to hold it by its center.

The force that reacts between the gravitational center and the center of weight is the temporal (weak) gravitational force. The temporal (weak) gravitational force is also responsible for gravitational time dilatation, which is why it is strongest at the poles of the celestial body.

When a star collapses under its own weight it implodes some of its core to the gravitational center, giving it mass which drastically increases its influence allowing the strong (spatial) force to spread much further than the Planck scale, taking macroscopic dimensions and consuming all matter that it can, even light cannot escape it since this force is much stronger than the electromagnetic one, which forms an event horizon. The spatial (strong) gravitational force then forms a new center, a gravitational singularity, allowing the temporal (weak) fore to remain unchanged. For example: we could replace the Sun with a black hole of the same mass and the gravitational relationship of the Solar system would not change. The outside gravitational force of black holes is the same as with any other body, however inside the event horizon there is only the strong gravitational force unlike any other body where this force is only present at the gravitational center, on the Planck scale.

2) The Electromagnetic force which consists of the magnetic (weaker) component and the electric (stronger) component.

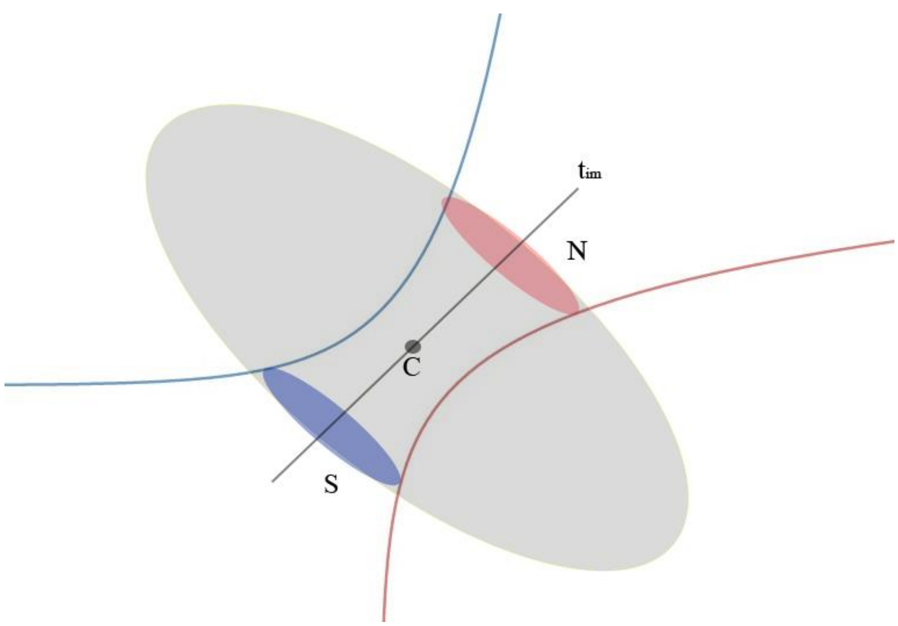

Figure 5: Electromagnetic force of Earth

Similarly to the gravitational force, electromagnetic force will instantaneously polarize during a reaction. In essence it is forming dipoles instantaneously which is an ability known as Polarizability.

Unlike gravity not every celestial body will have an electromagnetic field proportional to its mass since it depends on far more conditions.

3) The Nuclear force which consists of the orbital component (electroweak force) and the central component (strong nuclear force).

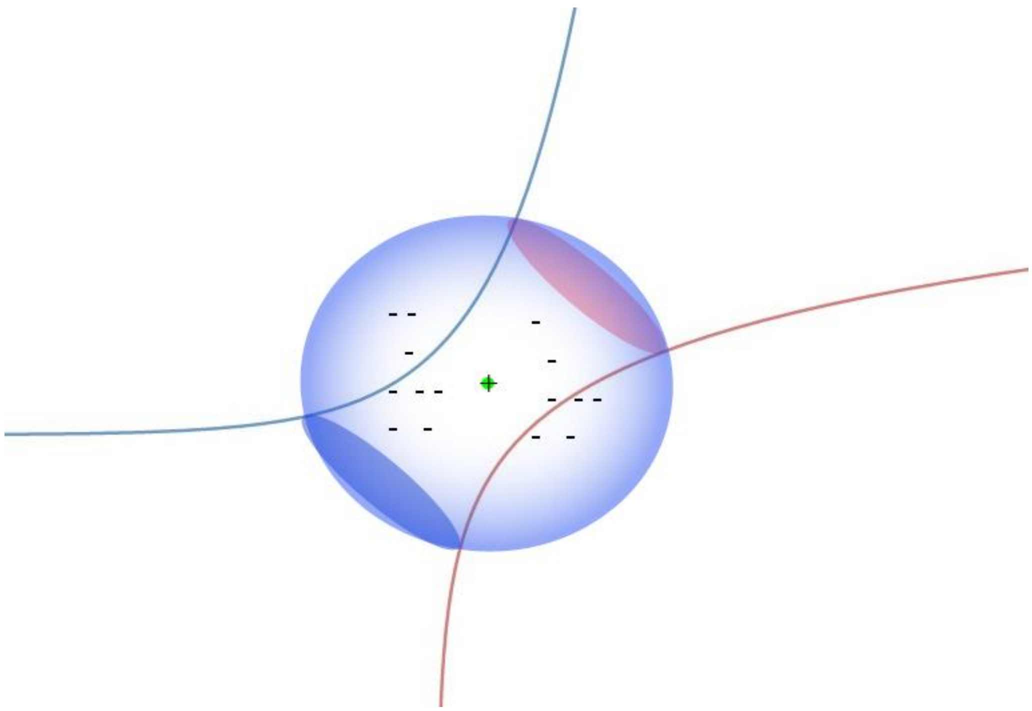

Figure 6: The Atom, where + and the green center is the nucleus and the blue cloud and - represents the electrons.

The Nuclear force is only present on the microscopic scale, unlike the former two forces.

The nucleus reacts with electrons and due to its mass being much larger and protons having reverse polarity (+) than electrons (-), while neutrons being neutral but even more massive than protons which mutually form the nucleus and influence the electrons to form a sphere around it, which is the atom. Poles of the atom influence the electrons to be in a cloud like state, essentially in a form of “still waves”.

Due to its poles, atoms can attract and repulse other atoms, forming covalent and ionic bonds.

The CP violation that occurs in atoms is similar to the anomaly of the black holes, where the weak gravitational force is not influenced by the drastic change of its center.

Transformation to General Relativity

In order to transform to General Relativity we will use the notion of z-frames. Every individual z-frame is represented by a value of (z), for example the current period is $(z = 1)$. We do so by transforming the (i) from the equations of temporal motion to (z), therefore $(i \Rightarrow z)$.

For $(z \simeq 1000)$ we have a value:

$$(15)\ a^{+}(t) \simeq \left(\frac{3}{2} H_0 \sqrt{\Omega_{m;0}} t\right)^{2/3}$$

Which is a z-frame know as “matter dominated era”. Earlier than that, in a z-frame known as the “radiation dominated era”, a period when the Universe was dominated by radiation, around $(z \gtrsim 3200)$ we have a value:

$$(16)\ a^{+}(t) \simeq \left(2 H_0 \sqrt{\Omega_{r;0}} t\right)^{1/2}$$

The early, radiation dominated Universe expanded as:

$$(17)\ a^{+} \propto \sqrt{t}$$

Every frame has slightly more temporal-kinetic energy, or “dark energy”, than the previous one but since the differences in the trillions of frames is complicated to determine it is therefore simpler and more productive to use only some frames.

Due to the negative velocity of temporal motion its kinetic energy, which is dark energy, has a negative pressure (p^{-}) which is due to the negative factor $(d\text{Д})$. Due to such a pressure, dark energy accelerates the inflation of space conducted by temporal motion.

Conclusion

Evolution is among the oldest and most influential laws of physics that seeks to increase entropy on every scale, in every different system in the Universe and it is time-dependant.

Evolutionary influence grows stronger with gravitational time dilatation, due to the centralized nature of the celestial bodies which makes them partially isolated systems. A strong electromagnetic field of the celestial body further increases the evolutionary potential and if the body is in the so called “habitat zone”, such as Earth, this will increase the evolutionary potential leading the drastic local increase of entropy to even create life.

At first life is primitive and microscopic however as it evolves it will reach the state of multi-cellular life. When life reaches this state, some of the organisms will evolve to a state of “second partial isolation” allowing them to move by choice, unlike a rock or a star. This was the period of

DNA and RNA separation. RNA life, such as grass and trees, cannot move by choice while DNA life forms can, which drastically increased their evolutionary potential.

Evolution can become one of the most crucial and beneficial branches of physics which could effectively unite Quantum Mechanics with General Relativity and Thermodynamics, most notably due to its second law that describes entropy. The best equation to describe the Evolution of the Universe is the "collective equation" (13) that is $a^{\pm}_{-}(t) = a^{+}(t) + a^{-}(t)$, which can be rewritten as:

$$(18)\ 3^{\pm}_{-} = a^{+}(t) + a^{-}(t)$$

where the symbol (3) is Evolution on the largest of scales know to us, the scale of the Universe.

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