iJournals: International Journal of Software & Hardware Research in Engineering
ISSN:2347-4890, ijournals.in/ijshre
Volume 12 Issue 7, July 2024

A New Model of Our Universe's Origin

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DOI: 10.26821/IJSHRE.12.7.2024.120701

ABSTRACT

If A is generated by B, then the following problem is that how B is generated? i.e. What is the cause of B? Then we must assume that B is generated by C. As a result the same problem is that how is C generated? What is the cause of C? Therefore we will go into the infinite regression problem if we don't stop at some point. So the final problem is that if there is a first cause, then what is the cause of the first cause? The same problem applies to our universe. Does our universe have an origin? What generates our universe? Is there a first cause of the being of our universe? If so, what is the cause of the first cause? Our sensible universe apparently contains or is constructed by space, time and materials. We may wonder that is it possible space, time and materials are all generated from the first cause? Are they generated independently or cross-related? These problems give rise to my new model of our universe's origin..

Keywords*: *Model, Origin, Universe

1. FROM NOTHING TO SOMETHING

My fundamental thesis in this paper is to claim Things are from nothing to something or equivalently. Things are generated from nothing. This is the first cause of the universe origin.

To find the first cause, we may wonder if it is possible that on the contrary something can generate nothing. Here I list 3 causes of nothing.

(1) destroying of things

(2) movement of things

(3) shrink of a universe

But again, these things should have a cause of where they are from.

(1) destroying of things ==> how are things from?

(2) movement of things ==> how are things from?

(3) shrink of a universe ==> how is the universe from?

Hence it seems like it could be circular for generating things, but actually it should be a tree-like graph which has a root that is the first cause, the first nothing.

So what we are looking for is the first nothing that can generate something. The first nothing where there are no things yet!

Lastly, let's make an assumption that our universe is generated from the first nothing.

2. SPACE AND TIME ARE GENERATED FROM NOTHING

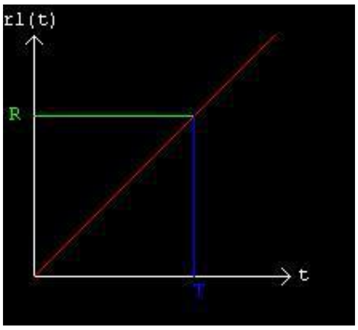
Our universe contains space, time and materials. Firstly I will show how space can be generated from nothing! Without loss of generality, let me assume that space is 1 dimension.

Thanks to the invention of zero in number theory, we can let 0 represents nothing. So initially space is nothing meaning that space has zero size. Let time takes 0 when space has size 0, then we get a pair of coordinate (0,0) in space time plane. Let r(t) be the function that gets input from time and outputs space size. Therefore if we get r(t), we get how space and time are generated from nothing (0,0), the universe origin.

The radius R of our universe is now $4*10^{26}$ m [1], and the age T of our universe is now $1.38*10^{11}$ year [2], which is $4.35*10^{18}$ s.

Connecting 2 points (0,0) (T,R), I get my first model of universe inflation r_1(t)

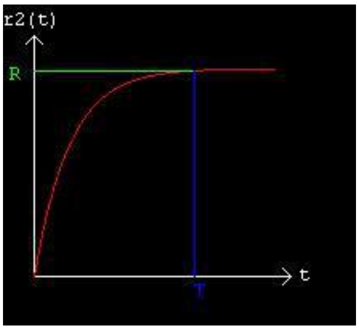
$r_1(t)= \frac{R}{T} * t$



In this model the universe inflates from nothing to infinity with speed $\frac{R}{T}$ ~= 10^8 m/s. Because it is a straight line, it also predicts that the speed of inflation is 10^8 m/s.

If we think the speed now is too large, I propose a second model r_2(t) here.

$r_2(t)= R\ (1+10^{-6})\ (1-10^{\frac{-6t}{T}})$



Note

(1) $r_2(0)=0$ This means the universe inflates from nothing.

(2) $r_2(T)= R\ (1+10^{-6})(1-10^{-6})$
$= R\ (1 - 10^{-12})$
$\sim= R$
This means the curve passes the current space-time point.

(3) $r_2(\infty)=R(1+10^{-6})$ This means that the inflation of the universe in a long run will converge to $R(1+10^{-6})$. i.e. a finite universe.

(4) $r_2'(t)=\frac{R(1+10^{-6})*6*\ln(10)}{T}*10^{-\frac{6t}{T}}$

$\sim=\frac{R*6*\ln(10)}{T}*10^{-\frac{6t}{T}}$

$r_2'(T)= \frac{R*6*\ln(10)}{T}*10^{-6}$
$=6\ \ln(10)\ 10^2$
$=600\ \ln(10)$
$\sim= 1382$ m/s

This is the speed of the inflation at current time T. If the speed is still too large, we can generalize the number 6 to a variable k such that

$$r_2'(T) = \frac{R*k\ln(10)}{T}*10^{-k}$$
$$= k \ln (10) * 10^{8-k}$$

Therefore we can adjust k to change the growth speed.

3. ATOMS ARE GENERATED FROM VACUUM

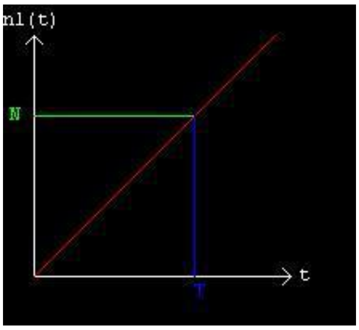
To avoid collisions of electrons and protons which will emit infinite energy, here I assume the fundamental materials are atoms. And to simplify the computation, I assume all atoms have the same size 10^{-10} m and have the same mass $\frac{1}{6*10^{23}}$ g.

Our universe's total mass is 10^{53} Kg [3], so the total number of atoms is about $10^{53}*10^{3}/(1/6*10^{23})=6*10^{79}$. We can convert the number to 1 dimension =>

$$N=\sqrt[3]{(6*10^{79})} \sim= 4*10^{26}.$$

In my model, the atoms are generated one by one at random positions with random speeds in the vacuum space r(t). A new function n(t) is the number of atoms generated till time t. Equivalently, at time t, the n_{th} atom is generated by n(t)=n_{th}.

With total number of atoms N=$4*10^{26}$ and age of the universe T=$4.42*10^{18}$s, we can get the first model of n_1(t) which is a straight line passing (0,0) and (T,N). i.e. $n_1(t)=\frac{N}{T}*t$



The generation has a constant rate $\frac{N}{T}$ all the time, where

$$\frac{N}{T} = \frac{4*10^{26}}{4.42*10^{18}} = 9*10^{9} \text{ \#/s}$$

The mass generated per second in 3D is

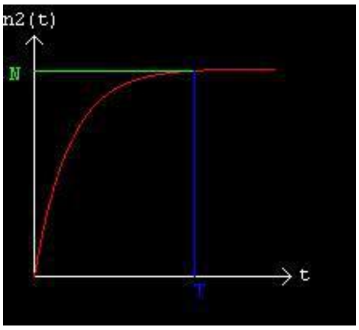
$$(9*10^{9})^{3}*\frac{1}{6*10^{23}} = 4*10^{5}\text{g} = 400 \text{ kg}$$

The first atom is generated at time

$$t = \frac{T}{N} = \frac{4.42*10^{18}}{4*10^{26}} = 1.1 * 10^{-8} \text{ s}$$

If we think the generation rate of atoms by n_1(t) is too large, I propose a second model n_2(t), here

$$n_2(t) = N*(1+10^{-6})*(1-10^{-\frac{6t}{T}})$$



Note

(1) n_2 (0)=0. This means that initially there is nothing.

(2) n_2 (T)=N*(1-10^{-12})~=N This means that the

curve passes the current atom-number v.s. time.

(3) n_2 (∞)=N(1+ 10^{-6}) This means that the generation of atoms will converge to N(1+10^{-6}) in a long run.

(4) n_2'(t)=N(1+10^{-6})*6ln10/T*$10^{-\frac{6t}{T}}$

n_2'(T)=N/T 6ln10*10^{-6}

=54ln10*10^3

=1.24*10^5 #/s

The mass generated per second in 3D at time T is

$$(1.24 * 10^5)^3 * (\frac{1}{6*10^{23}}) = 2.56*10^{-9} \text{ g}$$

(5) To compute the time of the first atom generated

n_2(t)=1 ==> $\frac{N*6\ln 10\ t}{T}$=1

t~= $\frac{T}{N*6ln10}$ ~= 8*10^{-9} s

4. COMPACTNESS NUMBER

Here I define the Compactness Number CN as the ratio of size occupied by all generated atoms over all space size.

$$CN := \frac{n(t)*10^{-10}}{r(t)}$$

Here 10^{-10} is the size of an atom.

Let's firstly check the linear model

$$CN_1 = \frac{n_1(t)*10^{-10}}{r_1(t)}$$

$$= (\frac{Nt}{T}) * 10^{-10} / (\frac{Rt}{T})$$

$$= \frac{N}{R}*10^{-10}$$

$$= 10^{-10}$$

Then let's check the convergence model

$$CN_2 = n_2(t)*10^{-10}/r_2(t)$$

$$= \frac{N*(1+10^{-6})(1-10^{-\frac{6t}{T}})*10^{-10}}{R*(1+10^{-6})(1-10^{-\frac{6t}{T}})}$$

$$= \frac{N}{R}*10^{-10}$$

$$= 10^{-10}$$

Convert to 3D, CN_{1_3D}=CN_{2_3D}=10^-30

This means every 10^30 slots, one slot is occupied by an atom. This is too few to form materials by collisions or by gravity. Since CN_1 cannot be modified because of the linear model, here we change CN_2 by changing r_2(t) to

$$r_3(t) = B*R(1+10^{-6A})(1-10^{-\frac{6At}{T}}).$$

i.e. we introduce a variable B in front and a variable A in the power of 10.

This curve must pass (T,R). So

R=r_3(T)=B*R(1+10^{-6A})(1-10^{-6A})

⇨ B=1/(1-10^{-12A})

Therefore

$$CN_3 = n_2(t)*10^{-10}/r_3(t)$$

$$= \frac{N(1+10^{-6})(1-10^{-\frac{6t}{T}})*10^{-10}}{B*R(1+10^{-6A})(1-10^{-\frac{6At}{T}})}$$

$$\sim= \frac{(1+10^{-6})\ln 10\ 6t/T}{\frac{1+10^{6A}}{1-10^{12A}}\ln 10\ 6At/T} * 10^{-10}$$

$$= 10^{-10} *(1-10^{6A}) \quad / A$$

where 6t/T and 6At/T <<1. During this stage I call it an inflation stage, otherwise I call it a convergence stage.

So we solve the equation and get

$$A = \frac{(CN_3 10^{10} + 6*\ln(10))}{18*\ln(10)^2}$$

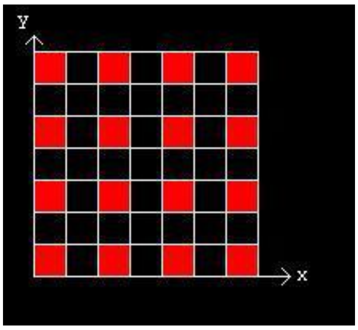
Hence $r_3(t)=\frac{R(1+10^{-6A})(1-10^{-\frac{6At}{T}})}{(1-10^{-12A})}$

When CN_3=1/2

$$A=\frac{(10^{10}/2+6*\ln(10))}{18*\ln(10)^2}$$

Hence CN_{3_2D}=1/4 which means there is one atom by every four slots.

This figure is the distribution for CN_{3_2D} =1/4 without randomization.

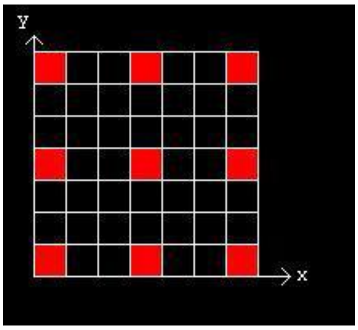


When CN_3=1/3

$$A=\frac{(10^{10}/3+6*\ln(10))}{18*\ln(10)^2}$$

So CN_{3_2D}=1/9, which means there is one atom by every nine slots.

This figure is the distribution for CN_{3_2D} =1/9 without randomization.



Therefore it is easier to form materials from atoms by collisions or gravity with larger CN_3 value.

5. COMPARISONS WITH OTHER MODELS

The first another model is the famous standard model Big Bang Theory [4][5][6]. There are 3 differences between the Big Bang Theory and my model.

"1. The Big Bang Theory is not about the origin of the universe. Rather, its primary focus is the development of the universe over time.

2. Big Bang Theory does not imply that the universe was ever point-like.

3. The origin of the universe was not an explosion of matter into already existing space."

In fact the Big Bang Theory does not give how the initial particles were born. i.e. how the "hot dense state" was formed. So these are the major differences between Big Bang Theory and my model.

The second another model is Friedmann–Lemaitre–Robertson–Walker metric [7]. This metric is a metric based on an exact solution of the Einstein field equations of general relativity. However, it could be a problem to making commitment to Einstein theory of relativity. Because the general theory of relativity relies on the truth of special relativity, which in turn relies on the truth of electromagnetics. However the Coulomb's law in electromagnetics is unsound. The unsoundness comes from the theoretical fact that when an electron hits a proton, it will produce infinite energy. Therefore in this paper I don't make commitments to

Einstein's general theory of relativity, and therefore I will stop comparing my model with the Friedmann–Lemaitre–Robertson–Walker metric.

The third another model is the Steady State Model [8]. "In the steady-state model, the density of matter in the expanding universe remains unchanged due to a continuous creation of matter, thus adhering to the perfect cosmological principle, a principle that says that the observable universe is always the same at any time and any place." Comparing this model with my two models : linear model and convergence model, the linear model r_1(t) n_1(t) is the same as the steady state model, however the convergence model with compactness number is the same as the steady state model only before the convergence stage of the universe size r_3(t), n_2(t), but not the same as the steady state model during the convergence stage of the universe size.

6. CONCLUSION

I start by asking the infinite regression problems of the first cause. And I wonder if there are the same problems of our universe. i.e. is there a first cause of the being of our universe? To solve this problem, I claim my fundamental thesis that things are generated from nothing. And I make an assumption that our universe is generated from the first nothing. Thanks to the invention of the number 0 which nothing can be represented by, I can make two mathematical models of how the space and time are generated from nothing (0,0). One is a linear model r_1(t) and the other is convergence models r_2(t), r_3(t). To avoid the collisions of electrons and protons which will emit infinite energy, I assume the fundamental materials are atoms. In my model, the atoms are generated one by one at random positions and with random velocities in the vacuum space r(t). Similarly, I propose two mathematical models of how atoms are generated in the vacuum space. One is a linear model n_1(t), and the other is a convergence model n_2(t). Lastly I compare my models with other existing models, and found that the differences of my model with the Big Bang theory are those the Big Bang Theory is not about the origin of the universe and the Big Bang Theory does not imply that the universe was ever point-like, in fact the Big Bang Theory does not give how the initial particles were born. A very similar model "the Steady State Model" differs with my model in that during the convergence in the convergence model r_3(t) n_2(t), the behaviors are different between the two models. Therefore I think my model is a new model of our universe's origin. This model not only has an extreme reductionism for aesthetic principles, but also has least commitments to other theories and observables.

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