

Before and after the Big Bang using True Relativity

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Abstract

This paper is based on the theory of True Relativity to view quantum Space-Time using simple geometry and represents a paradigm shift in the way we view Time and Space. The ideal gas law and the math of True Relativity are used to model the moments before the Big Bang and the extreme expansion of Space-Time in the initial moments after the Big Bang. Both are displayed using graphs and time lines from the data supplied from the math of True Relativity. Answers to the Olber's paradox and the horizon problem are shown to be a natural consequence of True Relativity.

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1 Introduction

This paper is based on the theory of True Relativity [1] so all the assumptions that arise from True Relativity are applied. It is advisable to read [1] and [3] before reading this paper so you at least have some understanding of True Relativity and the quantum nature of Time and Space. Time dilation is not discussed in this paper but is covered in [1], [2] and [4]. For any theory to be taken seriously it must be able to model the Universe from the moment of the Big Bang. This paper goes one step further and takes us to moments before the Big Bang itself. I have only used the principles of True Relativity with the well know 'ideal gas law' to produce a complete model of how the Universe began from moments before the Big Bang and well into the future.

Physicists argue that the Universe can be both infinite but remain finite and uses examples such as person walking for an infinite amount of Time around the world will never get to the edge of the Earth because there is no edge to a sphere. No one has looked at the obvious, that the Universe is actually finite in size and is expanding inside what could be described as an energy null. If True Relativity is correct and the presence of energy generates a quantum Space-Time field around itself then there must be a place or point in Time where no energy existed, such as the moment of the Big Bang, therefore no quantum Space-Time fields existed either. I believe there may be small energy nulls inside our Universe and these are responsible for some of the gravitational lenses found by astronomers.

The extreme forces that existed at the Big Bang are not easily modelled so this paper only attempts to show that it is possible, using True Relativity, to model what happened immediately before and after the Big Bang itself. There are limitations to using a personal computer and a commercial math programme but True Relativity is as accurate as the tools we use to run the models. The better the computer and math programme, the more accurate the results and the further back in time you can go. As usual, all claims in this paper can be modelled by anyone with a personal computer and a math programme. A copy of the math programme used for this paper, in a MathCAD format, is available from the author on request. A printed version is shown in [5].

First I will display some of the results of the math programme in a simple Time line and include a short explanation, from the point of view of [1], for what the data is telling us about the events surrounding the Big Bang. Later there is an explanation of the cosmological observations of our Universe in terms of True Relativity. A snapshot of the math programme used for this paper is given in example 1.

2 The Model

The balance of the model is a delicate one. If there is too much matter, the temperature of the Universe remains far too high and the velocity of the outer Universe is over run by the attractive force of the mass contained within the Universe. Too little matter and the velocity of the outer Universe out runs the attractive force but the temperature drop means the Universe cools too quickly and is short lived. By trial and error, the math programme used for this paper has placed the value for the mass of the Universe at 2.234×10^{52} kg. For reasons of simplicity I have taken the mass of each particle to be 1/12 of the mass of a carbon atom, in other words the amu or atomic mass unit. This gives the total number of particles that generate a Space-Time field to be $N = M / \text{amu} = 1.35 \times 10^{79}$ (2dp).

There are many models of events shortly after the Big Bang derived from various theories but none of these models have been able to show the moments just before and immediately after the Big Bang itself. The math of True Relativity do not break down as it is based solely on the speed of light in a vacuum, so using equation (1), it is possible to determine the events prior to the Big Bang.

The Time line in Figure 1 starts at $t = 1 \times 10^{-100}$ Us, Universal second[®], to enable you to visualise what True Relativity is telling us about the Big Bang. The main equation used for the Time line, is derived from [1] and provides all the data for the model of how the Universe expanded moments after the Big Bang. This equation is

$$RU := \left(\frac{3 \cdot t \cdot \Phi \cdot N \cdot G}{4 \cdot \pi} \right)^{\frac{1}{3}} - c \quad (1)$$

where RU = radius of the Universe, t = Universal seconds[®], $\Phi = 4/3\pi c^3$ = Universal clock[®], N = number of particles generating a Space-Time field, G = Newton's universal gravitational constant from [1] and c = speed of light in a vacuum.

An explanation of this equation may be needed if you have little knowledge of how the concept of True Relativity works. The right hand part of the equation 'c' is the velocity of the speed of light in a vacuum. It is this constant that is responsible for our Universe from the point of view of True Relativity.

On the left hand side of equation (1), t = the time input in Universal seconds[®] and represents an observer's inertial frame from where he/she is viewing the event of the Big Bang from inside his/her own Space-Time field. According to True Relativity all particles have a Space-Time field that emanates from the particle itself. How each particle generates its Space-Time field is not discussed in this paper but the volume of each field for a mass less particle must be $\Phi = 4/3\pi c^3$ in 1 Us, as shown in [1].

The total number of particles 'N' will depend on the mass of the Universe and the mass of each individual particle.

The 'G' on the left hand side of the equation, Newton's universal gravitational constant and I have used it as a scaling factor. As stated earlier, all particles generate a quantum Space-Time field around themselves and these fields will overlap as they expand, so the rate of overlap, for reasons of simplicity, is modelled by Newton's gravitational constant 'G'. All true values for each component of equation (1) are given at the end of this paper.

Here is a snapshot taken from the math programme used for this paper.

<p>Time input</p> <p>$t := 3.26512761760778 \times 10^8$</p> <p>Time in years $\frac{t}{\text{year}} = 10.3$</p>	<p>Universal clock</p> <p>$Uc := \left(\frac{3 \cdot t \cdot \Phi}{4 \cdot \pi} \right)^{\frac{1}{3}}$ $Uv := \frac{4}{3} \cdot \pi \cdot Uc^3$</p> <p>$Ut := Uv \cdot \frac{1}{\Phi}$ $Ut = 3.27 \times 10^8$</p>	<p>Redshift constant</p> <p>$RC := 1.3944334288906830^{-10}$</p>
Properties of Universe		
<p>Radius of Universe $RU := \left(\frac{3 \cdot t \cdot \Phi \cdot N \cdot G}{4 \cdot \pi} \right)^{\frac{1}{3}} - c$</p> <p>Volume of Universe $VU := \frac{4}{3} \cdot \pi \cdot RU^3$</p> <p>Redshift $z := \sqrt{velOU \cdot RC}$</p> <p>Density $\rho := \frac{M}{VU}$</p>	<p>Inward force of Universe</p> <p>$Fatt := \frac{G \cdot M^2}{4 \cdot RU^2}$</p> <p>$P \cdot \pi \cdot RU^2 = 2.1 \times 10^{25}$</p> <p>Energy density</p> <p>$u := \rho \cdot c^2$</p>	<p>Visible radius of Universe $Vradius := t \cdot c$</p> <p>Velocity of outer Universe $velOU := \frac{RU}{t}$</p> <p>Pressure</p> <p>$P := \frac{Fatt}{\pi \cdot RU^2}$</p> <p>$\frac{N \cdot k \cdot Temp}{VU} = 1.69 \times 10^{-44}$</p> <p>$\frac{k \cdot \rho \cdot Temp}{amm} = 1.69 \times 10^{-44}$</p> <p>Temperature</p> <p>$Temp := \frac{P \cdot 4 \cdot \pi \cdot RU^3}{3 \cdot N \cdot k}$</p> <p>$\frac{G \cdot amm \cdot M}{3 \cdot k \cdot RU} = 3 \times 10^3$</p> <p>Mean wavelength</p> <p>$\lambda_{mean} := \frac{Wdl}{Temp}$</p>
Outputs		
<p>Volume of Universe $VU = 3.31 \times 10^{103}$</p> <p>Radius of Universe $RU = 1.99 \times 10^{34}$</p> <p>Velocity of outer Universe $velOU = 6.1 \times 10^{25}$</p> <p>Temperature $Temp = 3 \times 10^3$</p> <p>Redshift $z = 1.089 \times 10^2$</p> <p>Mean wavelength $\lambda_{mean} = 9.67 \times 10^{-7}$</p>	<p>Attractive force $Fatt = 2.1 \times 10^{25}$</p> <p>Density $\rho = 6.79 \times 10^{-52}$</p> <p>Outward force of Universe (Pressure) $P = 1.69 \times 10^{-44}$</p> <p>Energy mass density $u = 6.07 \times 10^{-35}$</p> <p>Visible radius of Universe $Vradius = 9.79 \times 10^{16}$</p>	

Example 1

The Time input in the top left hand corner is where we input the Time as seen from the inertial frame of the observer and below the Time input is the amount of Time given in years. Next to the Time input True Relativity's Universal clock[®] with the value of the redshift constant, which is only valid for this model, given in the top right hand corner. Below this under the heading 'Properties of the Universe' on the left hand side is equation (1) which gives the radius of the outer Universe 'RU' at that moment of Time as seen from the inertial frame of the observer. Below this is the volume of the Universe 'VU', to the right of that we see the visible radius of the Universe. Because of the consistency of the speed of light in a vacuum, a photon of light could only travel this far at this point in the evolution of the Universe hence True Relativity provides an explanation for the horizon problem encountered by all other theories of the nature of this Universe. Below this 'velOU' calculates the velocity of the outer Universe. On the left hand side below 'VU' is the equation 'z' that calculates the value of the redshift for this model. I believe that nature only provides one cause to any one phenomenon and only velocity can account for redshift. Cosmological redshift is a nonsense, and is just another 'bolt on' to explain redshift from the point of view of General Relativity. As you can see the other equations in the middle of example 1 are from the ideal gas law and all the outputs to these equations are shown at the bottom of example 1.

I will start with a time line built from data using the math programme shown in example 1, leading up to the Big Bang and continuing on past the point where primordial nucleosynthesis takes place. This happens when the Universe has a temperature of about $T \approx n \times 10^8$ K. The event of the Big Bang itself (c) takes place at $1.113\,989\,822\,756\,506 \times 10^{-69}$ Us as viewed from the observer's Universal clock[®].

Even though I am using a CAD math programme that can only run to 15 fs the accuracy of this model is pretty amazing. I would love to know what a super computer could do with True Relativity but for now I will display a Time line using the data provided by my computer.

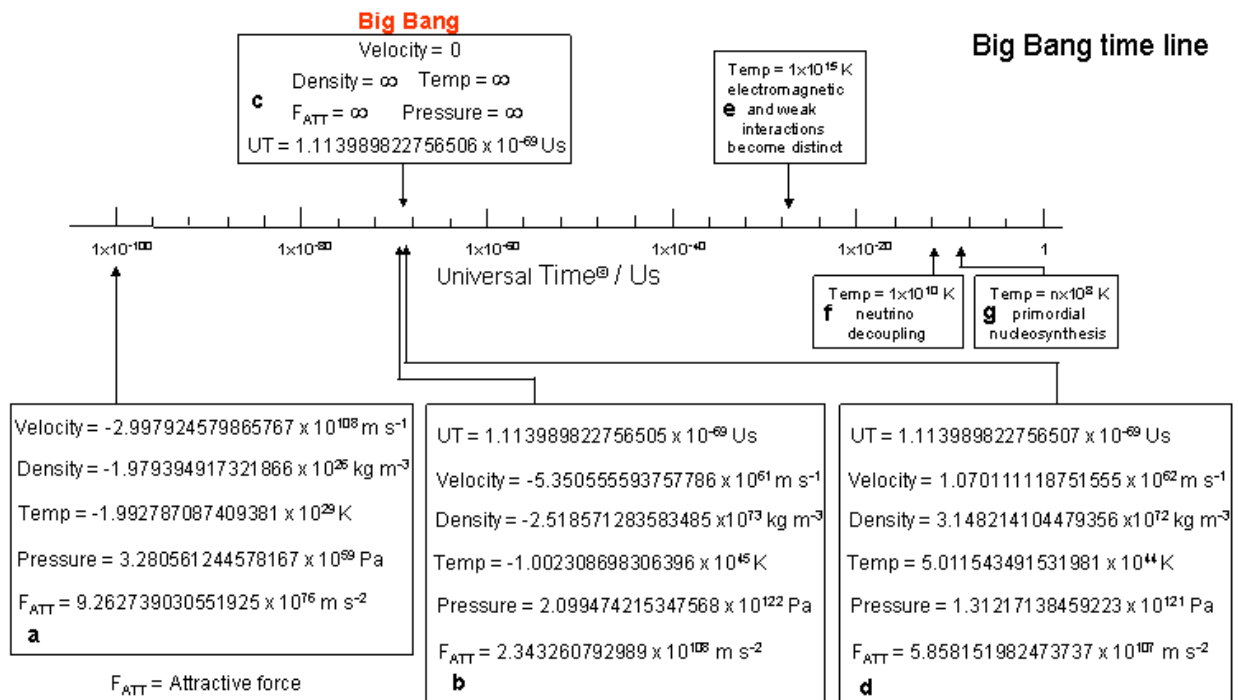


Figure 1

There may be many ways in which the data can be interpreted but here is one possible explanation for what the data is telling us may of happened before the Big Bang. In Figure 1 in (a) the observer's clock starts the event at 1×10^{-100} Us where density and pressure in the negative universe are shown in (a). Figure 1 also shows the outer negative universe has an incoming velocity of about 3×10^{108} m s⁻¹ but it slows down to 5×10^{61} m s⁻¹ by the time of the Big Bang. Once it has past infinity it emerges out the other side and expands to become our Universe. The point of interest is the entrance and exit values.

Notice the exit velocity of the outer Universe after the Big Bang is greater than the entrance velocity just prior to the Big Bang and there appears to be a slight loss of density, pressure and attractive force compared to the entrance values. Our Universe appears to have been given a kick as it passed the infinity. Another explanation may be in the limitation of this computer to calculate the exact moment of the Big Bang.

A closer look at the Big Bang is required but first I will take a look at the volume, radius, temperature, pressure, density, redshift, attractive force and the velocity of the outer Universe, and see what happened after the Big Bang, through the present day and well into the future.

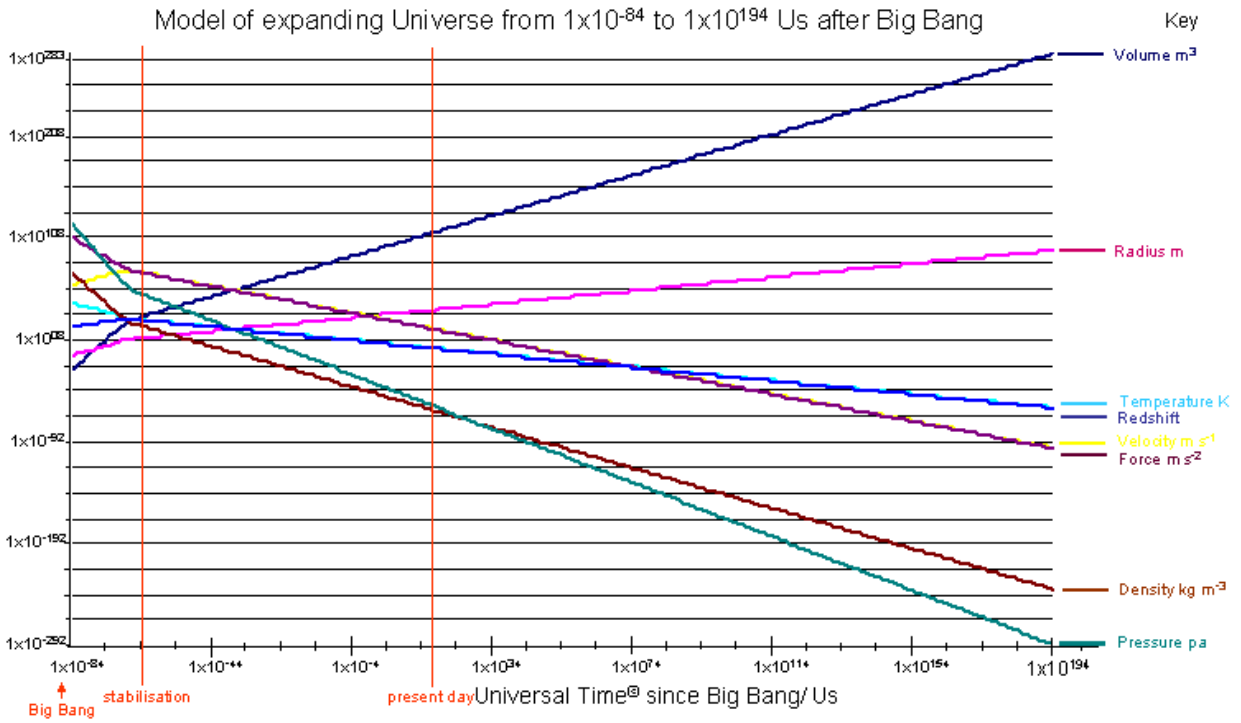


Figure 2

The graph above is logarithmic and displays how each property of the Universe evolves over Time.

In the first moment after the big bang pressure was the dominant force and this may be responsible for the Big Bang itself but the pressure dominance eventually gives way to the attractive force, as shown in Figure 2. Notice how turbulent the Universe was and how after stabilisation it settles down.

The next Time line, from data provided by Example 1, continues on past our present day well into the future so let's see what the data tells us beyond the time line shown in Figure 1. I have created this Time line spanning 1 Us to 1 x 10³⁰ Us and taken us well past the estimated age of the Universe, which is believed to be about 1.375 x 10¹⁰ years old. The Time line finishes at about 3 x 10²² years, at the limitations of my computer.

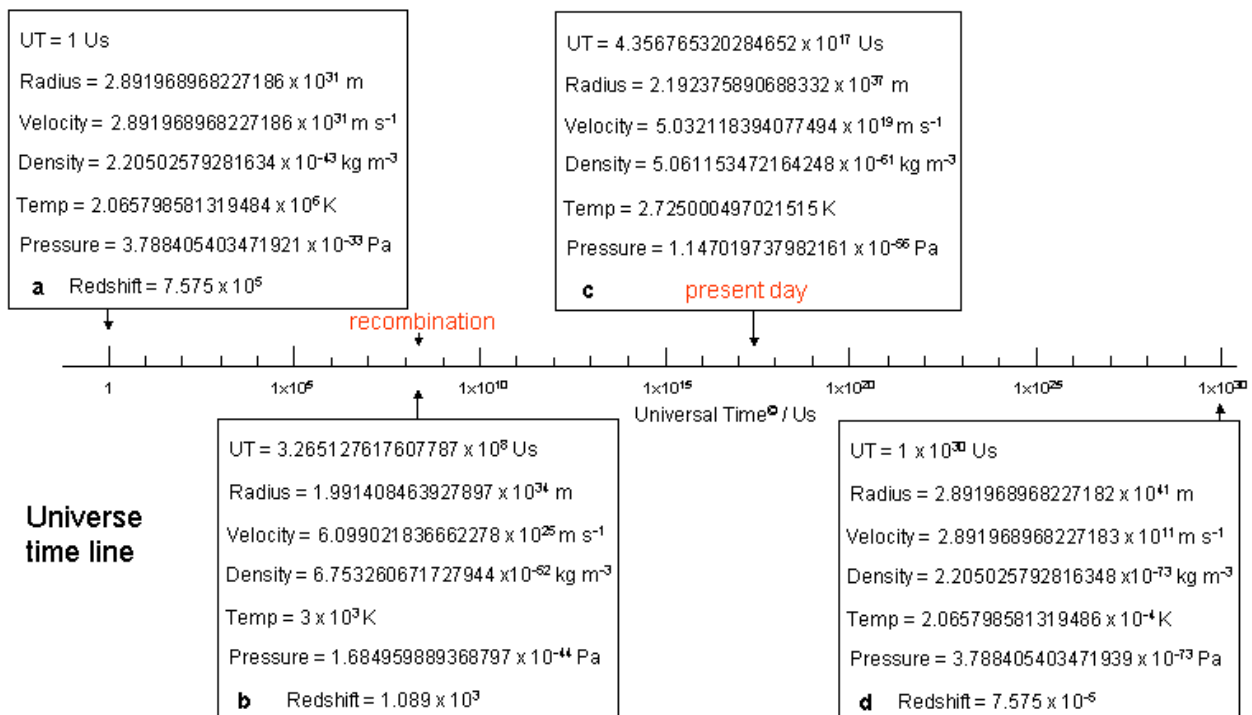


Figure 3

In Figure 3, (a) shows the enormous size the Universe had reached in just 1 Us and the incredible speed the outer Universe was moving in the initial moments after the Big Bang, shown in yellow in Figure 2 above. Even today, according to this model, the outer Universe has a velocity of $5.032\ 118\ 394\ 077\ 494 \times 10^{19} \text{ m s}^{-1}$. The value of the redshift given is totally dependant on the velocity of the outer Universe by the redshift constant. In this model the cmb radiation is emitted at recombination, in just over 10 years after the Big Bang, which is much quicker than any other model has predicted to date.

The cmb radiation pervades every direction we observe and according to True Relativity, the redshift of the cmb only tells us what the velocity of the outer Universe was at the time the cmb was emitted so $v = (z / RC)^2$ where v = the velocity of the outer Universe, z = redshift at time of emission of photon, and RC is the redshift constant, which is only valid for this model.

Shortly after the Big Bang the temperature of the Universe cools enough to allow for the electromagnetic and weak interactions to become distinct, followed by neutrino decoupling and primordial nucleosynthesis shown in (e,f,g) of Figure 1. All values displayed in the Time lines and graphs, for density, pressure, temperature and attractive force are taken directly from the math programme used for this model.

The velocity of the outer Universe, just after the Big Bang, increased for a short period of time then after stabilisation it still maintained a greater velocity than the attractive force, keeping the Universe from collapsing back in on its self. The density and pressure dropped quickly but the temperature remained fairly stable over a much longer period. Notice how, in Figure 2, the redshift follows the line of the temperature but as far as True Relativity is concerned, redshift is purely related to velocity by the redshift constant, yet after stabilisation, there remained a stable relationship between redshift and temperature. Interesting!

Symmetry breaking, where particles begin to coalesce, may of happened because the Universe cooled so fast, ensuring that some parts of the Universe are much denser than others. The incredible velocity of the outer Universe is a striking feature of this model and an increase in velocity after the Big Bang was completely unexpected. I will take a close look at the velocity of the outer Universe just before and after the Big Bang.

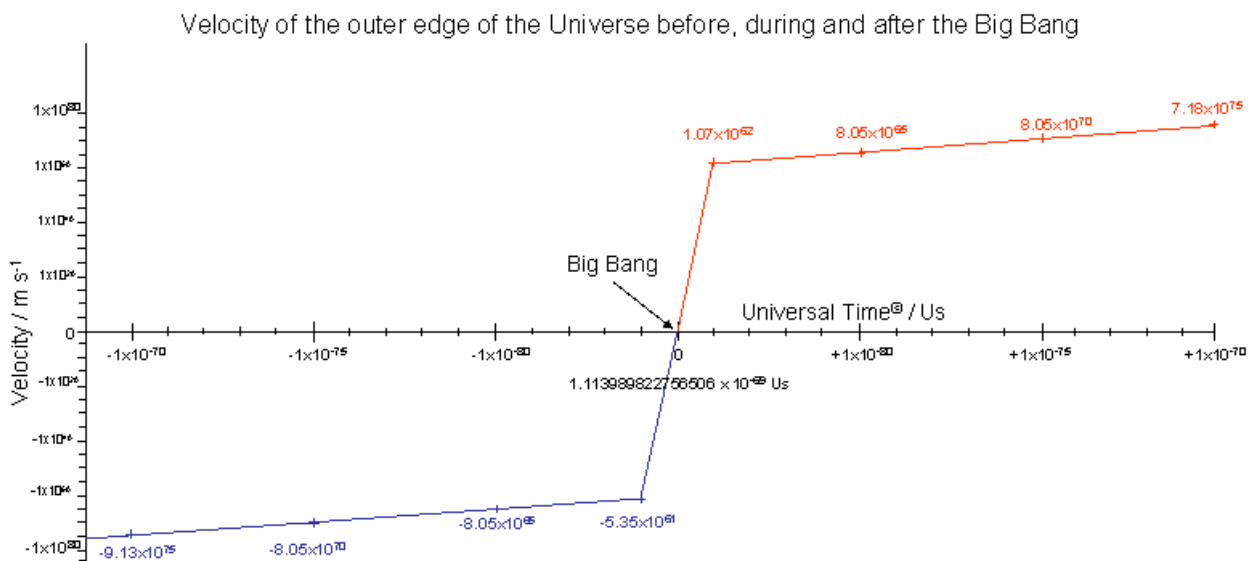


Figure 4

Figure 4 above shows the abrupt nature of the Big Bang, although a better computer would be able to provide much more detail. Notice how the rate of velocity increase suddenly changes just after the Big Bang. It alters sharply at $1 \times 10^{62} \text{ m s}^{-1}$ but the velocity still carries on increasing which, as stated earlier, is totally unexpected.

I have decided not to comment too much on the data because at this stage I do not feel that I understand what the data is telling me but it does show a loss in pressure, density, temperature and attractive force, yet it seems there was a net gain in the velocity of the outer Universe.

Next I will display pressure and the attractive force together over the same time scale from just before the Big Bang to just after.

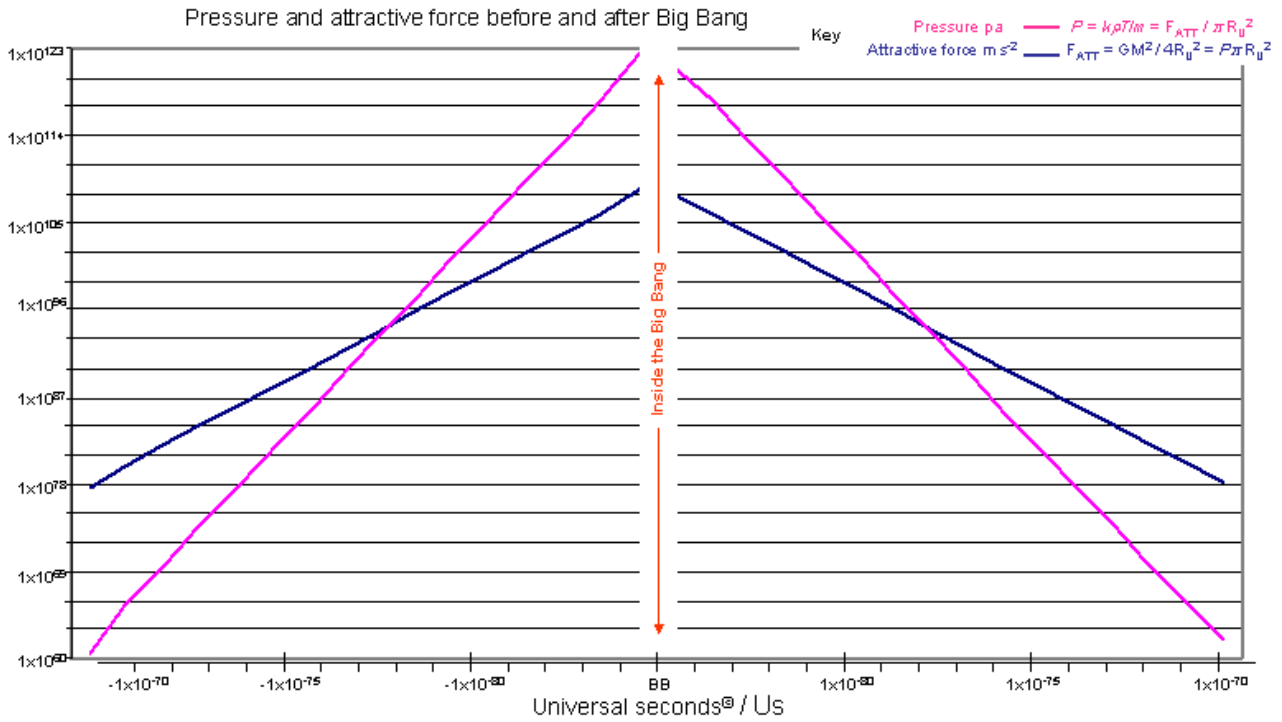


Figure 5

The graph in Figure 5 gives a visual representation of the entrance and exit values of the attractive force and pressure in the moments surrounding the Big Bang. The pressure was the dominant force just before and after the Big Bang and probably caused the Big Bang because the pressure outstripped the attractive force of the negative Universe.

The temperature and density in Figures 6 & 7 also experiences a loss between entrance and exit from the Big Bang.

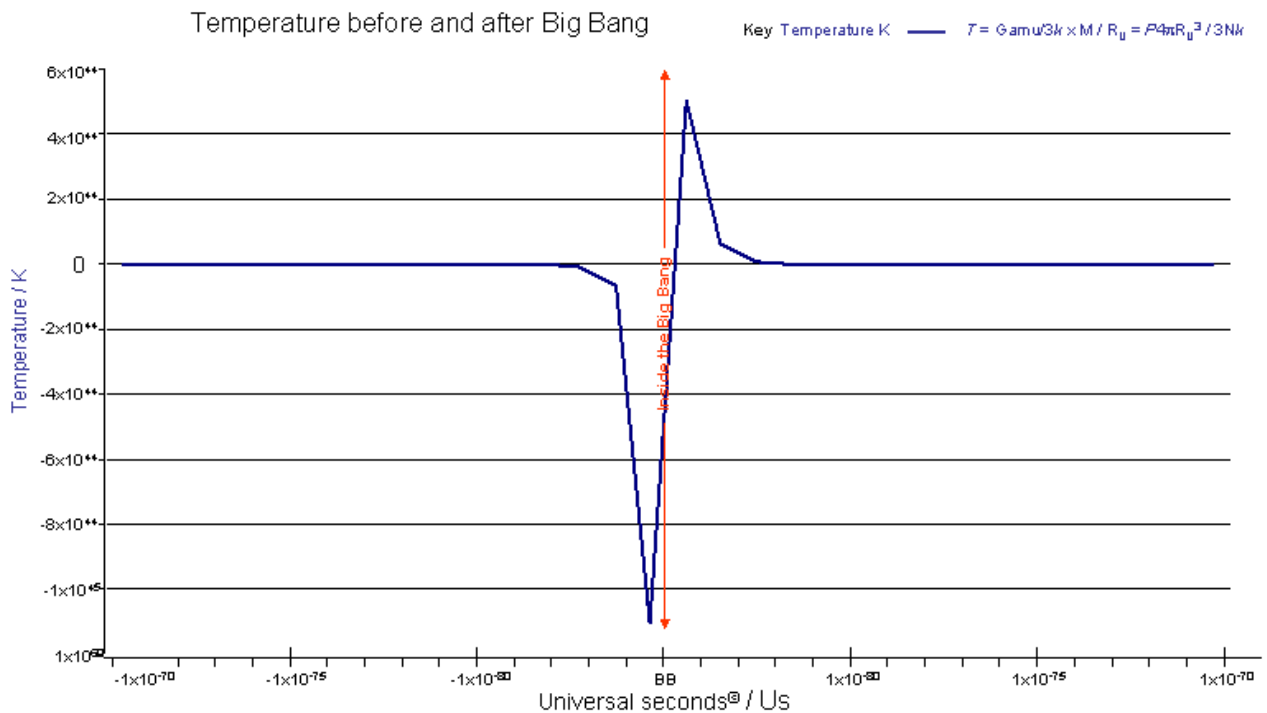


Figure 6

Remember in the negative universe we encounter negative temperature that cannot exist in our Universe. Here we see how the extreme negative temperature flips out of the infinity.

The density is shown in Figure 7 below.

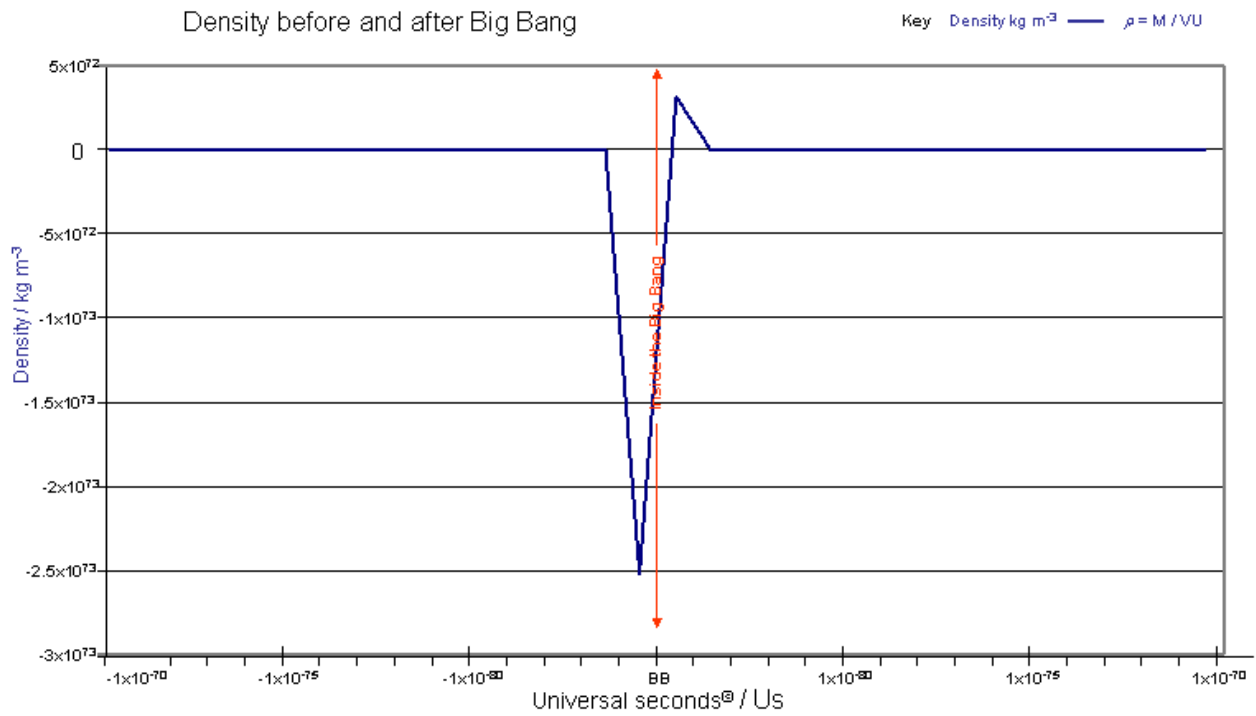


Figure 7

Figure 7 shows how the density flipped out of the infinity losing some strength in the process.

The increase in the velocity of the outer Universe just after the Big Bang needs a little closer look so I have displayed the results in Figure 8 below so we can look more closely and see how long it takes for the outer Universe to reach its peak velocity.

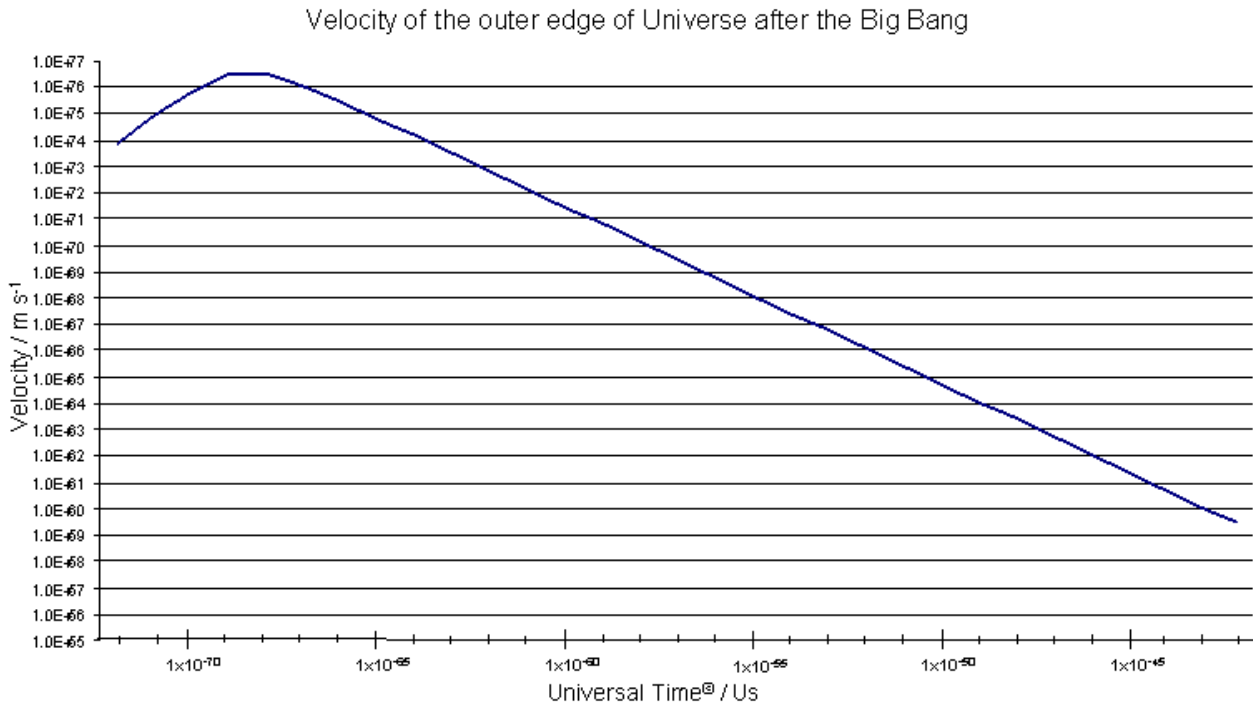


Figure 8

The outer edge of the Universe reaches its peak velocity at a Time of about $t = 4 \times 10^{-69}$ Us, as viewed from the observer's inertial frame, then begins to slow down. This may not be the inflation as envisaged by most physicists but just look at the size of the Universe when it is just 1 Us old, shown in the Time line in Figure 3.

The next graph takes a closer look at the volume, radius, temperature, pressure, density, velocity and attractive force.

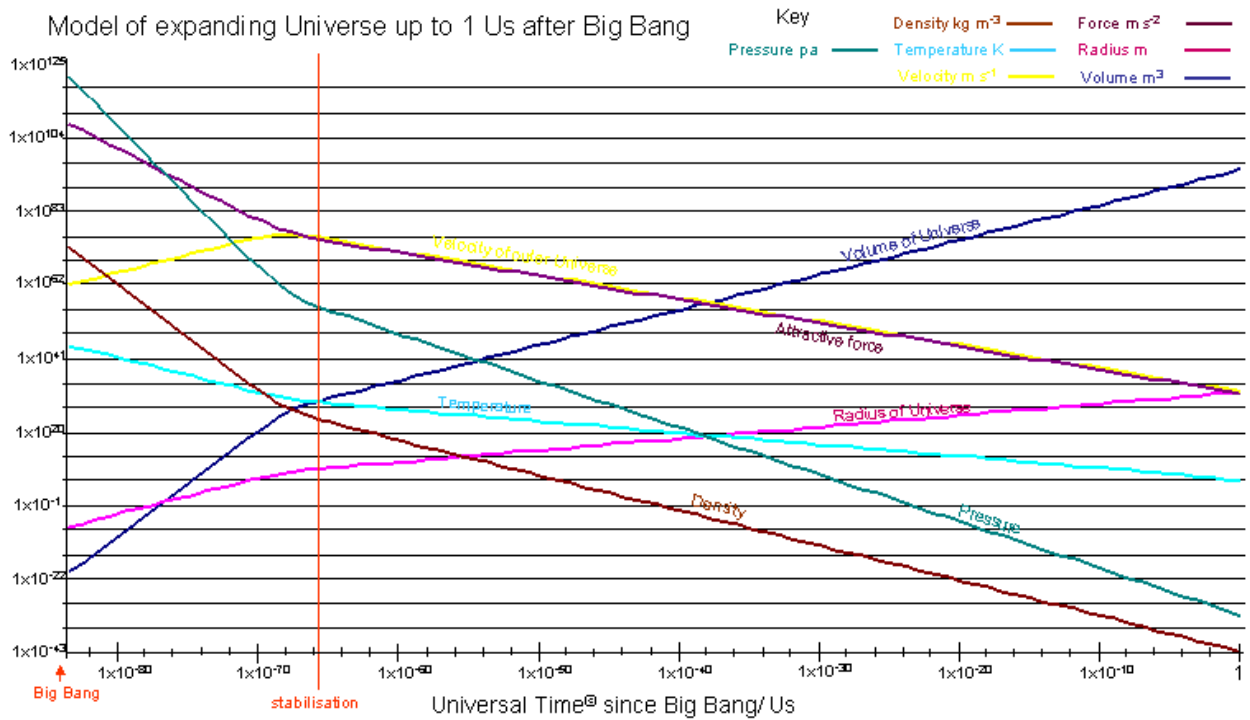


Figure 9

The Universe appears to go through a turbulent period as seen in Figures 2 & 9, until it reaches an age of about 1×10^{-66} Us, then it seems to stabilise itself. Once stabilisation has taken place, notice how the attractive force of the Universe is just over a third of the velocity of the outer Universe where the difference = $F_{\text{ATT}}/V_{\text{OU}} = 0.34$ (2dp) and remains that value for the duration the Universe exists for.

By the Time the observer's Universal clock reaches 1 Us, the Universe will have reached a diameter of 5.78×10^{31} m or in mega parsecs, 9.36×10^8 MPC. This accounts for the horizon problem in a very dramatic display of the vastness of this Universe, according to True Relativity. It illustrates how the horizon problem is solved because it would take a photon over 3.04×10^{15} years just to cross the radius of the Universe when it was only 1 Us old! Therefore we are only ever able to view a tiny part of this vast Universe because light is restricted to a velocity of 'c' as shown in [1]. In fact we are only able to view $1 / (1.68 \times 10^{11})$ of this Universe at this moment in Time. Eventually the visible radius $R_{\text{VIS}} = t \times c$ will reach the actual radius $R_{\text{ACT}} = (3t\Phi_{\text{NG}}/4\pi)^{1/3}$ when the Universe is about 9.47×10^{26} years of age.

We can see, using the ideal gas law and True Relativity^[1], at the Big Bang the density, pressure, temperature and gravitational force all become infinite but just 1×10^{-84} Us later, our Universe emerges from the infinity with very high values of density, pressure, temperature and some very unexpected data.

3 The observable Universe.

The laws of physics should reflect what is observed and cosmology seems to have failed in this respect in a number of areas, one of these being the use of redshift to measure distance, another is the constant use of 'dark matter' and 'dark energy' to explain observations.

We are all aware of Doppler shift. If a photon is emitted by an object moving towards you, the photon reaches you at 'c' but its wavelength is shortened, so it is blueshifted. On the other hand if the object that emitted the photon is moving away from you, you will still see the photon arrive at a velocity of 'c' but its wavelength is stretched out or redshifted.

In General Relativity the redshift of distant galaxies is accounted for by the expansion of Space where Space is thought of as a single entity stretching out causing the wavelength of the photon to stretch with it and is known as 'cosmological redshift'. A plausible explanation if General Relativity is used for the model but True Relativity^[1] only uses velocity to account for redshift which has to be the most logical choice.

Cosmologists believe that the reason this Universe is expanding is because the more distant the galaxy observed, the greater the redshift. This is an observation that requires an explanation from the point of view of True Relativity^[1].

4 The pseudo expansion of Space

Electromagnetic radiation or light is like a Time machine, in the sense that the further out in space you observe, the further back in Time you go. In the early Universe, galaxies were moving away from each other at greater velocities than they are today so in general, galaxies will be moving at their peak velocity soon after they formed. We can only measure relative velocity, at the time the photon was emitted from the galaxy, by its redshift. The greater the distance of the galaxy the further back in Time you go, so the more distant the galaxy is, the younger the Universe was at that Time. If you are looking at an object that is 100 MPC in distance from the Earth, then you are seeing that object and the object's position as it was 325 million years ago. It would no longer be in that position or moving at that velocity if it was possible to see it in real Time.

A photon from deep Space is like a frozen picture of the object at the Time the photon was emitted. According to True Relativity and this model, the early Universe expanded at a faster rate than it does today so this would mean when you look back in Time you will see galaxies moving at greater velocities than they are today. They will have greater redshifts. The view of cosmologists on this point is not a rational one. No dark energy is required or needed to explain the expansion of the Universe because the Universe is not expanding as cosmology seems to suggest. They show a complete lack of understanding of the nature of quantum Space-Time.

On the cosmic scale, the light we observe should not be thought of in terms of distance, instead it should be thought of purely in terms of the relative velocity of the object that emitted the photon, at a given Time in the past. Photons give no information about when they were emitted therefore they carry no information about their distance. The standard candles used to measure distance, such as Cepheids and type Ia supernovae are valid because the luminosity of these is well known. In the case of the Cepheids it's the period-luminosity that is used to calculate the distance. In True Relativity there is no real relationship between redshift and distance.

This paper shows the extreme velocities involved with the expansion of Space in the early Universe. Such incredible velocity would ensure that no one place could ever be considered as the centre of the Universe and almost all galaxies would be moving away from each other and indeed, this is exactly what is observed.

Space is expanding, but it's not due to a large amount of mysterious dark energy. All the energy needed to create this Universe was created at the Big Bang. True Relativity^[1] does not require 'dark energy' or 'dark matter' to explain any cosmological observations, including the formation and rotation of spiral galaxies.

The possibility that a negative universe exists, must be of great curiosity to anyone who has an interest in particle physics. If there was no proof of antimatter, this aspect of True Relativity^[1] would concern me but antimatter can be created in particle accelerators, so proof that antimatter exists is another indication that the quantum nature of True Relativity, has merit.

One of the claims of True Relativity^[1] is that this Universe is finite, but it is enormous in size, indicating that at present it has a radius of about $RU = 2.19 \times 10^{37}$ m so Olber's paradox is solved, the Universe is finite.

So far this is just my first interpretation of what this programme is telling me about the events before and after the Big Bang but the accuracy of this programme goes well beyond any other model of the Big Bang that I have ever seen. This incredible accuracy is only possible using True Relativity and the Universal clock[©].

Using different parameters yields differing results of how long a Universe will exist for but according to true Relativity the cyclic nature of Space and Time remain.

5 Comment

The next time you gaze up at the stars, think of it as gazing back in Time to the distant past and not in terms of distance to each object and you will have learnt one of the aspects of True Relativity^[1]. Time and Space is not as Einstein imagined it to be. His theory of General Relativity does not explain the flow of Time whereas True Relativity^[1] needs only one simple equation, $\Phi = 4/3\pi c^3$ to give a complete picture of the quantum nature of Space and Time and even the Universe as a whole.

Space and Time are much simpler than Einstein could ever have imagined.

The more I study True Relativity the safer the £500 reward, for the first person who proves to me that True Relativity has no merit, seems to be. This reward still stands.

6 The math

Speed of light in a vacuum = $c = 2.997\ 924\ 58\ \text{m s}^{-1}$

Universal clock $\Phi = 4/3\pi c^3$

Newton's gravitational constant = $G = 6.673 \times 10^{-11}\ \text{N m}^2\ \text{kg}^{-2}$

Total particles of Matter = $M/\text{amu} = N = 1.345\ 377\ 898\ 223\ 427 \times 10^{79}$

Mass of each particle = $\text{amu} = 1.660\ 5 \times 10^{-27}\ \text{kg}$

Total mass of Universe = $M = N \times \text{amu} = 2.234 \times 10^{52}\ \text{kg}$

Redshift constant = $RC = 1.394\ 433\ 428\ 890\ 688 \times 10^{-10}$

Boltzmann constant = $k = 1.381 \times 10^{-23}\ \text{J K}^{-1}$

Wein's displacement law $Wdl = 2.9 \times 10^{-3} / T$

Time input from observer's inertial frame = t

The equations are written as they are used in the math programme and anyone who has used a math programme should be able to follow these equations.

Equations

Radius of Universe = $R_U = (3t\Phi NG / 4\pi)^{1/3} - c$

Volume of Universe = $V_U = 4/3\pi R_U^3$

Ideal gas law (Pressure) = $P = k\rho T/m = F_{ATT} / \pi R_U^2$

Velocity of outer Universe = $V_{OU} = R_U / t = (3\Phi NG / 4\pi t^2)^{1/3} = (z/RC)^2$

Temperature = $T = \text{Gam}_u/3k \times M / R_U = P4\pi R_U^3 / 3Nk$

Redshift = $z = (\sqrt{V_{OU}}) \times RC$

Mean wavelength of emission from Universe = $\lambda_{\text{mean}} = Wdl / T$

Density = $\rho = M / V_U$

Attractive force of Universe = $F_{ATT} = GM^2 / 4R_U^2 = P\pi R_U^2$

Energy density = $u = \rho c^2$

The amount of data revealed means this paper cannot contain all the results obtained from running this model but as True Relativity can be modelled by anyone with a computer and a math programme I would suggest any interested parties run the model of the Big Bang for themselves if a more detailed knowledge of this event is required.

7 References

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- [2] T. Stanton *Removing the accuracy drift and synchronising the GPS clocks using True Relativity and the Universal clock.* (available at <http://www.wbabin.net>)
- [3] T. Stanton *Gravity, Acceleration and inertia.* (available at <http://www.wbabin.net>)
- [4] T. Stanton *Inside and outside a black hole using True Relativity.* (available at <http://www.wbabin.net>)
- [5] T. Stanton's website (available at www.theoryofspacetime.co.uk)