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RESEARCH ARTICLE

LENGTH CONTRACTION, TIME DILATION, GRAVITY, TOTAL EXISTENCE OF UNIVERSE AND BEYOND

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ABSTRACT

We generate basic mathematics to express scientific concepts, those are crept in our mind. Scientific skill starts here. To find the facts further, we perform experiments, draw results on the basis of basic facts assumed. If the basic assumed fact is not fully correct, It's experimentation leads the concerned topic towards other way. Because, its observations are interpreted on the basis of initial assumed facts considered as basic facts, In case of Relativity, it has happened so. To start to derive relativity formulae, called Lorentzian transformations, they assumed speed of light equal to c on the basis of experiments performed till then to measure speed of light. But they considered it constant c irrespective motion of light source, motion of observers. All the experiment performed in that respect measure speed of light w.r.t. the source of light. But, measurements in space are being done speed of light irrespective of relative motion between observer and the source of light signal. Thousands of stellar bodies are mapped, assuming speed of light c as constant irrespective of relative motion between observer and the source-star. Hence mistakes in measurement of distances and related factors, is bound to persist in those performed measurements. In this article, the miss-concept in respect of length contraction and time dilation is discussed in detail. While, exercising on some one topic, innovative facts get revealed. While, discussing on time dilation, it is natural to analyze in deep, the working of atomic clock and the futuristic clock also, which is being installed by NASA in space within a few months. It involves action of gravity on it. Therefore, why, gravitational acceleration of objects having different masses is the same on a massive body? That should be directly proportional to the masses of the objects; then, verifying; it is not so? Why and how gravity behave differently from other forces? Property of gravity is only attraction; and no repulsion. Then how, dark matter and dark energy can repel the stars and galaxies and clusters to run away from the center of the Universe, that too at accelerated speed? The concepts are discussed with a bold hypothetical consideration very thoughtfully by the Author. General relativity concepts have become very popular. They create some illusive picture before the public. It is tried to drive away illusion about, Space-Time Continuum to catalyze creative real thinking of Relativity Principles. NASA keeps the world's time the Best. It will be keeping Universe's time after fixing the Futuristic clock in free space. To make it, Universal conman time (in respect of scientific laboratories and observatories) innovative suggestions are offered in this article. Concept of very first birth of Universe through whirling of Dark Energy matter and, next by Big Bang, not like what is thought as per present theory, instead by different suitable and natural way, is very innovatively found by the Author.

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INTRODUCTION

Einstein's Theory of Special Relativity revealed that, when a body is in linear constant motion w.r.t. an observer, its length along the direction of motion is seen lessened. That is, its length along the direction of motion is seen shortened by the respective observer. It is *'length contraction'*. This is one of the results of 'Special Relativity' by Einstein. At the same time an observer see that, the clock, attached to the object; which is exactly similar to his clock; runs slow.

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It is *'time dilation.'* Both these phenomena of 'length contraction' and 'time dilation' in inertial frames, having constant linear relative speed w.r.t. each other, are apparent. Neither length of an object in linear constant motion gets shortened; nor, the clock with the moving object as mentioned here, runs slow. Because, all inertial frames are, equal in, themselves as per the principle of special relativity. But, when a body is moving with accelerated velocity, the time in attached frame of the body really runs slow. An observer from his inertial frame, judges, manipulates dual 'time dilation' at an every instant of time. One because of accelerated speed of the object and another, because of speed of the object assumed

linear for incremental lengths progressively, instant to instant during its accelerated speed. Thus, causing the shortening of length, increasing successively from, the object's leading end to trailing end for the incremental pieces. (The speed taken for calculation of length contraction is, equal to average speed during the time period during which, the light signal from leading end reaches the trailing end).

Means of Perception: We the human being, perceive the world with the help of our five natural senses; a touch, taste, vision, smell and hearing. But, we know the world outside, by mainly seeing things and events by means of light or electromagnetic radiations received by our eyes and more minutely by using telescope. Light is everywhere in our world. We need it to see and analyze the facts seen. It carries information from the world at remote to our eyes and brains. Light is the basic tool to perceive, to realize, to know objects in the world, far away from us. Yet light is a perplexing phenomenon when we study it more closely. It doesn't show object in motion w.r.t. an observer as they are. Hence, to realize them 'as they are' Theory of Relativity is developed.
There are certain definite inherent rules of the nature, in respect of observing the world, by an observer. Those rules being inherent; hence, no one is seen talking about it. To avoid illusions and to know the facts crystal clear; those rules shall be kept in mind. They are as mentioned below.

- The means of perception for distant objects is light and other electromagnetic radiations.
- The light travels at speed 'c' in free space *w.r.t. its source*. But, It travels irrespective of any frame at constant speed c in free space; as is considered at present; is false. Light travels at constant speed c in free space between its source and an observer, both attached to same inertial frame and there is not relative motion between the two. (Please see article 'An Innovative Review of Kennedy-Thorndike Experiment'; published in 'scirj' issue V, May 2017 by this author.). An object is visualized, or an event is learnt, by an observer; when, all the light-signals emitted from each point of the object, in sight of vision of an observer; are received by an observer at a conman same instant of time.
- An event is said to have happened by an observer at that instant of time, when, the observer receives the event-signal, informing him about that event. This concept is inherently obeyed in life since Baba Adam and in Relativity theory.

The light emitted by an object at speed c w.r.t. itself and the object moving at relative speed v w.r.t. an observer; the light contains a component of the speed v relativistic-ally w.r.t. the observer. The speed of light is not c w.r.t any inertial frames except the source's inertial frame, is not in relative motion w.r.t. an observer's inertial frame; meaning by, the source and observer have the same rest frame. These above factors play an important basic role in relativistic mathematics. Ignoring them, introduces mal-concepts in relativity principles. Such as length contraction and time dilation observed in special relativity is real. Above rules of perception are inherently being followed, since the man dwelled to understand the world around him. Though these rules are very simple; they play a mysterious vital role in perception of universe. Hence to realize the physical world exact, Relativity Principles are developed in Physics world.

The Purpose of Relativity Principles: It has remained the thrust of human being since the era of 'Baba Adam and Eve' to know 'Who am I ? Where from I came into this Universe? How Universe works? etc.' Hence, since then the Mankind is studying the Nature; studying the Universe; Thinking on life beyond this materialistic Universe. The physical study is the study of Universal Truths. It needs physical measurements of an object and of everything, under its study. The measurements of objects at far away cannot be taken directly mechanically. The natural way of observing Universe is seeing it by means of light and for perceiving it 'as it is, Relativity principles are framed by the Great Scientist Einstein. At the root of observations; an Observer cited O and an Object cited as source of event-signal; this pair along with their rest frames is basically involved. Another Observer stationed on the object cited as O', is considered for the sake of simplifying the learning principles of Relativity. O' may be real or imaginary depending upon the object of study.

Length Contraction in Special Relativity is Apparent: When we see an object moving and measure its length along its direction of motion with the help of light coming from it i.e. with the help of light signals; it is found that, it is less than its actual length. In measurement its actual length the object doesn't move w.r.t. the observer. Actual length is called its 'rest length' and its length in motion measured with the help of light signals is called 'relativistic length'. An observer can visualize the relativistic length but not the true length of an object moving w.r.t. him in space. To realize the true length of the object, Lorentzian relativistic formulae are developed. The actual length (rest length) of an object, from origin of its rest frame is,

$$x' = [1/(1 - v^2/c^2)^{1/2}].[x - vt] \quad \ldots\ldots(1)$$

where, x is the length measured by observer say O assumed stationary; (that is us), by means of light signals. This type of measurement is called electro-magnetic measurement. x' is the actual length of the object as measured when if the object were stationary w.r.t. the observer. In this type the length can be measured by observer O' mechanically by means of a measuring tape or, by civil engineering survey, if the length involved is big enough, who is stationed with the object. v is the relative velocity between the observer O and the object. c, is the velocity of light w.r.t. its source i.e. the object in this case. t is the instant of time of measurement. It is the instant when light signal is reached to observer O with the help of which signal, the observer manipulated the real or rest-length of the object and time scale in its attached frame of the object. Here the object is at rest w.r.t. its attached frame from origin along the direction of x' axis as shown in Figure-1.

For derivation of above formula and other relativistic formulae, attach Cartesian co-ordinate frames to the observer O and the moving object, with observer O' attached to (fixed to) frame of the object, not in motion w.r.t. the object. Let the x axes of both of the frames be parallel to the direction of motion of the object w.r.t. the observer O. Let S be inertial frame of observer O and S' be inertial frame of observer O'. Observer O is assumed stationary as mentioned above and observer O' and the object, both attached to the same frame S', be moving at linear constant speed v along +x direction. Axes x and x' are always coinciding with each other in their relative motion between them. During their travel they met at a point in space and there they synchronized their very sophisticated similar

watches to instant of time (t = t' = 0). Then, t gives the period of time and the last edge of instant of time of that period i.e. number of units of time say seconds passing after the zeroth instant in the watch of O in its rest frame S attached to it; and, t' gives that similar in the watch of O'. As their watches are similar, O and O' see the same time passed in each of their watches. (In special Relativity, no one's rest frame is under the influence of any field.) But, as O and O' are in different frames moving w.r.t. each other; O cannot read in watch of O' directly. He reads it indirectly with the help of light signal carrying time information, released from clock of O'. Please be cautious about that, clock of O' is sending time signals during its relative motion w.r.t. O and that light also has its speed c w.r.t. its source, here the clock of O'.

The reverse communication may take place exactly in the similar way. Hence, when something happens around O' in his frame; "the instant of time of noticing the happening in both of their synchronized similar watches" does not coincide, due to perceptional natural limits; And, it differs in a mathematical relation, because of speed of light signal and the relative motion between observers O and O'. The times t and t' are not seen to be the same. The period of time t' passed in frame S' will be read as t in frame S.

The relation between time t and t' is given below.

$t' = [1/(1 - v^2/c^2)^{1/2}].[t - vx/c^2]$.....(2)

These formulae (1) and (2) called Lorentzian transformations are derived in many books of Modern Physics. It is needed to go through their derivations to understand miss-concepts that have crept in Relativity and to come out of them to avoid any mistakes in future inventions. Thus, from above equations length measured by observer O, x < x' the actual length of the object measured in its rest frame S'. This phenomena, is called length contraction. Because, Observer O, (the main real Observer) finds length of the moving object shortened. The shortening of the length takes place along the direction of the sight of vision of observer O.

Similarly, the time of an event, happening in frame S' is observed t by observer O; but, the time of same event is observed by O' with the help of his watch is t'. Event happened is same. Its place in the Universe is the same. And its instant of happening is also unique one in Universe. But, observer O and observer O' perceive different distances of the event from a conman point of "event happening" in space; and, also different instants of time of its occurrence with the help of each of observer's synchronized similar watch, such that mathematically, t'>t.

Meaning by, time period of t units of time in seconds read by observer O in his watch, attached to his assumed stationary frame; is smaller than the corresponding time period assessed by him, in the watch of observer O' who is moving at relative speed v w.r.t. O. That is , say if Watch of O' clicks 1 seconds, as found by O with the help of light signals coming from moving frame S'; the watch of O has clicked 3 seconds, though both of the watches are synchronized at zeroth instant, when both watched happened to be at the same conman point and clicked the zeroth instant simultaneously. Hence, O assumes that, for his 3 seconds, the watch of O' has clicked only one second. Hence, he takes for granted that, time in moving frame runs slow.

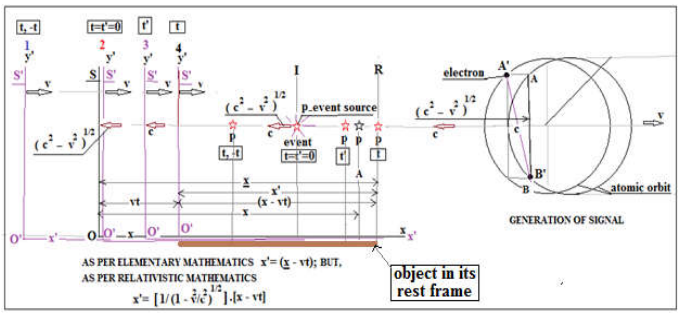

Figure 1. Real and Relativistic Position of an Event

This phenomena, is called time dilation. Time seems dilated in linear constant motion. If we attach ourselves to Universal frame; and we have signaling source having some extra ordinary light having infinite speed; then, we would have observed that, neither the length contracts nor the duration between two consecutive clicks of both the watches differ. The length contraction and time dilation observed by assumed stationery observer O as above is not real; but, it is apparent. If Observer O assumes him-self stationary w.r.t. the object and takes similar observations; he also arrives to the same results as O'. In this case, Observer O attaches himself to the attached frame of the object S'. Now, Observer O and the Object are not in relative motion w.r.t. each other as assumed above. Thus, when there is relative motion between an observer and the source of light signal; the observer experiences, the length contraction and time dilation. But when the observer is not in relative motion w.r.t. the source; he doesn't observe time dilation and length contraction.

Hence, Length contraction and time dilation in special relativity is apparent; not real. By going through above explanation minutely; one can definitely get conceived that, how the concept regarding, an event has happened with some one at that instant only when, he received the event signal, works. It will become clearer by going through the self explanatory *figure-1 above*. But, in reality the watch of O and the Watch of O', both click unit time duration say that of a second, the same; but, due to relative speed v between them; consecutive clicks of watch of O' travel at speed less than c towards observer O; thus, generating a feeling in him that, the times run slow at moving object. The very basic derivation of relativistic equations begin with x=ct, and x'=ct'; where, x' represent the distance of the event source p in its rest frame S' from observer O' attached (means fixed) to frame S' and x is distance of event source from observer O, in relative motion w.r.t. the source and observer O'. t' and t are periods of time required to reach the event light signal to corresponding observers O' and O from the instant of happening of the event in space at point p attached to frame S'; but both t and t' are read by observer O. The time t is read directly and t' by remote signals received from O'. The watches of O and O' both are very similar in all respect, well synchronized with each other, very sophisticated atomic watches and free from accelerating or other any forces.

The event 'a burst of light' have occurred at instance when O and O' were coincided with each other during their relative motion and at the same instant the watch of O and that of O' were synchronized with each other to zeroth instant, so that, both the watches read, (t=t'=0) at the point of coincidence of frames S' and S (Please refer figure-1 above). c is the constant in above pair of simple equations. *It is the velocity of light and*

it is considered constant in free space irrespective of any inertial frame and their relative motions in between themselves. And this property of light is accepted worldwide. In reality, speed of light is not constant in free space. It depends on relative motion v between an observe and the source of light (Proved by Author in his article, 'An innovative Review of Kennedy-Thorndike Experiment', published in Science Research Journal (scirj), volume V, May 2017). In physical observations, particularly in remote observations, we might be carrying a permanent mistake in calculations, due to consideration of constancy of light speed in space irrespective of any frame and relative speeds between them, as the whole Universe is expanding at noticeable accelerated speed. Lot of experimentation is found had been performed. But, in those experiments, performed, the basic concepts of relativity are taken other-way. *The red-shift of far distant moving stars and galaxies is very practical example of above statement of Author. The red-shift in distant moving away star represents decrease in its light-velocity. If one is alert with his perceptions, it is very interesting to know, light generating process of an excited atom. It is explained in my above cited review article. Doppler shift in light is due to change in velocity of light; due to the change in relative speed between the observer and the source.* See the beauty of light generating process of excited electron of an atom. That is in linear non-accelerated speed, there is not any change in process of light-generation obeyed by the excited atom. The equation derived (1) above, between distances x' and x respectively of event source from observers O' and O respectively is, taken below for further processing.

$$x' = [1/(1 - v^2/c^2)].[x - vt]$$

Simplifying above relation mathematically, it is further written as below.

$$[x'/c] = [x - vt]/(v^2 - c^2)^{1/2} \quad \ldots\ldots(3)$$

Digging out the facts from above equations and observing them; we arrive to following results discussed here very originally. Please see that, x' is the distance of event source from observer O' in his attached frame to which the event source is also attached. Hence, there is not any relative motion between them. c is speed of light w.r.t. its source. This factor is found not perceived as it is. Because, all experiments performed till date give, the speed of light c w.r.t. its source. Because, in all those experiments performed, there is not relative linear motion between respective source and observer. This fact is not realized by the physics world. Hence, they, consider the speed of light in free space constant, equal to c irrespective of any frame, which is a totally false presumption proved by Author mentioned in his review article cited above (scirj, issue v). So, in frame S' observer O' and source of light are stationary w.r.t. each other and both are attached to frame S'. Hence, speed of light observed by observer O' is c. Hence, (x'=ct). Now, (x - vt) is the distance between the source of light and observer O' but, measured by observer O w.r.t. whom, the source is in relative motion v. The source and the observer O' both are attached to frame S'. There is not relative motion between the two as mentioned above. Hence, the distance x' between the two is fixed in the Universe. But, the same distance is seen different by observer O as equal to (x-vt), measured scientifically: electromagnetically or by light signaling. Because, direct measurements in respect of moving object are not practicable. Because, when the object is in motion w.r.t. observer, he cannot measure dimensions of the object directly by a measure tape or so. The observations about the same distance are related with each other by the equation (3) above.

The term $(c^2 - v^2)^{1/2}$ represents/gives the speed of light w.r.t. frame S which is moving at relative speed v w.r.t. the source. Hence, it is the speed of light w.r.t. the Observer O who represents us. With this innovative above explained data; we will see now, how the length contraction in special relativity is apparent in more detail. By the way let us get cleared the frequent use of word speed instead of velocity. In Special Relativity, the phenomena of length contraction and time dilation are not dependent on direction of relative motion between the observer and the source of light signal. Either they are departing away or coming closer to each other; the results are same in all respect. Hence to emphasize this fact, the speed word is used. Where ever direction of any motion will affect the result; the word velocity is used in Relativity.

Time Dilation is Apparent in Special Relativity: To perceive length contraction, one should be well aware of a basic natural law of perception; not yet seen quoted anywhere. That law is, I quote, "an observer can visualize an object clearly; only when, the light photons from all points of the object, reach the observer at the same instant (even when there is not anything in between the observer and the source of light). It is a three dimensional view of an object in its motion from zero to c w.r.t. observer. Then by triangulation effect, the observer visualizes the object four dimensionally. i.e. length, breadth, height or thickness and the time. The fourth dimension visualizes the relative motion between the observer and the object as above. In the *figure-2 below*, there is a straight bar AB parallel to x' axis of its rest frame S'. It is moving at linear constant speed v w.r.t. observer O attached to frame S assumed. It is moving at linear constant speed v w.r.t. observer O attached to frame S assumed stationary. Both of the frames S and S' are inertial frames. The x-x' axes of the frames are in coincidence with each other.

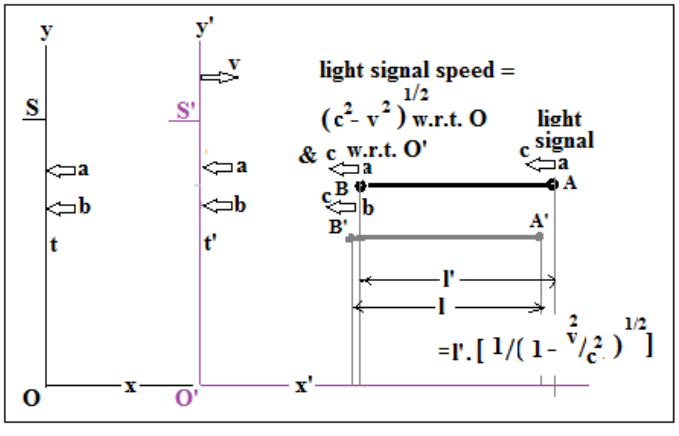

Figure 2. Length Contraction

Light photons are continuously released by each point of the object in all possible directions in space. Similarly, light photons from all points of the object are reaching the Observer, But the observer's 'eye' selects photons as number of waves with a particular constant consecutive phase difference between released or reflected photons as waves, in sequence from leading end to trailing end, length wise along the line of vision of the observer. That's why we can see the object four dimensionally. Hence, when light photons released from end A

to end B, reach the observer at the same instant of time along with photons from all the points; then, the observer visualizes the bar i.e. an object in general. Consider us in universal frame. Then we will see that S and S' are moving at relative velocity v w.r.t. each other. When we will concentrate on one frame; we will observe other frame moving at velocity v w.r.t. other. So, concentrate on S'. The length l will be seen real length stationary w.r.t. observer O'. Light signals from it will be travelling at speed c w.r.t. to the length. The observer O' selects signals from A to B at the same instant having sequential constant phase variation. Henceforth, we will consider signal from end points only for simplicity of explanation. Signal from A and B having consecutive resultant phase difference, reach the eye at the same instant of time at velocity c. Observer O' visualizes the length AB as l'. It is true length (as far as inertial frames S and S' are concerned. Because, if at least one of them had happened to be an accelerated frame; then, the situation would have a bit different). Now let us concentrate on frame S. we will see that S is stationary and S' is moving at velocity v w.r.t. S. Observer O visualizes the signals from A and B are travelling at speed $(c^2 - v^2)^{1/2}$ as explained in the figure-1 above. We in space will also visualize the same situation because now, we have attached ourselves to frame S. Pure logically considering, in the Universe as a frame, points A and B are fixed at their spots. Such a small distance or very theoretically, the space between points A and B is neither contracting nor expanding practically.

The event of release of signals from A and B at the respective instants, so that they may travel coincidently after the point B (trailing point), require signal from A (leading point) at speed $(c^2 - v^2)^{1/2}$ reach point B and light signal from point B released at that instant, will travel hand in hand towards observer O. Due to relative motion of the bar total consecutive phase difference between the two signals will be reduced for observer O w.r.t. that for observer O'. Because, as observer O is moving w.r.t. the bar the signal from leading end of the bar, reaches its trailing end earlier; hence, it seems to travel shorter distance for observer O as compared to with, that of observer O'. Therefore, Observer O finds distance between end points A and B of the bar, shorter than actual. Observer O' finds the actual distance between A and B ends of the bar because he is stationary w.r.t. the bar. Hence, observer O, assumed stationary, finds the moving length AB of the bar moving w.r.t. him, SHORTER, i.e. length l shorter than the length l'. How, observer obtains l' mathematically, is given below.

$$l' = l/[(1 - v^2/c^2)^{1/2}] \quad \ldots\ldots(4)$$

Observer O visualizes length AB as l from rest frame S. If he happens to observer attached to frame S', he will observe the true length l'. Hence, after going through above discussion it becomes crystal clear that, in special relativity, space contraction is apparent; and it is not real. It is as if a parallax in optics; like, a stick dipped in water vertically seems shortened.

Unification of Observer O Assumed Stationary with Observer O' in Relative Motion w.r.t. Stationary Observer O:- Let us review the equations (1) and (2) above.

$$x' = [1/(1 - v^2/c^2)^{1/2}].[x - vt], \quad \ldots\ldots(\alpha)$$

$$t' = [1/(1 - v^2/c^2)^{1/2}].[t - vx/c^2] \quad \ldots\ldots(\beta)$$

We have to and, we can measure the distance x' of a stellar body from us at the instant of time of observation, with the help of light signal received at that instant. . That will be the rest frame distance of the object. This is our requirement in evolution of knowledge of the Universe. But, in above relations, difficulty arises with the rest frame of the object, as where to assume it? Hence, by modifying above equations as processed below; the problem is solved and we can measure the rest frame distance of the moving body any time! A simple thing we need to do is, to shift the instant of coincidence between the two frames S and S' from (t=t'=0) to t=0. Thereby, the instant of occurrence of the event will shift, back to instant of time (-t, -t') and the watches would be synchronized at the instant (t=0). The instant (-t, -t') is rectified instant in comparison to instant (t=0) of coincidence of the frames. So, by substituting (t=0) in above equation α, it becomes,

$$x' = x/(1 - v^2/c^2)]^{1/2} \quad \ldots\ldots(5)$$

Now regarding time equation the considerations applied are as follows. In the equation β above, the term (vx/c^2) represents the time period required for the signal to travel from frame S' to Frame S as shown in figure-1 above. For,

$vx/c^2 = (v/c).(x/c) = (v/c).t$ Because, (x/c) gives, the time period required for signal to travel distance x from signal source to observer O, at speed c.

= (vt/c) . It is the time period required for the signal to travel the distance between the frames S and S' at the instant when, Observer O has received the signal. And as per the condition applied, it is zero at the instant of receipt of the signal by O. Hence,

i.e. = 0.

Hence, $vx/c^2 = 0$. Substituting this value in equation β above, it reduces to,

$$t' = t/(1 - v^2/c^2)^{1/2} \quad \ldots\ldots(6)$$

Thus, equations (5) and (6) suit an observer, to calculate actual distance of a stellar body x' from him. Using the measured distance x by means of light signal coming from event source.

The concept of third observer attached to Universe in which infinite number of frames, in relative motion within themselves, are accommodated is, inherent in the basic equations [x=ct and x'=ct'] on which the whole Relativity is based. These relations are true absolutely, for an observer attached to Universe as a basic reference frame in which all other frames are in relative motions w,r,t, each other. The observations are made by that Universal observer, by means of virtual signal having infinite speed. Hence, for the universal observer, there is not anything relative w.r.t. him. In fact, how can observer O and O' know the instant of the happening at its point in universal space? Because, an observer knows the happening of event; when, he receives its signal late, after the signal travels for a long distance through space, at speed c from the source of event to an observer. So these are assumed scientific facts. See we are monitoring and analyzing the happening of event and its observations by observers O and O', to mark exact instants of each event that, a blast of light at point p; receipt of signals by observers O and O'; coincidence of their attached frames; and, distance of source of event. It is assumed that, we are attached to third basic frame, The Universe, in which all other frames in relative motion with each other are included, as mentioned above. Frame S and S'

are under our observation. Further important thing is that, we have an assumed signal tool, with infinite speed, such that, soon an event happens at whatever large distance from us; at the same instant we know it. This idea of such a signaling device and such type of signal is behind this assumption inherently. So, as it is seen in the self explanatory *Figure-3 below;* observers O and O' have received the event signal, at the same instant of time. O' can measure rest distance x' of signal source; and observer O can measure its relativistic distance x from the same point occupied by observer O'; with the help of same signal which is used by observer O; that is the light signal coming from event source; and, the source of event is in motion w.r.t. O. There is not distance between the frames S and S' at the instant of receipt of event signal by both observers at the same point. Hence the mathematical relativity equations (1) and (2) are reduced finally to (5) and (6) as above. Observer O' gets eliminated. Observer O measure the distance of the event source x from him and finds its rest distance; the real distance x', from him at the instant of receipt of event signal by him using above equation (6); and, the event happening instant by measuring, ticks t of his clock for corresponding ticks t' of the clock attached with the event-source, from the instant of (-t, -t') [Because, it is, the instant of the event-happening]; and, then substituting it in equation (7) above. Observer O cannot see the event at its point when it happened. He has to judge it from the time read from the watches attached to him and that attached to event-source at the instant of coincidence and, the message from event-source's watch about the event's happening instant.

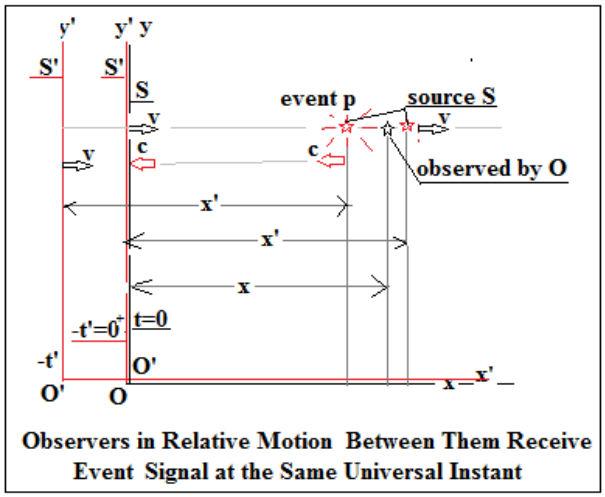

Figure 3. Observer O and O' Coincide When Both Receive Signal

True Distance of Event Source from Observer and True Instant of Time of Happening of event: Now, my question to me is that, what is real point of event happening or event-source at the instant the event happened in space, a conman instant to all observers in Universe in relative motion with each other. Because, each one will measure his value of x by direct observations with the help of light signal coming to him from the source of the signal. All those values will be different from source to source to source. Then, all observers will find true distance of the source from themselves each, using above equation (5). It will be same point of event happening pointed by all observers in the Universe. Even an observer in accelerated frame, will also show the same point. Because for each and every instant accelerated frame is an inertial frame at that each instant moving with speed v at that instant of receipt of signal. Event releases signals in all directions in space and the accelerated observer happens to catch the signal, which reaches to him, at that point, where the observer also reaches. Any observer in Universe is required to know the distance x of event source from him at the instant, he received event signal and the speed of the event-source at that instant. (With the help of these information, he can compute the position of the event-source in space, at any instant in future.) That he can know for nearer source by 'triangulation' and farther source by 'standard candle' methods. He has to go through good many data collected from years together and then by mathematical calculations he has to find out the distance of event source (that is on a stellar body), by computing its speed and speed-components, one along his line of vision and other perpendicular to it. Because, length contraction takes place along the line of observer's vision. Then calculate x'. It is real distance of event and its source, at the instant of time of receipt of event-signal from the event-source. For, calculation of instant of happening at the point of event, following method is to be used. We need to find out the distance of event-source and its speed. We know that light travel at speed c w.r.t. its source. In Universe basically all clocks are to be similar. An observer has read the instant of time t of receipt of signal as per his watch. All watches are synchronized with each other by the relativistic process used in derivation of Relativistic equations for distance and time. Observer's frames are assumed non-inertial.

Because, all things in universe are moving at varying accelerated speeds. With all these conditions, *the real and unique time of happening of event is to be calculated by each observer as following. Each one should divide his found distance x by c and subtract it from his instant of time of receipt of event-signal. Thus, [t-(x/c)] will be the conman time that will be achieved by all observers.* Each observer will have different values of x and t but, each one will get same instant of time of occurrence of the event in the Universe as a total existence. [Here again it is necessary to recollect that, c is the velocity of light w.r.t. its source.] But to synchronize all clocks in different types of relative motions with each other in the Universe; there should be a standard clock in free space. *Thanks to NASA for his project of 'Futuristic Clock' to be installed in space.* It should release time signals travelling from the clock in all directions, continuously. It shall work as standard clock in the Universe. Its time shall be Universal time. It should read standard time, that we follow on earth. A field, particularly gravitational field, will affect on duration of consecutive clicks. Hence, there must be another mechanism in "universal clock on earth or at anywhere in the world", to account for such variations and to nullify the effect of those. Any such clock with an observer, anywhere in Universe, be in synchronism with the standard Universal clock. Above equations (5) and (6) are of every frequent use. If there is not necessary software provided, at some stellar body in Universe, The observer will calculate the conman instant of event-happening in the Universe as follows. It will calculate the event distance from him according to above derived equations (5) and equation (6) to calculate the conman instant of time as below. Say the calculated real distance of the event from the observer anywhere in the Universe is x'. then the time period, required for the event-signal, generated by happening of the event, at its source is calculated as (x'/c). Because, light signal travels at speed c w.r.t. its source. Observer receives the signal at instant of time t. Then, the event has happened at instant [(t-(x'/c)]. This instant will be conman throughout the Universe. each observer in the Universe, at its rest-point will come to the

same instant of time. In this expression t will be conman to each observer in the Universe where ever he may be situated. We see that to find x', the relative speed in direction of sight of vision is required. For that two consecutive signals from the event source will have to be considered. And that is easily possible. Thus, Unique instant of time of an event-happening in the Universe, is given by the expression,

$$t = x'/c \quad \text{...(7)}$$

where, t is Universal time, read by each observer in his watch in the Universe. x' is the distance of an observer of the instant happening point from the respective observer in the Universe. And *c is the speed of light signal of the event w.r.t. the event-source.*

Now, it needs to change the concept of way of synchronizing the clocks in this case. According to existing old concept, if, an observer is looking in +x direction to a light-source-point; a light signal is released from that point in -x direction towards the observer. Then the signal traveling at speed c w.r.t. the point-source; when reaches at every point in its path; informs the instant of time, when the signal is released from it. Thus all observers in universe receive the instant of happening of an event; the release of light signal, from its source. All observers get this information. Each one will receive it at different instants of time, corresponding to their distances from the source. All observers are in relative motion with each other and at different distances from the event-source. Hence, each of them receive event signal at different instances. Each one *finds then corresponding instant of time of happening of the event, by using above formula (6).* All will get the same instant of time. as is read by the watch of event-source at its point in space. So for synchronizing all clocks in Universe as per standard time on earth, which is followed by the Universal clock in deep space, this Universal clock should work as an event source. Then, all watches in the Universe are synchronized, to the time informed by futuristic watch in the following the concepts behind the equation and not to the time of receipt of the signal from the futuristic watch. That will be instant t' of event happening.

All clocks in universe shall be synchronized with futuristic clock as if at the point of futuristic clock. All clocks should have instrumentation and software to nullify acceleration effects on each of them. They need one more display dial applied with respective instrumentation and software, to display the event happening time at the event point. Then let an observer move any way, anywhere in Universe, he will be knowing the real exact instant of time of an event-happening; though it may be known late by time period required for the event signal to travel from point of event happening to the respective watch with anybody. The study of application of above equations in practical measurements of distances of stellar objects/bodies in triangulation and in standard candle methods is very beautiful. But, it is seen that the Relativistic factor is not applied in measurement of distances of stars in space. It is used for measuring the masses of stellar objects. In distance measurement, it is not used. In methods of stellar body distance measurement's methods like, 'parallax shift', the recent 'stellar tape measurement with the help of Hubble introduced by NASA', 'arc-sec method'; whether includes therein the Relativistic factor $(1 - v^2/c^2)^{1/2}$ inherently or not. In application of these methods, the relativity factor application is not seen by me. *Therefore, the distances we get are real or otherwise. The facts will be discussed in forth coming paper. Because, At a far distance, where the terrestrial bodies are departing away from Universe centre at velocity say 0.6c units per second; the distances of those bodies will be obtained lesser by 20% of actual.*

Time Dilation in General Relativity: Before discussing time dilation in General Relativity; we need to see how the time runs. It is an experimental fact that, time in an atomic clock runs slower In free space than on the surface of a stellar massive body like earth or it is dilated as gravity lowers. Here again I repeat the meaning of time dilation. It is easy to understand or remember the meaning of length contraction; but, it is not that easy in respect of time dilation, meaning by *'increase in duration of basic unit of time, is time dilation'.*

Measuring Distance of a Terrestrial Body and the Role of Special Relativity Therein: It is discussed below how the Special Relativity affects on measured distances of Bodies in space far away, using the Triangulation and Standard Candle method. Please see the below self explanatory Figure-4.

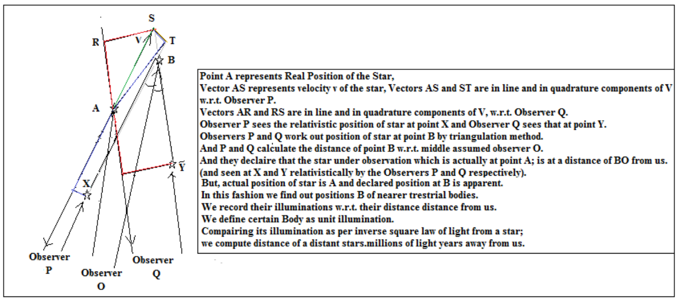

Figure 4. Measuring Distance of a Far Away Terrestrial Body

Each point of the process mentioned by the heading is explained step by step in the figure-4 above. It will be seen that, negative length contraction is observed in this case. But, it is also visible in the diagram that, basically the process routes through length contraction as per Special Relativity. Actual distance of the star under its distance measurement is, OA and the relativistic distance to which we consider actual is apparent distance OB. It works out greater than actual distance. *The triangulation method is the basic method involved in, parallax method, standard candle method and all other methods of distance measurement in space of bodies at far away.*

Does Gravity Affect Time?: Yes gravity affect time. An atomic watch run slower on hill-top than it runs at hill bottom. It is only due to gravity. Because, cesium atomic vibrations between, its two ground states are very stable. Hence, cesium atomic clocks are very accurate under constant field conditions. Orbital electrons change their energy levels in atom continuously with constant period of time. But, change in field in its surrounding affects the clock working as above. Gravity affects its time keeping. Low gravity will give shorter unit time period and higher gravity will give longer unit time period. It happens because higher gravity lowers the speed of orbiting electron. How? Let us see. It is very innovative and originally being explained. The utmost accurate minute time duration is maintained by vibration of a stable atom or revolution of orbital electron around its nucleus. Each orbit has its fixed energy. But, the orbital motion of an orbiting electron in its orbit is also affected by external forces if any of them are acting on the atom. The result is slowing the orbital motion and

increasing corresponding time period span of electron's revolution proportionately. Please see the *Figure-5,* below.

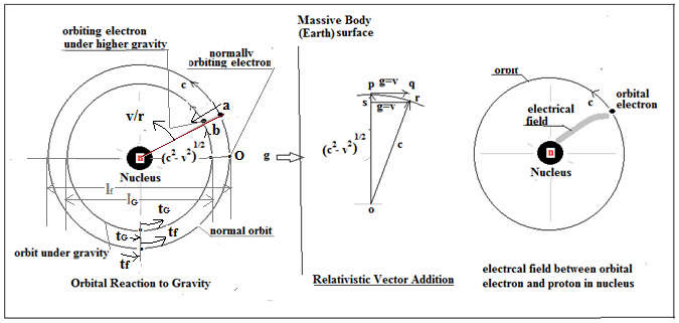

Figure 5. Effect of Gravity on atomic Orbital

When an electron is pulled away from its nucleus atomic internal work is done by an external force. It is stored as internal energy of an atom. When an electron is brought from infinity towards its nucleus (positive electrical charge) work is done on electron by the nucleus. Hence nearer orbital has greater energy and outer orbital has lesser energy; both w.r.t. nucleus. Hence, outermost orbit will be affected to small amount of energy external energy acted upon outermost orbital. Energy acts through a force. A force moves a mass-particle. *Moving mass is energy.*

Please refer, *Figure-5* above, Orbital Reaction to Gravity. The outermost orbital, under the influence of gravity, has assumed lower orbit having less energy. It is due to following reasons. Orbital linear speed is a vector continuously changing its direction along the tangent to orbital path. As per me, every orbital has linear speed c, the speed of light. Because, light photons at speed c, are released from an atomic excited orbit of an atom in space. Hence, orbital-electrons are revolving around their nucleus in the speed range nearing speed c. In Relativity, vectors acting on the same particle doesn't get added to each other and make their resultant act on the particle; instead of that, each vector acts of its own. One vector shifts another vector, when it could not get added to it because of its (prime vector's) limiting value. Larger vector acts as a prime vector and the smaller vector shifts the prime vector. The most interesting fact in Relativistic addition is that, the resultant prime vector's magnitude decreases correspondingly. Please refer above *Figure-5*, Relativistic Vector Addition. The gravity vector intending to add velocity (g=v), to c; shifts vector c (OP) to same value vector (OR) reducing prime vector c's magnitude to $(c^2 - v^2)^{1/2}$ i.e. (OS), as shown in the figure-5. Thus, orbital speed has reduces due to gravitational effect. Resultantly, the orbital energy has decreased w.r.t. nucleus. Here, gravity, V use MKS unit system as usual and geometrical units as in Schwarzschild's Time Dilation formulae. In an atom, orbital electrons are held as if they are hinged by a suitably flexible but a stiff band. Hence gravity works on an orbital electron as a pressure. It means, gravity does not accelerate the orbital electron at acceleration g, but, always maintains a force on the electron such that, if the electron is released from its orbit free to move, it will provide it acceleration g to achieve a velocity of v within unit time one sec. this gravity reduces orbital electron speed from c to $(c^2 - v^2)^{1/2}$ and rotates around its nucleus at reduced speed given here. For avoiding interference of proton to respective electron electrical fields of different pairs in atom; after coming down to lower orbit; it revolves at the same angular speed as in its previous orbit. For time unit, one orbital rotation of an electron of a stable atom is suitable than one peripheral length travel by orbiting electron. Peripheral lengths are different as per respective orbit numbers. So, if, before gravity acting, the electron obeyed outer periphery. It travelled at linear speed c along it. It took a certain time to complete one such rotation around its nucleus. Let us represent that time as t. in rotational speed the orbital electrons in different orbits maintain it the same. Similarly equivalent to linear speed c, angular speed of all orbiting electrons is same angular c. Hence product 'ct' in angular measurement remains constant. Please excuse me, I repeat again it. When gravity is acting on the electron, its linear speed reduced to $(c^2 - v^2)^{1/2}$. As far as angular speed is considered it remain the same due to reasons mentioned above and also the angular rotation time period remains the same. Thus the product 'ct' remains constant. Now in linear relation it works as following.

In gravity free orbit, the orbital linear speed is c and outer orbit refers to it as in *Figure-4*.there the orbital electron travels at speed c around its nucleus. With this linear speed c, it completes each one rotation in a certain time period say t. So, in outer orbit, the product of c and t, ct is taken. When gravity acts, the linear speed is reduced to $(c^2 - v^2)^{1/2}$ and, the electron drops to lower orbit as discussed above. The periphery of lower orbit is lesser than outer orbit. But, due to reduction in linear speed, the electron takes more than previous time period to complete its travel of one lower periphery. In angular motion we have seen the same time and same angular velocity of electron in both the orbits. But, in linear motion, orbital electron seems to need more than previous period of time. As per Relativity formula it is $[ct/(c^2 - v^2)^{1/2}]$. So for inner orbit, the product of speed and time is $[(c^2 - v^2)^{1/2}. \{ct/(c^2 - v^2)^{1/2}\} = ct]$. as per outer orbit. Outer orbit works as frame S' attached to orbital, the source of event and, inner orbit works as frame S attached to observer. And it is true we as observer O, the main real observer are watching events happening with orbital electron in motion.

Gravitational Time Dilation and Length Contraction are True in General Relativity: It is considered that, the sophisticated watches are similar in all respect. Inherently we understand that, the gravitational forces exerted by frames S and S' are equal or zero in Special Relativity. With that consideration, and it is true; But, in reality each and every frame in Universe is influenced by gravity more or less. Then in that case General Relativity works. Hence, unit scales of t and t' are bound to differ in their rest frames depending upon gravitational constant of those frames or any other acceleration due to another type of field. A well known example of general relativity time dilation is an atomic clock that runs slower on surface of a massive stellar body like earth, than in free space. Because, earth has gravity g. Gravitational constant of earth's gravity, on earth's surface is g w.r.t. free space. Please refer figure-5 above. An excited electron in an atomic orbit in free space, revolve at speed c around its nucleus. Its orbit is shown in the figure above as normal orbit. Light photons emitted from excited orbital electron there-from move at speed c. Under the action of gravity g, the orbit of electron reduces to $(1 - v^2/c^2)^{1/2}$ times the normal orbit in reality. But, the electron's angular speed in its newly occupied orbit due to gravity, external to the atom remain c or even more in excited atom; or, naturally higher atomic numbered-atom's orbiting electron as mentioned in relativistic effects on atomic orbital in Wikipedia. Hence, as orbiting electron goes nearer and nearer the nucleus, its linear speed decreases proportionately w.r.t. decrease in respective

radius. The orbital radius of an atom decrease w.r.t., external gravity on it. As discussed above. The linear velocity v in an orbit of electron is derived under the influence of gravity. Thus, as shown in *Figure-5,* for velocity c, the orbital dia. is l_f and, for reduced velocity, $c.(1 - v^2/c^2)^{1/2}$ the orbital dia. is l_G. The notations in this figure subscribed 'f' correspond with velocity of light, c. And that subscribed with G correspond to gravity acting on the atom from external massive object. See that periphery p_f corresponding to dia. l_f and p_g corresponding dia. l_G, is orbited by the electron in the same time period. (Hence, it is rightly thought in geometrical units of space measurements to keep period of time of an event, t as constant and to vary c by taking its proportion.). Therefore, $p_g<p_f$. This is the Gravitational length contraction. To state it; a length of an object becomes shorter on a massive body due to gravity of the body; than it is in free space beyond any gravitational influence of any other body.

Now about time dilation consideration: Both the peripheries, p_g and p_f where, $p_g<p_f$, are traversed in the same time period t. Smaller length traversed in same period as the larger length. Hence, now in smaller orbit the electron will require more time to traverse the distance equal to the larger orbit existed in free space. Therefore, the unit time duration is increased in lower orbit which is accepted by electron under effect of gravity of external massive body. This is Gravitational time dilation. The mathematical relations in this respect are discussed below. A common equation used to determine gravitational time dilation is using the Schwarzschild solution, which describes space-time in the vicinity of a non-rotating massive object. The Schwarzschild solution for time dilation for a spherically-symmetric object is:

$$t_0 = t_f\sqrt{1 - \frac{2GM}{rc^2}} \quad \text{.....(8)}$$

in free space, and i.e.

$$t_o = t_f\sqrt{1 - \frac{2gR}{c^2}} \quad \text{.....(9)}$$

on earth's surface. Where,

- t_0 is the proper time between events A and B for a slow-ticking observer within the gravitational field,(for example on earth.)
- t_f is the proper time between events A and B for a fast-ticking observer distant from the massive object (and therefore outside of the gravitational field), (that's in free space.)
- G is the gravitational constant,
- M is the mass of the object creating the gravitational field,
- r is the radial coordinate of the observer (which is analogous to the classical distance of observer from the center of the object, but is actually a Schwarzschild coordinate), and
- c is the speed of light.
- g is the acceleration due to earth's gravity.
- R is the radius of earth.

Then, above equation can be written as

$$t_g = t_f\sqrt{1 - \frac{2gR}{c^2}} \quad \text{.....(10)}$$

where, tg ≡ t ; tf ≡ t'
G = Earth's gravity,
R = Earth's radius,
c = speed of light.

It is as derived in ' Nave, C.R. "Gravity and the Photon." in Hyper Physics. <http://hyperphysics.phy-astr.gsu.edu/hbase/ relativ/ blahol.html#c2. From Hyperspace Wiki; exploration in effects of gravitation; gravitational time dilation." In the above equation (9), t_0 is time-period between two consecutive ticks defining unit of time on the surface of a stellar body or a planet; and, t_f is the time period between two consecutive clicks defining the unit of time by similar watch in free space; then, we can realize that the same watch will show different Unit time periods on different stellar bodies or different planes w.r.t. time in free space. Thus in its rest frame, an object experiences time dilation due gravity of its rest frame. Thus time runs slow in space in lower gravity and fast on a stellar massive body that is in higher gravity. Now, let us see about Length Contraction in General Relativity. Assume there is no gravitation-phenomena in Universe! Then, every similar dimension of each object would be the same in free space and on any big body. Now, Measure the length l_f' of the object along radius of the big body in absence of Universal gravity. See that, the object is on surface of the massive body and the measured length is vertical to the surface of the body, in radial direction. Assume next step. Let gravity in space G appears. G acts in all directions. Hence physical dimensions of each object would be contracted. Hence, above measured length will also contract to l_f irrespective of its direction. G acts at any point in space in all radial directions to point in space. Please be cautious about that, there is not gravity of its own to any, big body/object/particle yet in our assumption. The diameters of terrestrial all bodies would be contracted; the all lengths of each of the body would be contracted; measuring tape will also be contracted. It will all happen due to Universal gravitational constant G. the Universal gravity G is same in magnitude in space in all directions, Hence, in its case there won't be acceleration of anything at this stage of our thinking. This length l_f, we consider length in free space having Universal gravitational constant G. Now, the last step; consider existing Universe. There is gravity-field to each body, each object and, almost each particle, each of its own. Hence, on a planet or on a terrestrial body; the dia. of or the length of respective body reduces, proportional to l_G. the length of an object resting on or in gravity-influence zone of a massive body, will reduce to its respective length l_G in radial direction of the object's rest-massive body. It can be seen from free space where Universal gravity G is only present. The relation between the length l_f in space (in any direction) and its respective contracted length l_G on massive body, in radial direction, due to gravity of massive object is,

$$l_G = l_f\sqrt{1 - \frac{2GM}{rc^2}} \quad \text{.....(11)}$$

Where, l_f is length of object in free space, l_G is the length on massive body, along the radial direction of the massive body. G is gravity of the massive body, M its mass and, r is the radius; and, c is the velocity of light w.r.t. the length. (Please

see that till yet we have not considered the effect of Special Relativity on length contraction.)

Above equation is derived in web: *The Origin of Gravity - ag-physics.org. While reaching to above equation (9), G is talked as Universal gravitational constant as is existed. As nowhere part of Universe is found free of Universal gravity G, we have accepted the length in space as original length l_f the free length; not affected by gravity. And w.r.t. it, the gravitational contraction due to terrestrial bodies is being measured. Hence, in above equation (8), G represents the gravity of a body and not, the Universal Gravity Constant.* l' in above equation (11) includes gravitational contraction of length in free space and it is carried to observer through light signal in his measurements. Hence, the length l measured by observer in space contains gravitational length contraction. With this informative data, we will see how originally, the length contraction occurs physically. Please see the *Figure-5* above. It represents gravitational length contraction.

Length Contraction in General Relativity: In free space, there are not external forces acting on orbital electron of an atom. By 'free space' here it is meant that, there is not any material particle and any speed except unavoidable Dark Energy particles/Dark Matter and Higgs Field. There the duration between consecutive two ticks of scientific atomic watch is t_0 as given above by equation (8). On a massive body like earth, it is t_f and the relation between the two is given by relation (9) above. Then, t_0, on a massive any Body, is converted t_G i.e. time period between two consecutive ticks of scientific atomic watch and represented it in above equation (10). In the relation (10), the term (2gR) represents, v^2 where v is the velocity due to gravity of the massive body and our 'test atom' is considered on it.

Now, I take the relation (6) $t' = t\sqrt{1-\frac{v^2}{c^2}}$, Along with its relativistic basic equation (8), $t_0 = t_f\sqrt{1-\frac{2GM}{rc^2}}$ and its equivalent equation(10) for earth,

$$t_g = t_f\sqrt{1-\frac{2gR}{c^2}}.$$

Where, $\sqrt{1-\frac{v^2}{c^2}} \equiv \sqrt{1-\frac{2gR}{c^2}}$, $t_0 \equiv t_G$, $v^2 \equiv 2gR$ .....(12)

In equations (10) and (11), t_f and l_f are counter notations of l' and t' in special relativity respective equations, (6) and (4). Similarly, l_0 and t_0 are counter notations of l and t in special relativity. In above relation and expression it is indicated that, (v^2 = 2gR). From the discussion above, this relation can be interpreted as follows. An assumed stationary observer, finds the speed of light signal coming to him from a relatively moving object at speed v, in direction of his vision, equal to $\sqrt{c^2-v^2}$ w.r.t. him, in free space. Similarly, when an orbiting electron is revolving around its host nucleus at linear speed c freely; and it is then applied a force say a force of gravity g; its speed will reduce to $\sqrt{c^2-2gR}$. Now here is one beautiful perception in respect of Relativistic vector addition. In relativity two or more than that vectors, does not get added algebraically to form their resultant; but each of the vectors acts independently instant to instant. This happens because, any speed added to speed c doesn't increase it beyond c; instead, it lowers speed c to speed $\sqrt{c^2-v^2}$. It gets added to c relatively. Please go through the *figure-5* below, to get me.

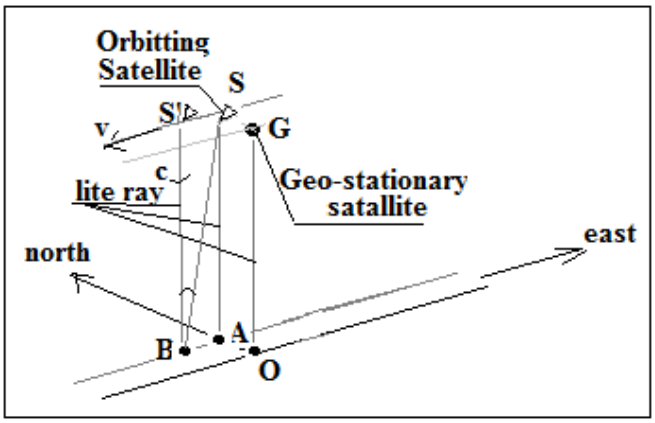

Figure 6. Relativistic Vector Addition

As per *Figure-6* above, G is geo-stationary satellite. O is its vertical projection on earth. Obviously it is orbiting around earth in west to east direction at the linear speed so that the point O on earth is always remains stationary. Arrange another satellite S which will be orbiting the earth in opposite direction to G parallel to orbit of G, at the same altitude from earth surface. Let a light (laser) signal be released from satellite Sat point S, when it is in line with G. Mark its vertical projection on earth surface. It will be at point A. Arrange experimental system such that, at this position of S, a sufficiently narrow and short light pulse be released from S towards ground in radial direction of earth. Along line AB already light sensors are put continuously. Observe for receipt of the light pulse. It will be seen that, the sensor at point B records the receipt of the pulse, which was fired at point S in space. Let the sensors be provided with measurement of angle of line of travel of the signal w.r.t. the vertical to earth-surface at respective places. Then sensor B will record angle of line BS' equal to zero degree instead the angle of line BS which is >zero. If the velocity of light c and velocity of the satellite S were added as per vector algebra; then the sensor at B would have recorded, the direction of signal along SB instead the direction S'B. Because, the sound boom generated in air by its source, doesn't travel with its source; but, it stays in the medium of sound generating sound waves in medium which travel radial. In relativistic terms; the rest frame of sound doesn't travel with its cause; which is the supersonic jet; but, the rest frame of light travel with its source. Hence whenever seen, light is found coming from its source.

In case of light, it doesn't travel by generating disturbance in a medium like sound. Sound travels through medium air by creating disturbance in still air medium. Its particle-photons released from its source, travel at speed c w.r.t. its source. It has two speeds. One its original speed c and other speed v of its source w.r.t. an observer. But, c and v does not get added algebraically, as vector addition creating a resultant vector which would have travelled along the path similar to SB as in *Figure-6*, informing us that, light signal received by an observer shows the position of its source, where at, the source has released the signal, the concept followed at present. But, light photons released by satellite S, at point P travel parallel to line SA and reach observer O, when the satellite S is at point position S'. Observer finds that the light signal has reached him along the line S'B. It indicates that, the light rays travel parallel

to itself at speed of its source. Hence, the position of signal source that is recorded by an observer is its actual position in space when he receives the signal; and not that, when the source released the signal in space. Thus in the relativistic phenomena, speed vectors of light doesn't get added purely algebraically but, they get added relativistic-ally. Attention is focused on speed of light discussed where ever needed, in my two research articles. One is published in 'Scientific Research Journal (scirj), volume V, May 2017', under the heading 'An Innovative Review Of Kennedy-Thorndike Experiment.' And other titled, 'The Light Photon, Dark Matter and the Whirling of Dark Matter. Theory of the Birth of Universe' published by, 'International Journal of Current Research. (ijcr). In its volume 09, issue 10, October 2017, sub-head: Physical Sciences and Engineering. Now returning to our orbital electron and its host atom under action of gravitational force; it is to state that, the tensor v, doesn't add to c, but it lessons its orbital speed by a factor say (1/x) where, x is an integer. Effectively, the orbital period increases by x times. Therefore, the orbital diameter seems decreased in rest frame of atom itself as per relativistic behavior, by the factor, $\sqrt{1-\frac{2gR}{c^2}}$.

Thus gravitational velocity tensor v acting on speed c of orbiting electron shifts vector c, thereby the vector c describes smaller orbital radius in this case. Because, vector v tries to its speed v on the orbiting electron; but, the electron is under the influence of atomic internal forces which were far greater than the external gravitational forces acting on the orbiting electron. Hence the tensor v lowers the speed c to $\sqrt{c^2-v^2}$ where ($v^2 = 2gr/c^2$). Therefore, the respective electron requires greater than previous time period to complete one rotation at speed c. As speed and time period are complementary to each other in Relativity; their product remains same the constant. Hence, c the speed of light is not universal constant but, the product of velocity of light and time period to travel the distance c, between two points fixed in universal frame of reference, is constant in each frame w.r.t. its attached respective observer. However, the travelled distance c and time period to travel it as observed from different frames each will be different but, the product ct in each frame will be the same. According to discussions above, if an object of length l' in free space happen to stand on the surface of a satellite where, the gravitational tensor v exists; its height will not be l' as previous but, it will be,

$$l = l' \cdot \sqrt{1-\frac{2gR}{c^2}} \quad \text{.....(13)}$$

Where l is length on earth and, l' is the length in free space. Provided the measuring tape used in free space, remain unaffected by gravitational forces of the planet and any other possible effects. As g differ from planet to planet; stellar body to body; the length contracted from l' to l will also differ from planet to planet. Thus, if the length of an object radial to a satellite, say Jupiter is l_j and that is l_e on earth; then gravitational contraction of an object on them will be as below, derived from above equation (13)

$$l_e = l_j \cdot \left[\sqrt{1-\frac{2g_e.R_e}{c^2}}\right] \Big/ \left[\sqrt{1-\frac{2g_j.R_j}{c^2}}\right] \quad \text{.....(14)}$$

Here, the gravitational vector force, tensor acts along the direction of length which is along the radial direction of the respective massive body. Second fact, l_e and l_j are vertical to direction of vision of observer. Please see *Figure-7* below. The observer will find this relation true for object's length lengths, in the direction of gravity of respective body. Thus, the length l_e along earth's Gravity on earth will be gravitationally contracted length l_j on Jupiter in direction of Gravity of Jupiter. When measured from earth, it will come out to be the same l_j. le and lj are lengths are same l_f, the free length when the object rests in free space. Hence, above equation, (13) exists. Thus, *Gravitational length contraction is Real.*

The case in *Figure-7* is of special & General relativity i.e. an object in accelerated frame (the planet Jupiter) is viewed from another frame (planet earth), (neither earth nor Jupiter has any revolving speed about one's self, as is assumed for the sake of explaining the facts very clearly) in relative linear motion v, w.r.t. each other. Observer on earth judges, the gravitationally contracted length l_j (l' in Special Relativity) and observes, the same! (l in special relativity); Because, there is not length contraction, in direction vertical to the direction of motion of the object, in Special Relativity. Thus, there will be two length contractions observed by observer. One, the Gravitational real length contraction the direction of gravity given by the equation, l_j as viewed by the observer in the direction perpendicular to the length; to be measured, is l_j , the same length. Because, in this case, there is not length contraction due to reason mentioned above. But, along the direction of vision of the observer in relative motion w.r.t. the object; the length contraction takes place as given below as shown in *figure-7*, below. Thus,

$$l = l' \cdot \sqrt{1-\frac{v^2}{c^2}}$$

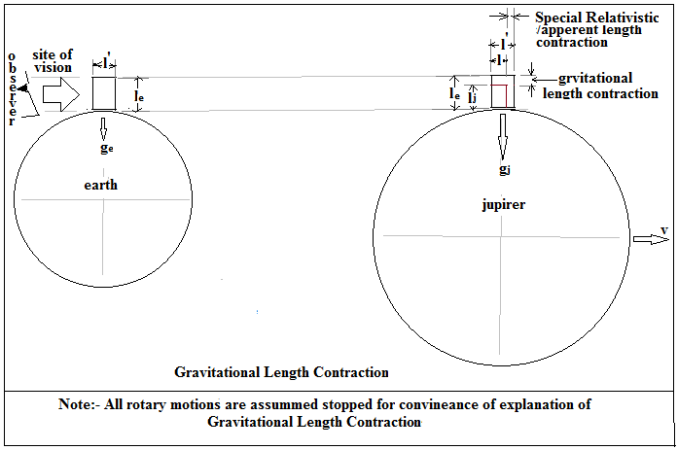

Figure 7. Length Contraction in General and Special Relativity

Below *Figure-8*, is revision of *Figure-7*. In the *Figure-8*, the length l observed by observer on earth, include both length contractions; gravitational and Special Relativistic contractions. The equation between length l observed by the observer, and the length judged l', that would be on the massive object, here the Jupiter; is as given below.

$$l' = l \cdot \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \quad \text{or,} \quad l = l' \cdot \sqrt{1-\frac{v^2}{c^2}} \quad \text{where,} \quad l' = l_f \cdot \sqrt{1-\frac{2g_j.R_j}{c^2}} \quad \text{..(15)}$$

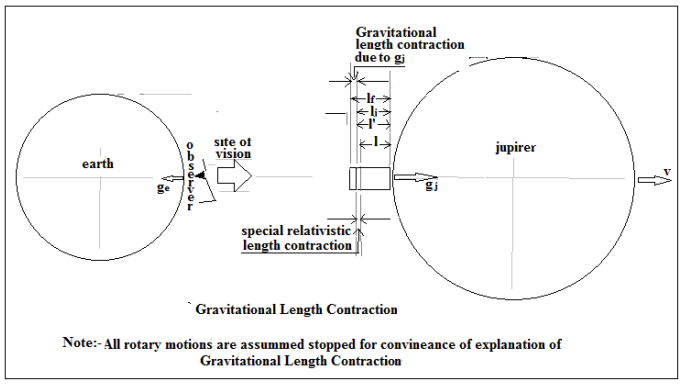

Figure 8. Gravitati0nal and Special Relativistic Length Contraction

Above fgure-8, is revision of *Figure-7*. In the *Figure-8*, the length l observed by observer on earth, include both length contractions; gravitational and Special Relativistic contractions. The equation between length l observed by the observer, and the length judged l', that would be on the massive object, here the Jupiter; is as given below.

$$l' = l \cdot \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \quad \text{or,} \quad l = l' \cdot \sqrt{1-\frac{v^2}{c^2}} \quad \text{where,} \quad l' = l_f \cdot \sqrt{1-\frac{2g_j.R_j}{c^2}} \qquad \ldots(16)$$

and l_f is length in free space.

Whenever, an observer finds a length l, of an object under the influence of a massive body, either in state of rest or in a state of relative motion w.r.t. him; it is included of the Gravitational contraction due to that massive body. Similar consideration, do apply to a massive body under influence of another massive body. The measured length thus, or the length judged l' is respective gravitationally contracted length as shown in above formula-16. In this case the object under observation is resting on massive object. now we should see, how gravity of a massive body acts on an object, the object, which is, moving (falling) freely under the gravity of the Body.

Moving in Free Space and Moving free under Gravity: Please see the *figure- 9* below.

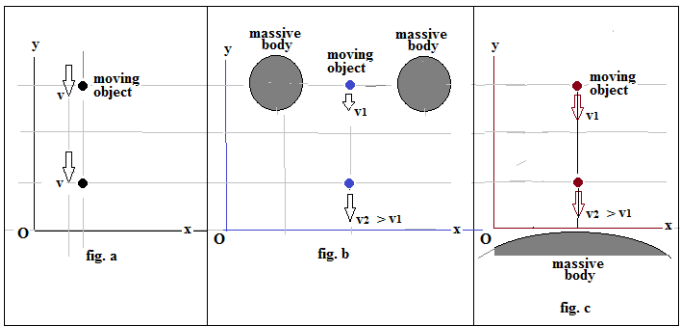

Figure 9. An object under free motion

There are three cases shown in figure-8 above, that of motion under gravity.

- In *figure-9a*, the object is moving freely, at constant linear velocity v conserving its momentum. There are not any forces acting on the object. there is zero gravity acting on the object.
- In *figure-9b*, there are two equal in mass and size, two bodies, resting each on one side of the object at equal distance from the line of motion of the object, the gravitational forces, x-components of the two massive bodies are equal and opposite to each other acting on the object, along line passing through the centers of the massive bodies; and y-components of both bodies acting in -y direction adding with each other. Hence, the object is moving freely w.r.t. x-x-components and under influence of -y, -y components.
- In *figure-9c*, the object is freely falling under gravity of massive body. Gravity is continuously acting on the body; but, it is gaining momentum by increase of its speed under the influence of gravity. Hence, it is freely falling under the gravity.

Thus for a free motion of an object, either there should not be any external forces acting on the moving object; or, if they are existing; the object can move freely if the forces are equal in magnitude and acting opposite to each other. In *figure-8*, Gravitational length contraction is observed in case the object is resting on the massive body. The force of gravity of the body tries to accelerate the object; but, the resting frame of the object, doesn't allow it. Hence, the gravitational effort of the body is transferred to contract the object. This Gravitational contraction of the object is viewed from each frame in the Universe in different Relative motions with each other.

This Gravitational contraction compresses the atomic orbits of atoms of the object under its influence.

But, what happens to Gravitational contraction of an object, falling free under the influence of gravity of a Body? *Gravity of a Body acts on each particle of an object independently. Hence, when Gravitational contraction takes place; it is homogeneous throughout the object. That's why, objects with different masses, diverging-greatly in their masses, fall from the same height on a massive Body at the same accelerated speed and touch the plane horizontal ground at the same instant of time.* So, *when an object is moving free under gravity acting in direction of motion of the body, The object moves freely. Gravitational contraction in this case doesn't occur.*

Difference between mechanical force and gravitational force: Please see the *figure-10* below. *Fig.* 10.*a*, shows the action of mechanical force and *figure-10 .b* shows the action of gravitational force. Number of particles, are connected in a line passing through their mass-centers by themselves by their internal bonds in a total consolidated mass. In case of application of a mechanical force, we have to attach an eye-bolt to the first particles of the mass and a hook to the source of mechanical force. The eye and the hook are coupled and mechanical force is applies on 1st particle. The force is then serially passed one after another up to the last particle through the internal bondage of particles between each other consecutively. The force has to come over the total inertia of all particles. Through the 1st particle directly connected to the force-source. Hence, the 1st particle carries maximum stretch. The stretch then lessons one by one till end particle. Each particle opposes the force due to its inertia. Hence, larger the number of particles, larger force is required to bring in motion all those, in a fixed period of time with uniform acceleration. But, in respect of gravitational force, the situation is different. Each mass particle has gravitational force, proportional to its

mass. When, a gravitational field line acts on that particle, it helps the massive body to accelerate it. Thus, each of the particles of mass of object, helps itself to accelerate towards the massive body. Hence, there may be either one mass particle or number of mass particles; each will respond independently to the force of gravity of the massive body. Therefore, either there be one or number of particles bonded in a single mass; both will attain same velocity after a conman particular time period with constant gravitational acceleration acting on each particle directly.

The main fact in gravitation acts directly on each particle of an object having mass. Therefore, a kilogram-mass and a tone-mass, when released from the same height; both touch the horizontal ground of a massive object at the same instant of time.

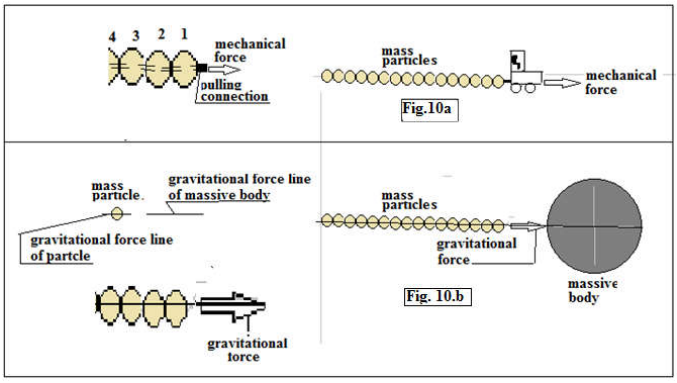

Figure 10. Mechanical Force and Gravitational Force

Space-Time Continuum: It is noticed that, whenever some new invention is declared, a conman man and even the persons engaged in that respective field start, illusive thinking. Illusions stop the progress of the invented fact. Same is happening in respect of 'ct' the space-time continuum. Some think it, bending of space like metal plate bending. Actually please excuse me; But, I consider, space-time continuum is mathematical process to include all the facts of relativity in a conman formula; conman to all observers in Universe. Please here me that, there is nothing illusive in concept of space time continuum. An object orbiting a massive planet or a star, moves free without experiencing, any resultant force on it. The gravitational force of the massive body acting on an object under its influence and, centrifugal force due to rotary motion around the massive body of the object, acting on the object opposite to each other; but, they being equal, no resultant force is acting on the object. Hence, the object is moving freely around the massive body as shown in *Figure-11.a* It is as if the path of the object is circular due to the presence of the mass of the body. The orbiting circular mass-velocity at any point on its orbit can be represented by a tensor, which inherently includes the balancing of gravitational force and the centrifugal force. As the distance of object increases from the mass centre; the path of moving object corresponding to its same speed with which it was orbiting circular around the mass; becomes less and less curved; ultimately becomes a straight path. When it comes across another mass during its travel, it accepts more and more bending as it reaches this second mass in its path. Thus, the straight path of an object moving free under its own conserved momentum; includes heights or troughs depending upon on which side the concerned mass is seen. Such, number of paths parallel to each other in a plane, in all possible directions form space-time plane or space-time continuum as shown in figure-11.c below. In figure 11.b, number of satellites orbiting a massive body, are shone. Each orbit belongs to independent space-time continuum spread from every possible one end to the other end of the Universe. When such spce-time net for each mass in Universe is drawn, the Universe seems like a foam; a space-time foam.

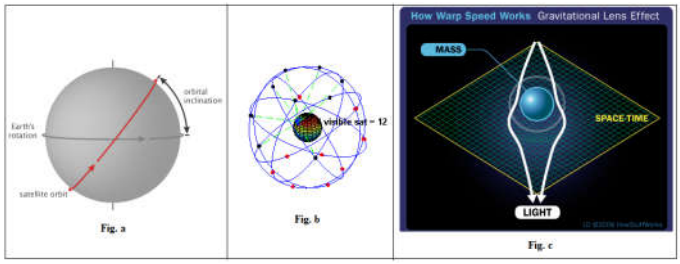

Figure 11. Developing the Space-Time Continuum

In a other way, please observe the *figure- 11.c* and find in that, there are four lines at four sides of the escape path orbit. It is conman to different objects having different masses. It is easily understood, if force due to gravity and centrifugal force due to the orbital linier velocity of the revolving body are seen. So, escape velocity-orbit, depends only on mass of the massive body. Larger mass of the stellar body gives larger escape-orbit diameter. Once the object is escaped, it will travel along straight path like a straight line from the orbit tangent to the orbit. The structure of lines seen in *Figure-11.c* is considered at every part of angle second around the orbit. So that, every point on the orbit can work as escape point. Now consider the net in *Fig. 11.c*. there are number of observers at different points. And some event happens at some point. If each observer, records event signal-massage of instant of happening the event and receipt of instant of time; then each observer can pinpoint the exact point of event source, point of event, source velocity and all other details required. All observers will pinpoint the same spot of the event and same scientific information of the event using Lorentzian transformations embedded in Einstein's equations. Each observer has such infinite number of planes with dips where ever massive bodies are existed. An observer can rotate the plane at any axis, in any direction. Imagine, how the Universe will look. It will look like foam called space-time foam. *Figure-11.b* shows number of satellites orbiting the massive body in different orbits. Each one has a basic space-time continuum like that in *Figure-11.c*. Distance is measured as product ct. Distance is known by an observer, by multiplying c by time period between the receipt of the signal and instant of event-happening; conveyed by the signal of the event. At least three light pulses with duration between them will be recorded by the observer to deduce exact information.

One very important thing to be added is the synchronization of watches. It shouldn't work as preset method of synchronization of watches. It must be as mentioned by the Author in this article.

Till here, we have tried to perceive effect of gravity on our realization of natural facts and its grass root mode of action. Now let us see, role of gravity in expanding universe.

The Fate of Expanding Universe: Reduce the world in two masses. One, equal to m, an existing big star at the horizon of the Universe; and, another equal to M, equivalent to remaining all stellar bodies at the centre of the Universe; the point of

happening of the Big Bang. The Big Bang has induced certain velocity to each basic mass particle at the instant of its happening. After combining a group of particles to form a star body; to form a massive body; the group of particles, assumed a conman velocity in space conserving momentum of all the particles in the group. Assume of the mass M stationed at one point and mass m moving away from it in its radial direction at speed v at an instant say t_1, all w.r.t. mass M. The mass m is at a distance of r from mass M at instant of time t_1. The force between the masses M and m is given by,

$$F = G\cdot\frac{M\cdot m}{r^2} = ma \text{ ; Hence, } \frac{G\cdot M}{r^2} = g \quad \text{.....(17)}$$

Where, g is acceleration due to gravitational force between the masses, acting on mass m in radial direction towards the mass centre of mass M. But, instead of above gravitational acceleration g, the mass m, is moving away from the mass M, in radial direction at a velocity v, at distance r. Because, in the Big Bang, the mass has acquired so much momentum and respective kinetic energy; that, the mass at a distance of r from M, is moving away from it, at velocity v. The moving mass has not any resistance to transfer its momentum or expend its kinetic energy on it. Due to velocity v of mass; the distance r between M and m masses, is increasing continuously. And, therefore, the acceleration g due to gravity of mass M, is decreasing at the square rate of distance of m from M. Hence, gravitational stored energy in mass m in its internal energy by gravitational contraction is released in the direction of v increasing its magnitude. *Hence, the expanding Universe, is expanding at accelerated rate.*

In a moving atom, at an accelerated velocity < c; the orbit of an electron revolving in its orbit and its linear speed in the orbit decrease; but, once the acceleration dies down, the electron assume its previous normal conditions in its host atom. But, in case the acceleration of accelerating velocity increases to c, as per relativistic addition of acceleration as velocity vector in linear orbital velocity of electron of the atom, second to second till the resultant velocity vector of the electron appears in its escape direction, that escape direction is almost radial to the nucleus of the respective atom; within a few seconds. Then, the orbital electrons in an atom leave revolving around their respective nucleus; and, accept to move in linear velocities disrupting the mass m into its Black energy matter particles. *Thus the mass is lost in the outsides of the Universe.* As universe go on expanding the speeds of Universal Bodies go up to c and try to exceed it. When it happens, Atomic structure is destroyed; the elementary particle structures are destroyed. It is supported by this author's, paper, 'The Light Photon, Dark Matter and the Whirling of Dark Matter, The Theory of the Birth of Universe', published in this Journal Volume 09, October 2017, article no.10 at sub head of the journal 'Physics and engineering'. Then the masses are transformed into basic ultimate Dark energy matter particles. In this fashion all Universe will die down of terrestrial bodies. That will evacuate the Universe about 4% of matter. The density of matter in the Universe will lower, creating relative vacuum. The expanding Universe, leads to think seriously that, there must be dark energy matter outside the Universe all around. And that is enhancing the expansion of the Universe at increasing accelerated rate. Excuse me sirs; but *I state that, once the eternality of mass and the definition of energy that, 'moving (ultimate the smallest mass particle) is the (basic) energy in the universe'; are realized, the Universe, will be perceived more and more.*(articles mentioned here in IJCR and SCIRJ) In addition Regarding Dark Energy Matter I state that, there is not anything as antigravity field. I realize that, *Gravity is such a field in Universe; which results in only attraction between particles. All types of Dark energy in Universe amounting to 96% of Dark Energy Matter keeps balanced the Massive Bodies in Universe* locked within it, forming a great massive group; which is moving outwards in the expanding Universe at their respective positions defining their different motions within gravitational attractive fields within themselves. I explain that, I am using 'Dark Energy Matter' word to include , Dark Energy particles of ultimate mass derived from Plank's constant i.e. $h\gamma/c^2$ each and the barons like free particles in the Universe. Till the Universe is expanding at speeds greater than c; a pressure is being exerted on outside of Universe. Once this pressure dies down, The Universal vacuum thus formed, causes 'Explosive Decompression', resulting in tremendous rush of Dark Energy Matter from outside the Universe into it. The rushing of Dark Energy Matter into Universe, then results in collisions of the Dark Energy Particles creating the Big Bang giving Birth to the Universe. The 'whirling theory' stated in my article in IJCR mentioned above; gave a birth to the 'FIRST UNIVERSE'. Pure Logic, leads to *concept of FIRST UNIVERSE.* Then after, recycling 'BIG BANG' theory is going to remain forever. See that, The Big Bang is not due to centralization of mass to infinite density; but, it is due to, rushing of Dark Energy Matter from outside the Empty Universe.

Mass-Energy and Space-time: It is very illusive thinking that, mass and energy; Space and time get converted into each other. Space and time are conjugates of each other. Space and time in combination define speed. Assume certain distance d. an object travels it in t seconds. Consider this standard event in Universe. Then, when distance d is travelled in greater than time t; then, we sense that, to travel that distance extra time is taken by the object. It required extra time means the distance has become longer. And we say that extra time is converted into distance additional to d. When, the object travels the distance d in lesser time period than t; we say, length d is shortened say by length s. And it is converted into time. Therefore total time has lessened. Similar thing happens with mass and energy. During some process when mass disintegrates into its very basic ultimate the most minimum mass the 'Plank's mass' particles; they give out their all external and internal energy. We equate it to mass. Thus decide standard of energy-mass conversion. And we say that mass converts into energy. Because, the ultimate mass particles, that the Dark Energy particles, are un-detected yet. Hence, Einstein's mass-energy conversion relation $E = mc^2$, give transformation of internal energy of mass into other form, mainly radiation energy; and, vice vis.

Conclusions

From discussions above following conclusions are drawn. In Relativity an event is said to have happened in the Universe by an observer, at the instant of time when, the event signal reaches to the observer; and not at the event when the source of event has released the signal. Mankind is enthusiastic about its origin and ultimate future. So to find it out, it should know the same about its habitat; the Universe. The main tool of it is the Relativity. Hence, study and research in Relativity is prime necessity. A Scientist have to observe the far away Universe and beyond Universe. There is no body to assist him at far

distances, as is assumed for deriving Special Relativity equations. So, the equations are reduced to simple form so that, the Scientist himself can successfully take observations of far away world also.

In kinetics, two or more vectors, acting on the same body, form a single resultant force vector and it acts on the body; but, in Relativity; each vector acts independently. From the received signal/signals, the Scientist derives the position of the source of the signal and considers it to be the position when the source released the signal. It is not correct, But, the fact is that, the found position/place of the source in space is when, the Scientist received the signal. If this concept is not followed, there is a big error is Mapping of the Universe. It is very wrongly considered that, the speed of light c is the limit of speed in the Universe; but, c the standard velocity of light is not the limit of speed in Universe; instead, it is the limit of perception lodged upon us,

The Space-Time continuum and warping of space/bending of space is part of relativistic mathematics, neither the space warps, nor the space converts into something or vice vis. In actual due to light signal velocity, each vector acting independently, the correspondence of unit time and unit distance being with, (time period) duration of one revolution of orbital electron and its orbital periphery respectively , and the natural limit of observer's perceptive senses, that experience above facts.

Concept of very first Universe is introduced: Its birth is through whirling of dark energy matter particles. The fate of universe to get lost in outside of it at speeds greater than c (*Speeds greater than c are definitely existed.* converting consolidated masses into, Dark Energy Particles. The Next Birth of Universe is through Big Bang, but not as pleaded by physics; but, quiet differently. Because, mass cannot concentrate to infinite densities.

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