Chapter

Temporal (t > 0) Space and Gravitational Waves

Francis T.S. Yu

Abstract

I will begin with the nature of our temporal (t > 0) universe, since without temporal space there would be no gravitation force because gravitational field cannot be created within an empty space. When we are dealing with physical realizability of science, Einstein's relativity theories cannot be ignored since relativistic mechanics is dealing with very large objects. Nevertheless I will show that huge gravitational waves can be created by a gigantic mass annihilation only within a temporal (t > 0) space. Since gravitational energy has never been consider as a significant component within big bang creation, I will show it is a key component to ignite the big bang explosion, contrary to commonly believed that big bang explosion was ignited by time. I will show a huge gravitation energy reservoir induced by a gigantic mass had had been created over time well before the big bang started. Since the assumed singularity mass within a temporal (t > 0) had had gotten heavier and heavier similar to a gigantic black hole that continuingly swallows up huge chunk of substances within the space. From which we see that it is the gravitational force that triggers the thermo-nuclei big bang creation, instead ignited by time as postulated. Aside the thermo-nuclei creation, it had a gigantic gravitational wave release as mass annihilates rapidly by big bang explosion. From which we see that it is the induced gravitational reservoir changes with time, but not the induced gravity changes (i.e., curves) time–space. In other words if there has no temporal (t > 0) space then there will be no gravitational waves.

Keywords: Gravitational Energy, Gravitational Waves, Gravitational Force, Einstein Energy Equation, Big Bang Creation, Curving Time–Space, Temporal Space, Timeless Space

1. Introduction

One of the essences of Einstein's general theory of relativity is curving the space–time [1]; from which as John Wheeler had said that as I quote "Space-time tells matter how to move; matter tells space-time how to curve". However as I see it; it is time tells space how to curve but "not" space tells time how to curve. Nevertheless Einstein's general theory of relativity was developed based on a Minkowski type space–time continuum where time is treated as an "independent" variable (i.e., an independent dimension) [2]. However from temporal (t > 0) universe standpoint, time and space are coexisted in which time is a "dependent" forward variable moving at a "constant" speed. In other words within our temporal universe, time curves time–space, but time–space "cannot" curve the pace of time.

Since it is impossible to create a magnetic field within an empty space that normally assumed it could. But we will show it is a temporal ($t > 0$) space, instead of an empty space that normally assumed [3], that an assumed gigantic mass was situated. For which the mass is capable for continuingly attracting substances to build up a super-gigantic mass, such that a huge gravitational field induced by the mass can be established overtime. From which we see that it was the huge convergent gravitational force that ignited the thermo-nuclei big bang explosion created our universe, but not by time. In other words it was big bang explodes with time, but not time ignites the big bang.

2. Nature of temporal (t > O) universe

As we accepted subspace and time are coexisted within our temporal ($t > 0$) universe [4, 5], time has to be real, and it cannot be virtual since we are physically real. And every physical existence within our universe is real. The reason some scientists believed time is virtual or illusion is that; it has no mass, no weight, no coordinate, no origin, and it cannot be detected or even be seen. Yet time is an everlasting existed real variable within our known universe. Without time there would be no physical matter, no physical space, and no life. The fact is that every physical matter is coexisted with time which including our universe. Therefore, when one is dealing with science, time is one of the most enigmatic variables that ever presence and cannot be simply ignored. Strictly speaking, all the laws of science as well every physical substance cannot be existed without the existence with time. For which we see that; time cannot be an independent dimension or an illusion. In other words, if time is an illusion, then time will be independently existed from physical reality or from our universe. And this is precisely that many scientists have treated time as an independent variable such as Minkowski's space [2], for which we see that Einstein 's space–time can curve time. However if matter can curve time–space, then we can change the speed of time. But as I see that it is our universe exists with time, it is "not" our universe changes time.

Since time is a constantly moving dependent variable at a constant pace, for scientific presentation we usually use numeric symbols to represent time otherwise it would be very difficult to facilitate and to understand the nature of time. For convenience we had divided time into past (i.e., $t < 0$), present (i.e., $t = 0$), and future (i.e., $t > 0$) domains to represent time, as exemplified in **Figure 1**.

From which we see that our universe changes with time; for example present moment at $t = 0$ moves immediately forward to become the next present moment ($t + \Delta t$). In other words the present moment $t = 0$ becomes the moment of past. Once the present moment ($t = 0$) moves forward a section of $\Delta t \to 0$, no matter how small it is, it is impossible to return back, since our universe changes with time. From which we also see that it is impossible to move the current moment ($t = 0$), no matter how small Δt is, ahead or behind the pace of time. Nevertheless this diagram exemplifies our temporal ($t > 0$) universe changes with time, since our universe is a stochastic dynamic temporal ($t > 0$) space [4, 5]. Of which we see that it is impossible to travel backward or ahead the pace of time.

Since past time domain (i.e., $t < 0$) represents the moment of certainty events (e.g., past universes), they were the past memories (i.e., information) but without physical substance in it and no time. Which is similar as viewing a backward video clip, if we move time backwardly ($t < 0$), we see that past consequences (i.e., past universes) changes with time (e.g., $t = -t_n$) as a backward movie clip. In view of Einstein's general theory of relativity as I quote; matter (i.e., time–space) curves (or changes) time–space. And this is precisely the section of past time (i.e., $t < 0$)

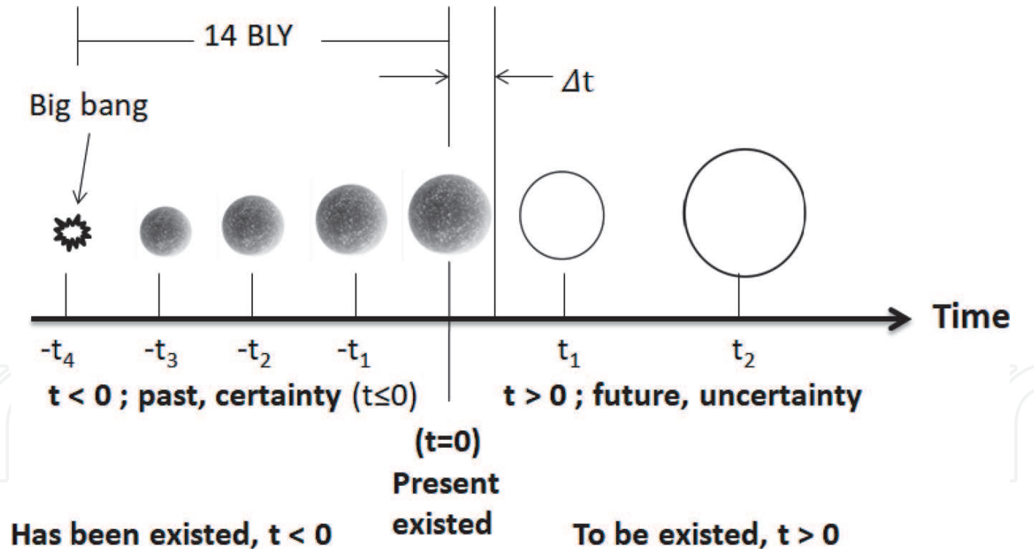

Figure 1.
Shows that our temporal ($t > 0$) universe changes naturally with time, in which it shows the age of our universe is about 14 billion light years old. The past time domain ($t < 0$) represents a set of certainty virtual events (i.e., past universes), the future time domain ($t > 0$) represents a physically realizable domain of uncertainty. And the instantaneous present moment ($t = 0$) is the only moment of absolute physical certainty. Yet we see that present moment is instantaneously moved forwardly to become the next new present moment [(i.e., $t = 0 + \Delta t$) where $\Delta t \rightarrow 0$], to next absolute certainty moment.

domain that Einstein used to derive his general theory, by which his theory had have treated time as an independent variable. This is precisely why general theory is a deterministic theory instead indeterministic. Which is similar to most of the classical sciences are deterministic, yet science is supposed to be non-deterministic or approximated.

Nevertheless within our temporal ($t > 0$) universe, time is a dependent or interdependent variable with respect to the subspace since space and time are coexisted. In which we see that future events (i.e., $t > 0$ domain) are non-deterministic consequences with degree of uncertainties. And this is the positive time [or temporal ($t > 0$)] domain that Einstein general theory may not apply within $t > 0$ domain, since subspaces are not deterministic (i.e., our universe changes with time). Nevertheless the implication of temporal ($t > 0$) is that physical realizable events exist if and only if within positive time domain, by which the instantaneous $t = 0$ can only be approach but never be able to attain (i.e., $t \longrightarrow 0$), even assumed we have all the energy (i.e., ΔE) to spend.

To further epitomize the nature of our temporal ($t > 0$) universe, I have come up with a composite diagram as depicted in **Figure 2**, which shows that our universe started from a big bang creation, although time has been existed well before the creation. Since the past certainty consequences (i.e., memory spaces) were happened at specific time within the negative time domain (i.e., $t < 0$), we see that every specific past time event had have been determined with respect to a specific past certainty subspace. From which we see that time can be treated as an independent variable with respect to the past certainty consequences in the pass-time domain ($t < 0$) as from mathematical standpoint. But from physical reality standpoint, time is no longer existed within the past time ($t < 0$) domain. And this is precisely why time can be treated as an independent variable from mathematical analysis to predict what would happen at a distant future, but with some degrees of uncertainty since physical substance or subspace changes naturally with time.

This is precisely what classical laws and principles had done to science, using past deterministic certainties to predict the future. Since prediction is supposed to be non-deterministic (i.e., uncertainty), yet all the predicted solutions were

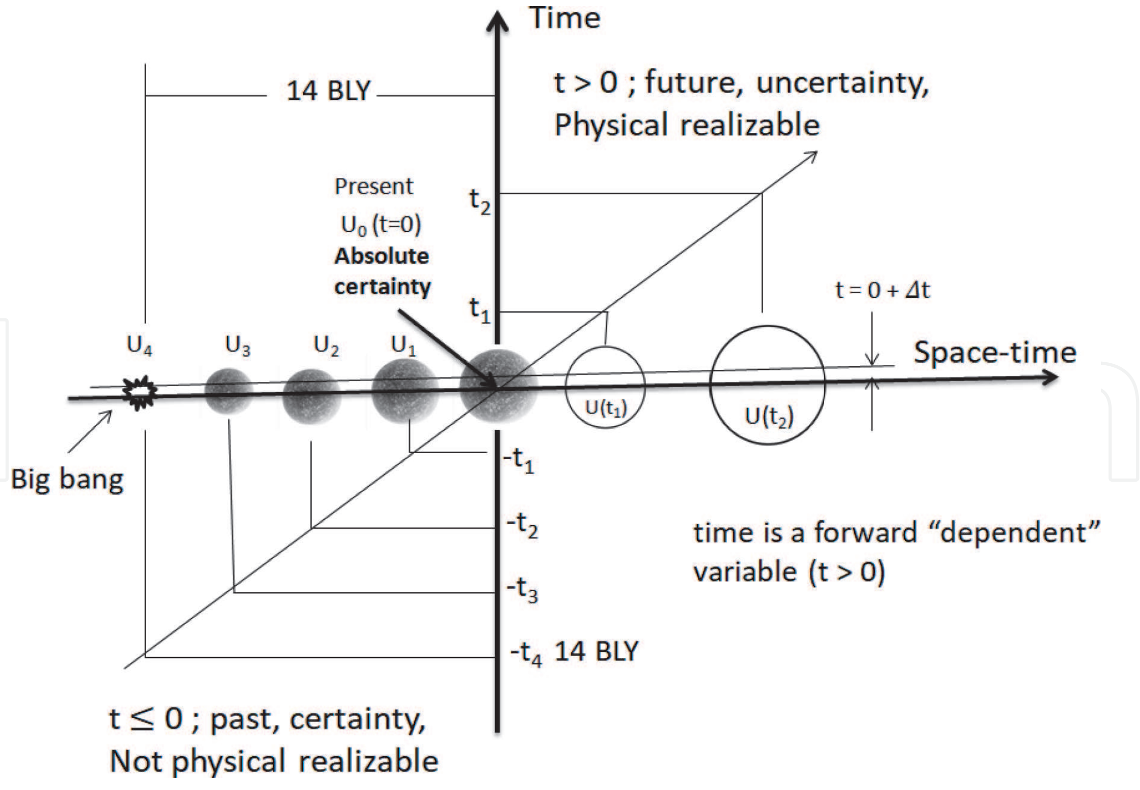

Figure 2.
Shows a composited temporal (t > 0) time–space diagram to epitomize the nature of our temporal universe. BLY is billion of light years. In which instant-present moment t = 0 is the only moment of absolute physically certainty of our universe. Past time domain (t < 0) shows past certainty universes but without time and no physical substance. And future time domain (t > 0) represents a physically realizable domain that changes with time.

maintained deterministic. it is because deterministic analysis produces deterministic solution. In other words all physically realizable solutions strictly speaking should be temporal $(t > 0)$ solution. From which we see that all the laws, principles, theories as well paradoxes were developed from the deterministic past certainties to predict the future uncertainty consequences, but in reality, those laws and principles should not deterministic instead of deterministic. From which we see that Einstein's general theory of relativity cannot be the exception [2]. But using past deterministic to predict the future consequence is likely be deterministic, that contradicts with our temporal $(t > 0)$ universe, which is a non-deterministic universe (or subspace) constantly changes with time.

Although using past certainties to predict future outcome is a reasonable method that had have been using for centuries, but it is physically wrong if we treated time as an independent variable within our temporal $(t > 0)$ universe. From which we see that irrational, weird, and fictitious solutions emerged, which had had already been dominating the world-wide scientific conspiracy. This includes Schrödinger 's fundamental principle of superposition [6], Einstein's special and general relativity theories [2], Hawking's space–time [7] and others. Since they were all developed from the past certainties to predict the deterministic future, but future prediction physically cannot be deterministic or certainty.

Nevertheless the section of time Δt shown in **Figure 2** represents an incremental moment after the instant $t = 0$ moves to a new $t = 0 + \Delta t$, where Δt can be as small as we wish (i.e., $\Delta t \longrightarrow 0$). Yet we will never be able to squeeze it to zero (i.e., $\Delta t = 0$) and this is the section of time that cannot be delay or moved ahead the pace of time (i.e., $t < 0 + \Delta t$ or $t > 0 + \Delta t$) or even stop. From which we see the aspect for time traveling either ahead or behind the pace of time is inconceivable, since we are coexisted with time.

Moreover the present instant t = 0 which represents the absolute certainty moment within our temporal (t > 0) universe, and this is the moment of time (i.e., t = 0) that divides the physical and virtual realities. From which we see that; future uncertainties are physical realizable consequences, but all the past deterministic consequences were the virtual reality since time is no longer existed within the past time domain i.e., (t < 0). From this conjecture we see that any hypothetical solution obtained from the past deterministic domain is anticipated to be deterministic. Nevertheless, every aspect happens within our temporal (t > 0) universe is a physical reality but non-deterministic. In other words every physical reality within the temporal (t > 0) universe are uncertainties that change with time. In other words, any deterministic science within our universe temporal (t > 0) is virtual as from strictly physically realizable standpoint. This is precisely the reason that classical sciences are deterministic. But this by no means that timeless (t = 0) solutions are useless, the fact is that all the laws, principles and theories were developed from the past certainty regime are still the foundation of our science. From which it tells us that; science developed mostly from the past certainties were deterministic, but science within our temporal (t > 0) universe are probabilistic or non-deterministic which changes with time.

Nonetheless, without the past deterministic consequences, it has no better way to determine the non-deterministic consequences. Thus we see that if temporal (t > 0) constraint is imposed on the past deterministic consequences in search for future non-deterministic solution, very likely physically realizable solution would emerge. From which we see that science is not supposed to be deterministic, science is a law of approximation. In view the nature of temporal (t > 0) space we see a temporal (t > 0) exclusive principle as stated: Empty space and temporal (t > 0) space are mutually exclusive.

Since physically realizable paradigm is depending on temporal space, it is vitally important to have a basic idea of our temporal (t > 0) universe, for which we exemplify the nature our temporal (t > 0) universe as depicted in **Figure 3**.

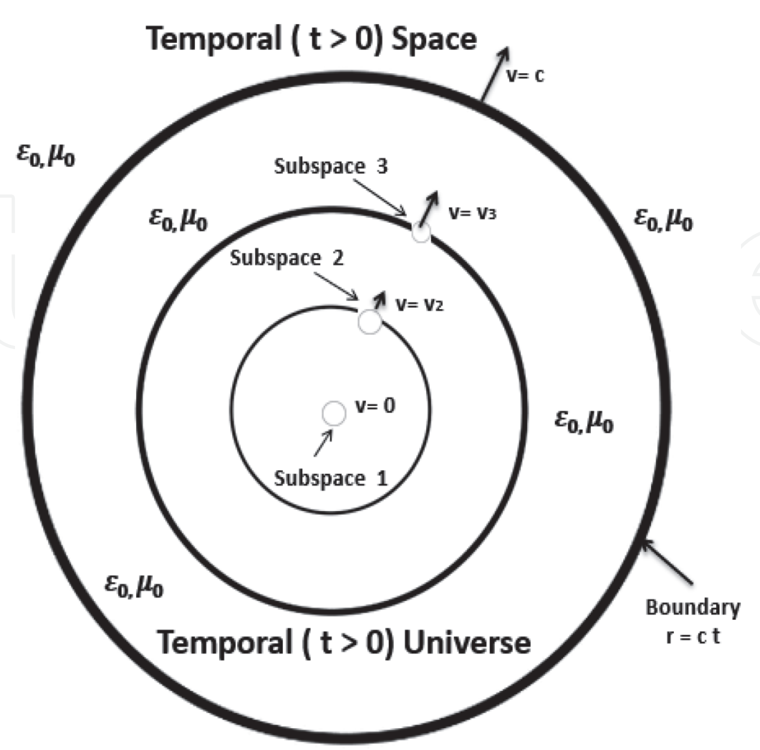

Figure 3.
Shows a simplified diagram of our temporal (t > 0) universe. c is the speed of light. v is the radial velocity. In which we show that every subspace is moving radially toward the boundary of the universe, which is linearly proportional to the speed of light since light speed is the current limit.

In which we see that every subspace has the same time within the entire universe. And our universe also has the same time with the same pace as the greater temporal pace that our universe is embedded in.

3. Gravitational energy

As we have accepted the origin of our universe was started by a big bang explosion from a gigantic mass annihilation within in a temporal (t > 0) space [4, 5], instead within an empty space as normally assumed [3]. Then before the big bang started a question may be asked, what triggers the explosion? As I will show that it must be ignited by an intense convergent gravitational force, induced by a gigantic mass M(t), that triggers the thermo-nuclei explosion which is mass to energy conversion.

Since big bang creation cannot be started from an empty space, big bang creation has to be started within a temporal (t > 0) because mass M(t) is temporal (t > 0), then a question is asked, under what physical means that will ignite the big bang explosion? I assert that it must be triggered by an extreme "convergent" gravitational force induced by mass M(t) over time as depicted in **Figure 4**.

From which we see that a huge mass M(t) had had been existed within a temporal (t > 0) space well before the big bang started. Since temporal space is a non-empty space, it allows M(t) to continuingly attracting new substances into mass M(t). Then eventually a huge induced gravitational field was created as M(t) grows. In which we see that mass M(t) is able to attract more and more substances added to her mass. Eventually M(t) behaves like a giant Black Hole or it is a black hole [8] that swallows more and more substances over time. From which we see that as M(t) is getting heavier and heavier until her "storage" gravitational pressure reaches to a point that triggers the thermo-nuclei explosion of mass M(t). From which we see that it must be the induced gravitational force that triggers the big

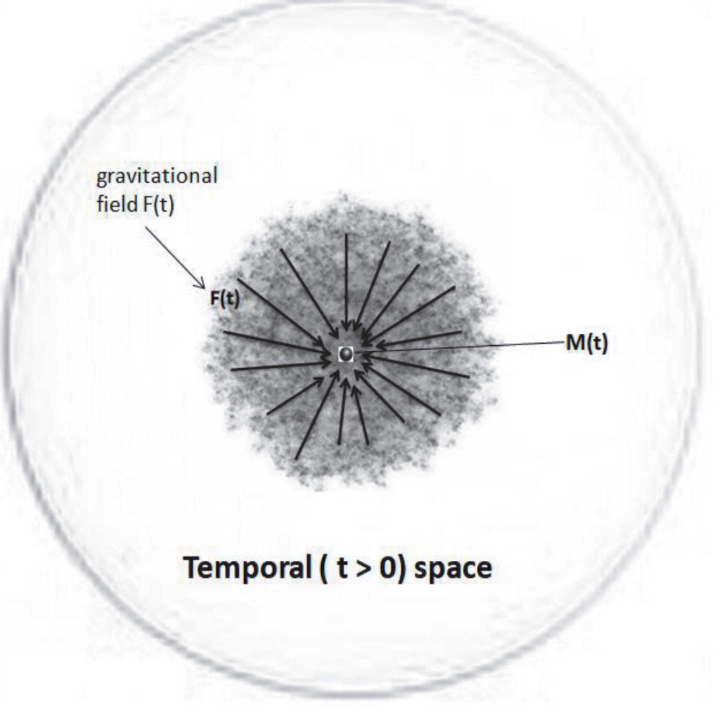

Figure 4.
Shows a well before the big bang explosion scenario. In which the dark dot represents a point-singularity approximated gigantic mass M(t), F(t) represents a huge gravitational field induced by M(t), the arrows show a set of very intense "convergent" gravitational force are applying at M(t).

bang explosion instead by "time" as most cosmologists assumed [3]. Thus it is reasonable to accept that, if mass M(t) were not embedded within a temporal (t > 0) space then there would be "no" gravitational field to create by mass M(t) and there would be "no" big bang. This is one of the many examples shows that physically realizable science comes from a physically realizable paradigm. From which we had have seen virtual and fictitious conjectures based the big bang creation within an empty space and it is hard to accept those illogical predictions as from physically realizable scientist standpoint.

4. Big bang and gravitational field

Since mass M(t) and her induced gravitational field are temporal (t > 0) substances, by which induced gravitational field "coexists" with mass M(t) as given by,

$$F(r;t) = G\,\frac{m\,M(t)}{r2} \tag{1}$$

from which we see that gravitational force strength F(r; t) "decreases" rapidly as inverse square law of distance r, where G is a gravitational constant and m represents an unit reference mass (i.e., points of interest) as illustrated in **Figure 5**.

With reference to the point of interest, "potential" energy for each unit m away from gigantic mass M(t) is given by [9];

$$E' = G_0\,M(t)/r \tag{2}$$

where $G_0 = G \cdot m$ is a "normalized" gravitational constant. In which it shows that gravitational energy exponentially "increases" as distance approaches to mass M(t).

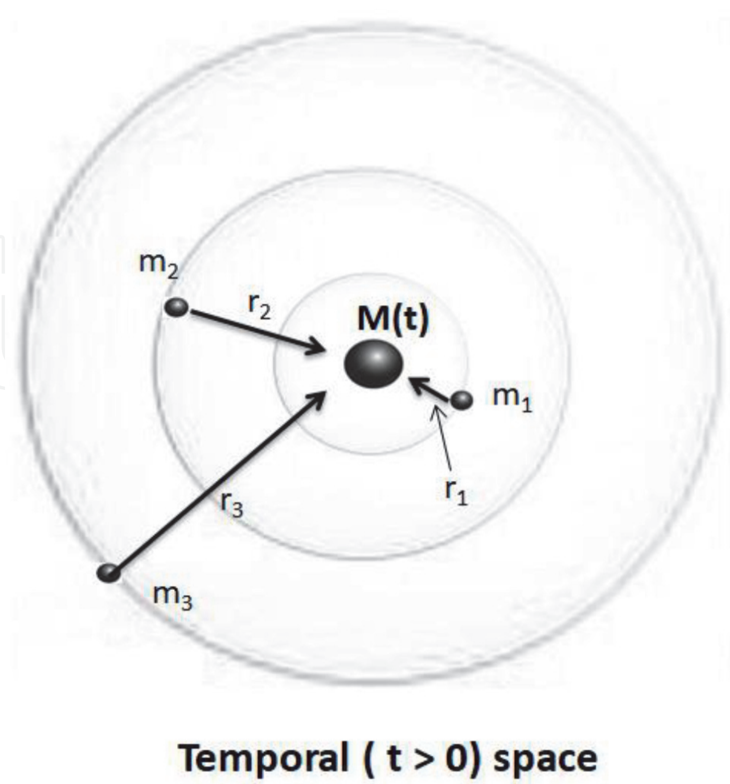

Figure 5.
Shows induced gravitational forces converge at a point-singularity approximated mass M(t). M represents a unit mass of interest. In which we see that without embedded within a temporal (t > 0) space paradigm it is impossible to create an induced gravitational field stored around mass M(t).

From which we see that as mass M(t) "reduces" rapidly with time, magnetic force attached to m (i.e., point of interest) releases quickly that causes m moves outwardly away as the induced gravitational force loses her pull. The outward force acted on each m, by Newtonian second law is approximated as given by,

$$f \approx ma \tag{3}$$

where f is an outward acting force on unit m and a is its acceleration.

$$a = \frac{G\,M(t)}{r2} \tag{4}$$

which is proportional to the inversed square laws of distance r. From **Figure 6** we see that further away from M(t) is lowering the acceleration a. While closer to M (t), acceleration of m is anticipated to be very high, as the gravitational field shrinks rapidly. This rapidly disappearing gravitational field give rise to a huge amount of energy as mass M(t) annihilates itself rapidly with time. From which we see that a gigantic gravitational energy together with a huge thermo-nuclei energy are simultaneously releasing as the big bang started.

Yet, without the thermo-nuclei mass annihilation there would be "no" such magnitude of gravitational waves that can be detected [10]. Unlike the electro-magnetic waves, gravitational waves are mostly "longitudinal" waves which dissipated quickly due to mass in motion within our temporal (t > 0) universe. As in contrast with transversal electro-magnetic wave it travels at speed of light. From which we see that it is extremely difficult to detect gravitational waves due to mass or masses in motion within our universe as can be seen as depicted in **Figure 7**.

Nevertheless the essence of preexisting temporal (t > 0) space condition is very crucial since any analytical conjecture or solution comes out from a physically

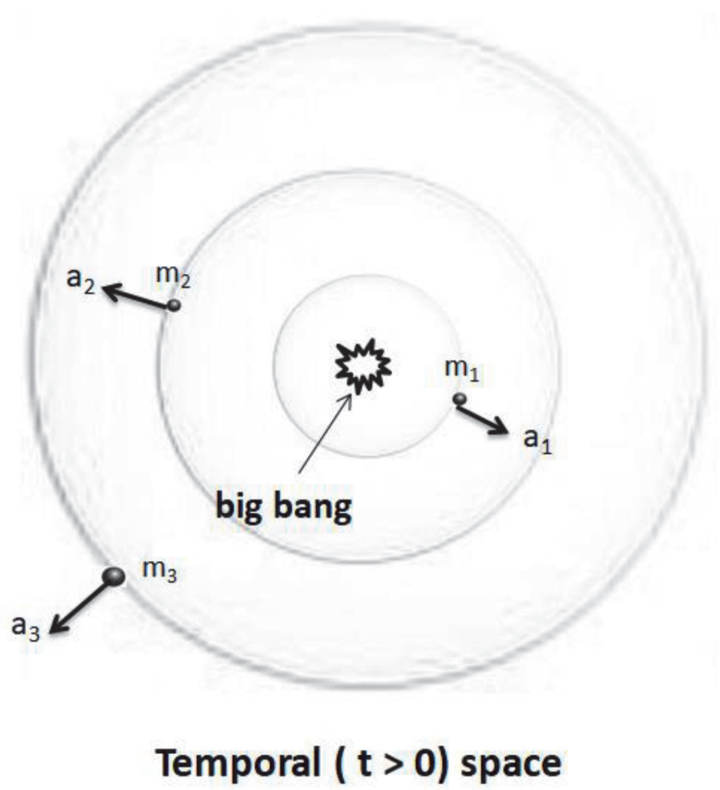

Figure 6.
Illustrates the thermo-nuclei big bang hypothesis, where the associated gravitational field releases its energy as the stored gravitational field shrinking with time rapidly. In which we see that unit m moves outwardly as gravitational field shrinks rapidly with mass M(t) annihilates.

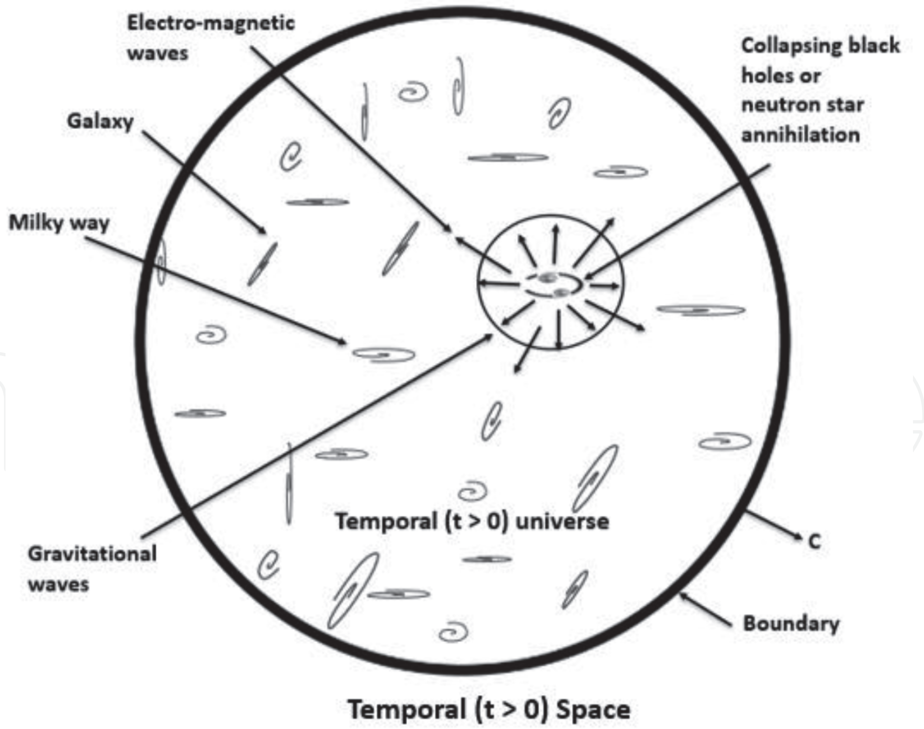

Figure 7.
Shows a scenario of possible black holes collide-annihilation or neutron star explosion. Aside the anticipated electro-magnetic energy radiation at speed of light, a huge gravitational waves releases as mases of black holes annihilation as depicted in the figure.

realizable paradigm is "likely" to be physically realizable, as in contrast with commonly used paradigm gravitational field can be created within an "empty" space. Since substance and emptiness are mutually exclusive, empty space is a "non-physically" realizable paradigm [11]. Aside the non-physically realizable issue, empty space has "no" substances for gravitational field to store. From which we see that it is a physically realizable reason to assume that big bang explosion was triggered by a huge convergent gravitational force induced by mass M(t), instead triggered by time as some cosmologists believed.

5. Nature of gravitational waves

Strictly speaking there are "two" dominant energies that associated with mass M before big bang explosion as given by,

$$E' = G_0\ M/r \quad (5)$$

$$E = (½)\ Mc^2 \quad (6)$$

where E' represents the gravitational energy induced by mass M, and E is the thermo-nuclei energy due to mass M annihilation. Since physically realizable paradigm guarantees her solution would be physically realizable, but either Eq. (5) and Eq, (6) are not physical realizable. Firstly there are timeless (t = 0) or time independent equations, as most of the laws and principles do. Secondly there are not temporal (t > 0) equations yet since mass M does not change with time [i.e., or temporal (t > 0)]. In which we see that everything existed within a temporal (t > 0) space has to be temporal (t > 0). Thus from physical reality standpoint, the existence mass M it has to be temporal (t > 0) [i.e., M(t)]. Which means that M(t) changes naturally with time and exist within positive time domain. For which

Eq. (5) and Eq. (6) can be written in temporal (t > 0) formulas as given by, respectively,

$$E'(t) = G_0\ M(t)/r, t > 0, \quad (7)$$

$$E\ (t) = (½)\ M(t)\ c^2, t > 0, \quad (8)$$

where t > 0 denotes that equation is complied with the temporal (t > 0) condition (i.e., exists within the positive time domain (t > 0). E' (t) is the gravitational equation, E(t) is the thermo-nuclei energy equation, and M(t) is a temporal (t > 0) mass.

In view of thermo-nuclei Eq. (8) one might wonder where the (1/2) factor comes from since it is different from Einstein's energy Eq. $E = Mc^2$. For which I will show in a in Section 6 Einstein's energy equation is physically significantly correct that energy and mass are equivalent, but it is "not" physically realizable within our temporal (t > 0) universe. It is because Einstein energy Eq. $E = Mc^2$ was derived from his special theory of relativity, but his special theory was developed within a non-physically realizable empty space. Since $E = Mc^2$ and $E = (½)Mc^2$ shares identical physical significance that energy and mass are equivalent, but $E = (½)Mc^2$ was based on kinetic energy standpoint where velocity of light is the current physical limit.

However, it is the induced gravitational energy E'(t) that had had never been a component included within the big bang explosion that I am concerned [3]. For which we start with the total potential energy due to induced gravitational field of Eq. (7), as referenced to point of interest "m" the overall gravitational energy induced by mass M(t) can be "approximated "by,

$$E''(t) \approx -G_0\ (4/3\pi)(r_0)^2, t > 0 \quad (9)$$

this shows that total gravitational energy E"(t) decreases as mass M(t) annihilates. From which we see that a huge amount of gravitational energy releases instantly soon after M(t) annihilated. In other words an intense "divergent" gravitational shock waves releases almost simultaneously with thermo-nuclei explosion, within a newly created expanding universe as depicted in **Figure 8**.

Since Eq. (7) and Eq. (8) are not time varying equations, strictly speaking they "cannot" implement directly within the temporal (t > 0) space unless they were reconfigured into time-varying partial differential forms, as given by [4, 5],

$$\frac{\partial E''(t)}{\partial t} \approx -K\frac{\partial M(t)}{\partial t} = [\nabla \cdot S''(t)], t > 0 \quad (10)$$

$$\frac{\partial E(t)}{\partial t} \approx -\left(\frac{1}{2}\right)c^2\frac{\partial M(t)}{\partial t} = [\nabla \cdot S(t)], t > 0 \quad (11)$$

where $\mathbf{K} = (4/3)\pi\ G_0\ (r_0)^2$, ∇· represents a divergent operator, S″(t) and S(t) are the respective gravitational and thermo-nuclei energy vectors and (t > 0) denotes that equation is subjected to the temporal (t > 0) constraint. In other words equation only exists in the positive time domain or equivalently temporal (t > 0).

As we know that an equation is a language, a picture or even a video, from which we see that soon after the big bang explosion two divergent energies emerge from the exploding mass M(t) are illustrated in **Figure 8**, one is due to thermo-nuclei explosion and the other is from sudden releases (i.e., outward explosion) stored gravitational energy due to instantaneous mass M(t) annihilation. Although thermo-nuclei explosion is responsible mostly for the big bang creation [4, 5] for

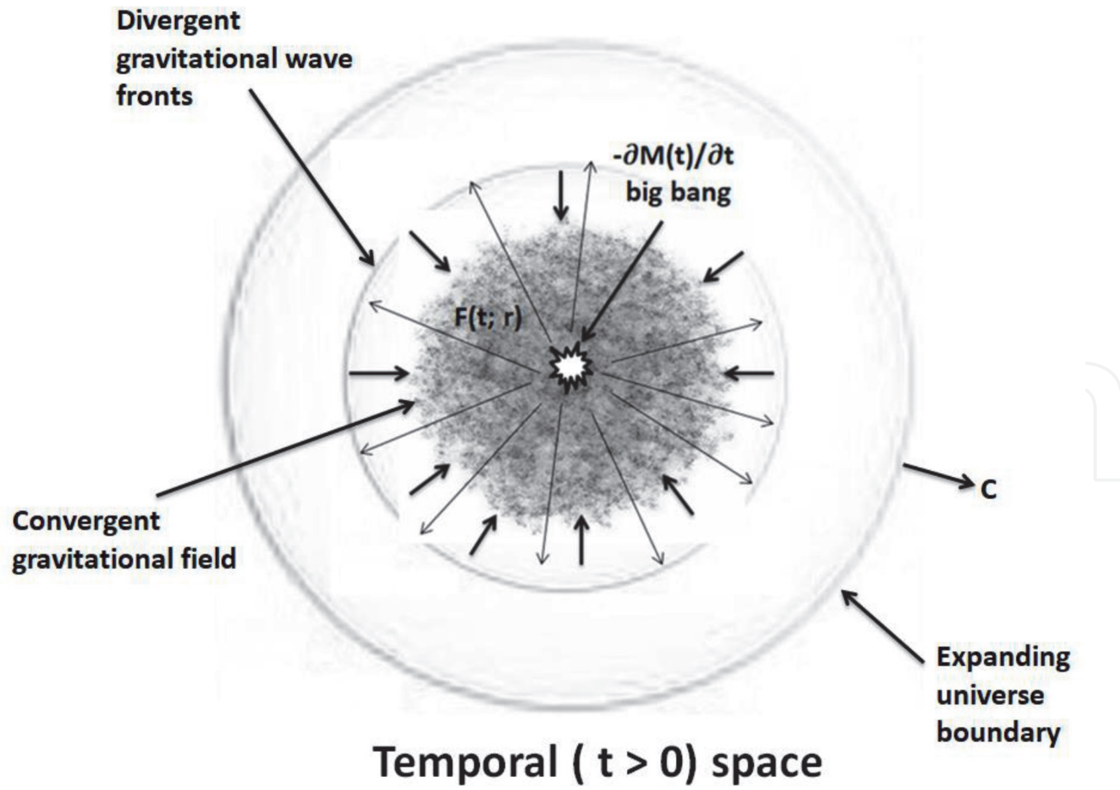

Figure 8.
Shows a composited diagram that our universe was created. The set of converged arrows represents a shrinking gravitational field. A set of outward arrows shows an outward energy explosion due to big bang. In which we also see that the boundary our universe is expanding at speed of light due to thermo-nuclei big bang explosion.

which the boundary of our universe is expanding at the speed of light, but with a surge of gravitational waves as represented by a set of arrows diverges from the big bang explosion as can be seen in the figure. From which we see that a set of convergent arrows represents the collapsing gravitational field as the mass of M(t) reduces rapidly as big bang explosion started.

Since every subspace within our universe is created by an amount of energy ΔE and a section of time Δt, we see that it is the "necessary cost" for space creation, which includes our universe herself. For instance mass to energy conversion can be written in partial differential form as given by,

$$\frac{\partial E(t)}{\partial t} \approx -\left(\frac{1}{2}\right)c^2 \frac{\partial M(t)}{\partial t}, \mathrm{t} > 0 \tag{12}$$

In which we have ignored the stored gravitational energy due to mass M(t), since thermo-nuclei energy is much greater than the induced gravitational energy from mass M(t) [i.e., E(t) > > E"(t)], where t > 0 denoted that equation is subjected to temporal (t > 0) condition or exists only in the positive time domain t > 0. By which the "total" amount of energy due to big bang explosion can be approximated by,

$$\Delta \mathrm{E(t)}\ \Delta \mathrm{t} \approx (½)\ \mathrm{M_0}\ \mathrm{c}^2 \tag{13}$$

where M_0 represents the total mass and c is the speed of light. Since ΔE(t) Δt is equivalent to a temporal (t > 0) subspace. In this case we see that our universe changes with time [i.e., temporal (t > 0)].

For example if we let t = 0 which is at the time equals to 14 BLY (i.e., billion light years) after the big bang, the amount of energy ΔE and the section of time Δt = 14 BLY that created our universe is given as,

$$\Delta E(t=0)\ (\Delta t = 14\ \mathrm{BLY}) \approx (½)\ M_0\ c^2 \tag{14}$$

where t = 0 represents the instant present moment, after the big bang explosion 14 BLY ago which is the moment when big bang started to explode (i.e., 14 BLY ago). Nevertheless, Eq. (13) can be written as.

$$\Delta E_{t<0}\ \Delta t_{t<0} \approx (½)\ M_0\ c^2 \tag{15}$$

where t is bounded between - 14 BLY to 0 [i.e.,(− 14 BLY, 0)], and Δt increases proportionally from – 14 BLT to 0. In view of preceding equation we see that energy is conserved which is equals to the total equivalent energy of the big bang mass $M_{0.}$ From which we see that the section of time Δt = 0 means that no energy releases yet from mass M_0 at exactly 14 BYL ago (i.e., t = −14 BLY). In other words our past time universes [i.e., $\Delta E_{\ t<0}\ \Delta t_{\ t<0}$] can be treated as a time-independent universe from mathematical standpoint since time and physical substance are no longer there. And this is the past-time universes (or subspaces) were deterministic (or certainty) time-spaces which we normally used to predict the future universe (or subspace). And this is precisely why all our laws, principles, and theories were deterministic instead of non-deterministic or uncertainty. Yet from physically realizable standpoint, future prediction is supposed to be non-deterministic and uncertain. And this exactly why Einstein's general theory is deterministic instead of non-deterministic, which violates the nature of our temporal (t > 0) universe, where future is hard to predict.

But as time moves on forwardly from the present t = 0 into the future time domain (I.e., t > 0), our universe [i.e., ΔE(t > 0)Δt] is an indeterministic or uncertainty domain, for which we have the following expression after Eq. (13),

$$\Delta E_{t>0}\ \Delta t_{t>0} \approx (½)\ M_0\ c^2 \tag{16}$$

which shows our universe [i.e. $\Delta E_{\ t\ >\ 0}\ \Delta t_{\ t\ >\ 0}$] changes with time and it does not change time. From which it is a mistake to treat our temporal (t > 0) universe as a deterministic universe, as Einstein's general theory did. From which we have seen that scores of fantasy time-traveling scenarios back to the past or to the future emerged.

Yet, it remains to be answered when the section of time Δt approaches to infinitely large (i.e., Δt → ∞)? Or is our temporal (t > 0) universe having a life? As we accepted our temporal (t > 0) universe, then it would be the end of physical realizability as Δt → ∞ that must be the end of our universe. But in view of energy conservation we see that when Δt → ∞ then ΔE → 0, we should have a finite energy preserved within a huge cosmological subspace within a vast temporal (t > 0) space that our universe was created as given by,

$$(\Delta t \to \infty) \cdot (\Delta E \to 0) = (½)\ M_0\ c^2 \tag{17}$$

And this is the end of our universe at t → ∞ at point of infinity, since time within the greater temporal (t > 0) space that had had supported the big bang creation of our universe has no beginning and has no end. But our universe has a beginning, but it has no end in time and in space. Similar to a wave created on a still water pond, it has the beginning, but it has no end from strictly speaking viewpoint.

Yet every subspace within our temporal (t > 0) universe, no matter how small it has a lowest limit by Planck constant. In which we see that the lowest limit for a tiniest particle within our temporal universe even at point of infinity (i.e., t → ∞) Δt ΔE is still within the quantum limit as from current knowledge of science is given by,

$$\Delta t \ \Delta E = h \tag{18}$$

where h is the Planck's constant.

Nevertheless as from macroscopic standpoint every subspace no matter how big it is, it is currently limited by.

$$\Delta t \ \Delta E = (1/2)\ M\ c^2 \tag{19}$$

where M is the mass.

Nonetheless, every subspace, as well our universe, changes with time. But our universe and her subspaces "cannot" change the speed of time since time and subspace (i.e., substance) are coexisted. Thus every subspace within our universe has the "same" time speed. Since the universe as a whole run at "the same" pace of time. In which we see that if any subspace has a "different" pace of time it "cannot" exist within our universe, that includes the timeless (t = 0) subspace. The fact is that; those timeless (t = 0) and time-independent subspaces are virtual and "non-physically" realizable subspaces. For which is "incorrect" to assume those virtual and non-physically realizable spaces as "inaccessible" subspaces within our universe as some scientists do.

6. Non-realizable relativistic theories

Since there are two pillars of modern physics one is dealing with very small particles of Schrödinger's quantum mechanics [6] and the other is dealing very large object of Einstein's relativistic theories [2], yet both of them are timeless (t = 0) or time independent principles since both of them were developed within a non-physically realizable paradigm. Firstly we see that Einstein's special theory of relativity was developed on an empty space paradigm as depicted in **Figure 9**.

In which we see that it is not a physically realizable paradigm by virtue of temporal exclusive principle. Nevertheless Einstein's special theory can be developed with Pythagoras theorem as given by,

$$\Delta t' = \Delta t / \left[1 - (v/c)^2\right]^{1/2} \tag{20}$$

where v is the velocity of a coordinate system and c is the speed of light. Since within empty space paradigm it has no time and has no direction, Einstein's special theory of Eq. (20) shows no sign of relativistic direction. Although the implication is relative-directional similar to the kinetic energy equation it has no sign of direction, but the equation implies that the energy is on the same direction of the velocity vector v. From which we see that scientists have frequently treated special theory as a relativistic-directional independent, which is due to the empty space paradigm. The question is that why we made those trivial mistakes? The answer is that, since scientists are mathematicians, they can implant virtual time on a piece of paper as they wish. But not knowing the background of that piece had have been assumed as an empty subspace for centuries.

On the other hand, if Einstein's special theory is developed within a temporal (t > 0) subspace as depicted in **Figure 10**. For example, derivation can start at time $t = t_1$ with a light emitter of S, where t is the time of the background temporal (t > 0) space. With reference to the diagram, we see that it will take a section of time Δt (i.e., $t = t_1 + \Delta t$) for beam 1 to reach position 1, which is a subsection within Δt′ (i.e., $\Delta t < \Delta t'$) for light beam 2 before reaches position 2. Since v·Δt is a

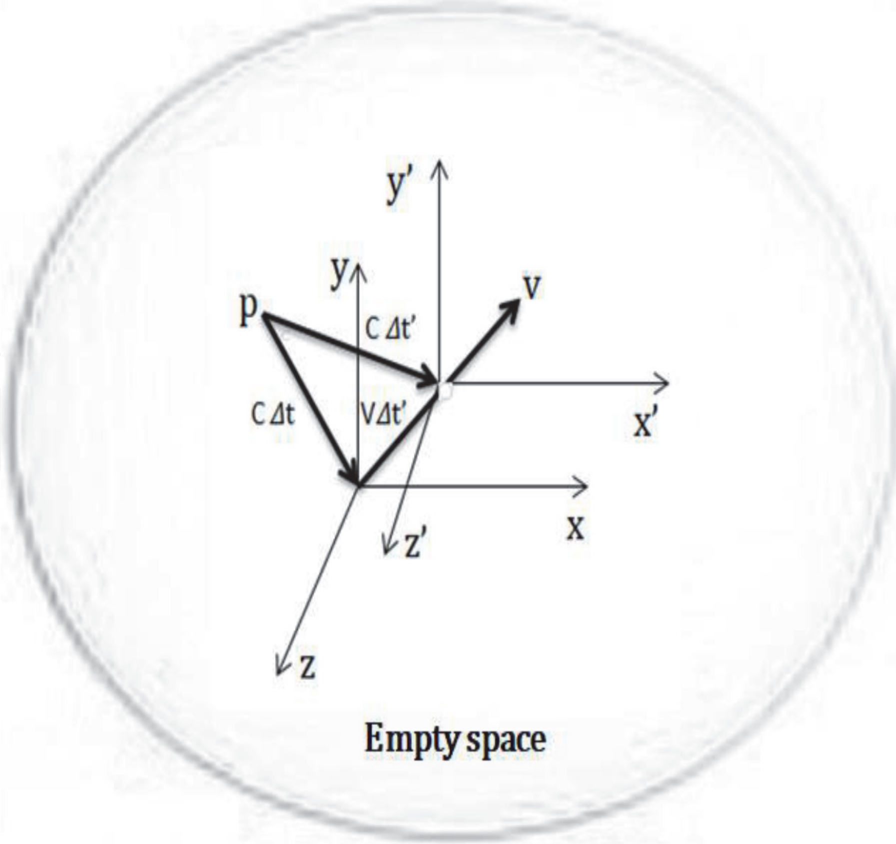

Figure 9.
Shows where Einstein's special theory of relativistic mechanics was developed from an empty space paradigm. In which we see a coordinate system (X' Y' Z') is translating at a constant speed with respect to a stationary coordinate system (X, Y, Z).

sub-distance of $v{\cdot}\Delta t'$ before the moving particle reaches position 2, it will take beam 2 an additional section of $c\ \Delta t'' = c\ (\Delta t' - \Delta t)$ to reach position 2 simultaneously when the particle arrives. Therefore we see that the duration at static position 1 is actually $\Delta t' = \Delta t + \Delta t''$, instead of just Δt as shown in the special theory of relativity [i.e., Eq. (20)], from which we see that the moving particle has "no" section of time-gain relative to the static position 1, since time at position 1 and 2 are "the same" ($t = t_2 = t_1 + \Delta t'$) when moving particle reaches position 2. In which the duration at position 1 is actually $\Delta t' = \Delta t + \Delta t''$, instead of Δt as shown in the special theory of relativity. Thus we see that Einstein's special theory of relativity fails to exist within our temporal ($t > 0$) universe. In other words Einstein's special theory of relativity is a timeless ($t = 0$) theory which is only existed within an empty space, which has no time and no space. From which we see that it is the background of that piece of paper inadvertently that had have treated it as an empty timeless ($t = 0$) space.

Nevertheless what is the physical significant of Einstein's special theory of relativistic to what? In view of the temporal ($t > 0$) paradigm of **Figure 10**, we see that it is the relativistic theory of distance as given by,

$$d_r = (c{-}v)\cdot(\Delta t' - \Delta t'') = (c{-}v)\Delta t \tag{21}$$

where d_r is a relativistic distance between position S of the light source and position 1 of a moving particle both simultaneous reach position 2. From which we see that light beam has traveled a extra distance of $(c - v)\ \Delta t$ more than the particle traveled. Thus we see that Einstein's special theory of relativity is relative to distance within our temporal ($t > 0$) subspace, instead of relative to time since we cannot change time. That means that particle and the light beam arrived position 2

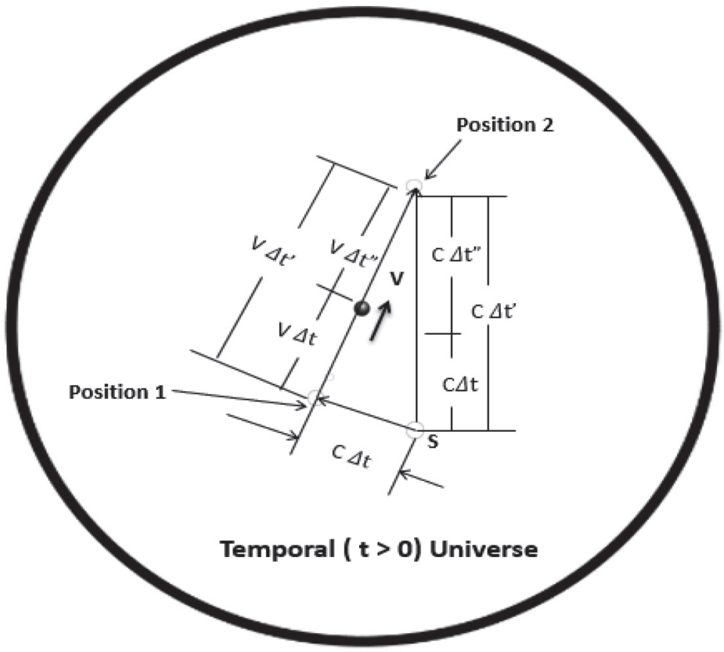

Figure 10.
Shows the same relativistic mechanics model is embedded within a temporal (t > 0) subspace. S is the light source and P is a particle in motion at a constant velocity of v, c is the velocity of light.

at the same time which is the same time at position 1, at position 2, at position S and the same time at everywhere within our universe. In which we see it has no time-gain or time-loss of the traveling particle.

Nevertheless when velocity of the moving particle approaches the speed of light (i.e., $v \to c$), we have a relative distance $d_r \to 0$. This is by no meant that time is running behind or ahead the pace of time. For which we see that it is the speed of light travels with time, and it is not the speed of light changes the pace of time.

Similarly relativistic distance of preceding equation can also be applied for relative velocity of two moving particles. For example two particles are moving at the same direction at different speeds v_1 and v_2, respectively. In view of Einstein's special theory is not a physically realizable theory within our temporal $(t > 0)$ universe, and it is also incorrectly had have interpreted as directional-independent, as can be seen from Eq. (20). It is however should correctly treated special theory as a directional sensitive theory because of particle's velocity vector. From which we see that the relativistic distance between two particles on the "same direction" can be shown as,

$$d_r = (v_1 – v_2)(\Delta t' - \Delta t'') = (v_1 – v_2)\Delta t \tag{22}$$

Again we have seen that Einstein's special theory is a relativistic velocity equation instead a relativistic time theory.

Equivalently Einstein relativistic mass equation can be derived from his special theory as given by,

$$M = M_0\left(1 - v^2/c^2\right)^{-1/2} \tag{23}$$

where M is the effective mass (or mass in motion), M_o is the rest mass, v is the velocity of the moving M and c is the speed of light. In other words, the effective mass of a moving particle increases at the same amount with respect to the relativistic time window (i.e., time dilation $\Delta t'$) increases. Nevertheless as we had shown in preceding Einstein's special theory is not a physically realizable theory within our temporal (t > 0) universe, then relativistic mass equation is also not a physically realizable equation. But one of the famous energy Eq. E = mc^2 was derived based on the special theory. Then the legitimacy within our temporal (t > 0) universe is in question. Since E = mc^2 was based to Kinetic energy equation to legitimize the significant of the equation as shown by,

$$M = M_0 \left(1 + \frac{1}{2} \cdot \frac{v^2}{c^2} + terms\ of\ order\ \frac{v^4}{c^4} \right) \tag{24}$$

By multiply the preceding equation with the velocity of light c^2 and noting the terms with the orders of $v^4/\ c^2$ are negligibly small, above equation can be approximated by,

$$\mathrm{M} \approx \mathrm{M}_0 + \frac{1}{2}\mathrm{M}_0 \mathrm{v}^2 \frac{1}{\mathrm{c}^2} \tag{25}$$

which can be written as,

$$(\mathrm{M} - \mathrm{M}_0)\mathrm{c}^2 \approx \frac{1}{2}\mathrm{M}_0 \mathrm{v}^2 \tag{26}$$

The significant of the preceding equation is that M-M_o represents an increased in mass due to motion, which is the kinetic energy of the rest mass M_o. And (M-M_o)c^2 is the extra energy gain due to motion. Nevertheless what Einstein postulated, as I remembered, is that there must energy associated with the mass even at rest. And this was exactly what he had proposed,

$$\mathrm{E} \approx \mathrm{Mc}^2 \tag{27}$$

where E represents the total energy of the mass. In which we see that Energy and mass are equivalent but there are not equaled.

Since we had shown that Einstein's special theory of relativity exists only within empty space, from which we see his energy equation cannot be legitimized within our temporal (t > 0) universe. Yet energy and mass are equivalent is a well-accepted physical reality but may not in exact form since science after all is approximated. In view of the legitimacy and Einstein's energy equation and comparison of the well accepted although empirical kinetic energy Eq. E = (1/2) m v^2, where v is the velocity. Since velocity of light c is the current limit of science, it is justifiable to rewrite the energy equation in following form after kinetic energy equation as given by,

$$\mathrm{E} \approx (1/2)\ \mathrm{Mc}^2 \tag{28}$$

In which we see that mass and energy are equivalent, and it has the same physical significant as Einstein's energy equation although Einstein's equruion has been illegimated. In view of preceding equation we see that energy and mass can be simply traded as given by,

$$\mathrm{E} \leftrightarrow \mathrm{M} \tag{29}$$

From which in princiole we can convert mass to energy or energy to mass.

Nevertheless, one of the greatest theories that Einstein had had developed must his general theory of relativity as given by [2],

$$G_{\mu\nu} + \; g_{\mu\nu} = \left(8\pi G/c^4\right) T_{u\nu} \tag{30}$$

where $G_{\mu\nu}$ is the Einstein tensor, $g_{\mu\nu}$ is the metric tensor, $T_{u\nu}$ is the stress-energy tensor, is the cosmological constant, *G* is the Newtonian constant of gravitation, and *c* is the speed of light.

In view of general theory it is a point-singularity approximated deterministic equation, we see that Einstein's general theory is not a physically realizable principle since science is supposed not to be deterministic. For which it is impossible to predict future with deterministic general theory. Although we can change a section of time Δt but we cannot change the pace of time or even stop time. Strictly speaking all physically realizable theory must be temporal (t > 0). For which we see that degree of uncertainty increases as time moves further away from the point of absolute certainty (i.e., present instance t = 0). Thus we see that it is not the complexity of mathematic that Einstein had have used, it is the physically realizable paradigm that determines the physically realizable science. Nevertheless, Einstein's theory is a relativistic theory of distance but not a relativistic theory of time since we cannot change time.

7. A necessary cost

One of most important aspects within our temporal universe is that everything has a price, and it is not free. For example, every physical realizable theory takes a section of time Δt and an amount of energy ΔE (i.e., Δt, ΔE) to implement, which is a necessary cost. From which we see that ΔE is coexisting with Δt and ΔE(t) changes with time t or temporal (t > 0). Since general relativistic theory of Einstein tells us that matter curves the space–time, then space is possible to curve our universe. As in contrast with our temporal (t > 0) universe, although space curves with time but space cannot curve time.

Einstein's general theory tells us it is possible to curve our universe for wormhole traveling, a scenario was proposed by renounced astrophysicists [12] as depicted in **Figure 11**, where we see a curved equivalent universe is situated within our temporal (t > 0) universe. From which we see that it is possibly go through a wormhole tunnel from one edge of our universe to the other edge. Instead of crossing the vast cosmological space that will take us beyond 28 billion light years of voyage at speed of light and still unable to reach it since our universe is expanding at velocity of light. Aside the fact that **Figure 11** is a non-physically realizable paradigm (i.e., by virtue of temporal exclusive principle), my question is that how long it will take to curve the universe (i.e., a section of time Δt), in which we assume that we have all the energy ΔE we need. From which we see that the necessary cost is the section of time Δt and the amount of energy (i.e., Δt, ΔE). But in reality, to make it happen we also need an amount of information ΔI or equivalently an amount of entropy ΔS that makes it sufficient, to curving a topological equivalent universe shown in the figure.

From which we see that Einstein general theory predicts the future deterministically, but from physical reality, future is supposed to be non-deterministic or uncertainty. Of which we see that Einstein's general theory is not a physically realizable principle within our temporal (t > 0) universe. Nevertheless it is possible to reconfigure his general theory to be temporal (t > 0), by imposing a temporal constraint on Eq. (30) as given by,

$$G_{\mu\nu} + \wedge g_{\mu\nu} = \left(8\pi G/c^4\right) T_{u\nu}, t > 0 \tag{31}$$

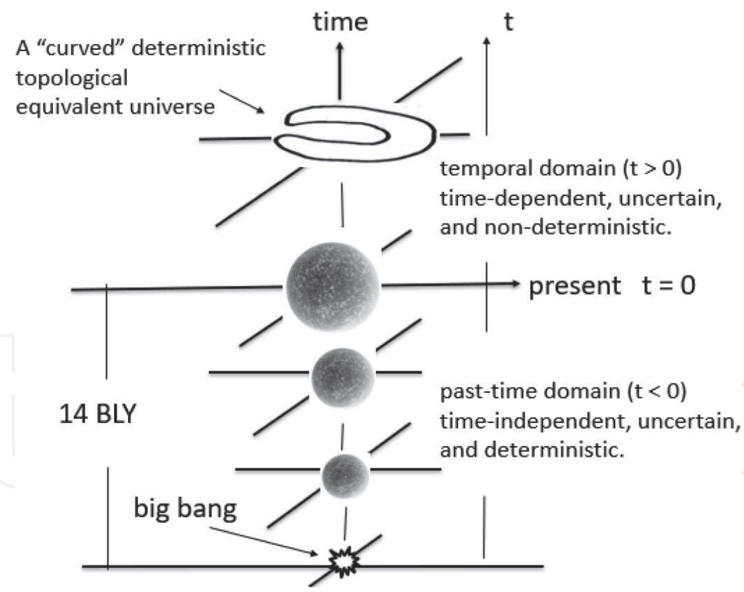

Figure 11.
Shows a non-physically realizable paradigm for curving space–time within our temporal (t > 0) universe. The curved topological equivalent space shows as a "deterministic" time–space. Since future universe is supposed to be non-deterministic or uncertain, this shows Einstein's general theory is "not" a physically realizable theory.

Where t > 0 denotes that equation is subjected by temporal constraint for which any solution comes out from this equation will be temporal (t > 0) or physically realizable.

In summary, we have seen as from Newtonian mechanics to Hamiltonian, to statistical, to wave mechanics, to relativistic and quantum mechanics are timeless (t = 0) mechanics. Although those timeless (t = 0) mechanics paved the way to our modern science, but the basic empty space paradigm had have not changed. For which it has produced a number of unthinkable virtual timeless (t = 0) solutions that causing a worldwide scientific conspiracy. Regardless of it is inadvertently or not, but it our responsibility to change it back to physically realizable science. Otherwise we will be continuingly trapping within the wonderland of timeless (t = 0) science which does not need to pay any price (i.e., Δt, ΔE). But unfortunately within our temporal (t > 0) universe everything needs a price to pay a section of time Δt and an amount of energy ΔE and it is not free.

8. Conclusion

Prior the origin of gravitational waves, I have shown the nature of our temporal (t > 0) universe. Since physical realizability of science depends on physically realizable paradigm, nature of temporal (t > 0) space paradigm supports the physical reality of science. Otherwise fictitious and virtual solution emerges which had had created a worldwide scientific conspiracy. As we are searching for gravitational waves, Einstein's relativistic theories cannot be avoided from which I had shown that his relativistic theories are not physically realizable theories since his theories were developed from an empty timeless (t = 0) space platform.

Since induced gravitational field from mass has never been a component in big bang creation, I have shown that it is a significant component for the inclusion. Prior the origin of gravitational waves, I have shown gravitational energy comes from a huge induced gravitational field by a gigantic mass within a preexistent temporal (t > 0) subspace. From which I have shown it is impossible to develop an induced gravitational within an empty space since empty space has no substance for gravitational energy to store. From which I had shown that without a gigantic convergent gravitational force to ignites the thermo-nuclei explosion, big band explosion was not possible to be ignited, as in contrast with commonly believed big bang explosion was ignited by time. In other words any mass annihilation will release an equivalent amount of gravitational energy associated with the mass annihilation. From which I assert that it is the gravitational field (i.e., time–space) changes with time, but not the gravitational field that changes (i.e., curves) the time–space.

Author details

Francis T.S. Yu
Emeritus Evan Pugh (University) Professor of Electrical Engineering, Penn State University, PA, USA

*Address all correspondence to: fty1@psu.edu

References

[1] A. Einstein “Zur Elektrodynamik bewegter Korper” Annalen der Physik 17: 891(1905).

[2] A. Einstein, Relativity, the Special and General Theory, Dover Publishers, Inc., New York, 148-157(2001).

[3] M. Bartrusiok and V. A. Rubakov, Introduction to the Theory of the Early Universe: Hot Big Bang Theory, World Scientific Publishing, Princeton, NJ, 2011.

[4] F.T.S. Yu, “Time: The Enigma of Space”, Asian Journal of Physics, Vol. 26, No.3, 143-158, 2017.

[5] F.T.S. Yu, “From Relativity to Discovery of Temporal (t > 0) Universe”, *Origin of Temporal (t > 0) Universe: Correcting with Relativity, Entropy, Communication and Quantum Mechanics,* Chapter 1, CRC Press, New York, 1 -26(2019) .

[6] E.Schrödinger, An Undulatory Theory of the Mechanics of Atoms and Molecules,” Phys. Rev., vol. 28, no. 6, 1049 (1926).

[7] S. Hawking and R. Penrose, The Nature of Space and Time, Princeton University Press, New Jersey (1996).

[8] S. Hawking, “Particle Creation by Black Holes”, Commun. Math. Phys. 43 (3): 199-220(1975).

[9] L. D. Landau and E.M. Lifshitz, *The Classical Theory of Field,* Pergamon Press, Oxford (1951).

[10] M. Maggiore, *Gravitational Waves Volume 1, Theory and experiment.* Oxford University Press, Oxford (2007).

[11] F. T. S. Yu, “What is “Wrong” with Current Theoretical Physicists?”, Advances in Quantum Communication and Information , Edited by F. Bulnes, V. N. Stavrou, O. Morozov and A. V. Bourdine, Chapter 9, p 123-143, IntechOpen, London (2020).

[12] M. S. Morris and K. S. Thorne “Wormholes in spacetime and their use for interstellar travel: A tool for teaching general relativity” Am. J. of Physics, 56 (5), 395-412(1988).