

Can the Equivalence of Energy and Spacetime Explain Dark Energy, Dark Matter, Gravity and Time on a Cause-and-Effect Basis?

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Abstract

A new theory provides cause-and-effect explanations for dark energy, dark matter, universal gravity and the nature of time, based upon two simple justified propositions. Firstly, that spacetime being created from energy in the big bang, following the law of conservation of energy and demonstrated mathematical equivalences, is fundamentally energy. Secondly that the Einstein's equivalence of mass and energy, can therefore be applied to Newton's laws of motion, in relation to spacetime itself. In an expanding universe, this unconventional approach creates a force in proportion to spacetime energy momentum change, predicting universal gravity. Reciprocal forces created explain why mass bends proximate spacetime, potentially reconciling Newton's and Einstein's models of gravity. A consequential modification to the big bang, requires that inflation also creates simultaneous exponential uniform compression and therefore time dilation, in accordance with general relativity. Resultant continuous ongoing time dilated release and expansion of infinite spatial energy 'moments', along the temporal plane, creates the 4th dimension of Minkowski's spacetime, aligning this theory with the mathematical framework describing general relativity. Time Dilated Spacetime Energy Release or TDSER has a perfect fit with dark energy and how we experience time, including special and general relativity. Unreleased spacetime compressed invisibly along the temporal plane is an excellent candidate for dark matter. This approach explains relativistic mass on a cause-and-effect basis and why nucleons have a greater mass than the sum of their parts. Consistent conjecture is presented on the first moment of creation; a big bang starting from nothing, creating familiar dimensions, all necessarily at 90 degrees. A contender for a single unifying force follows and is shown to match and indeed create equations describing Newton's second law, the law of gravity and Planck's force. Fundamental cause-and-effect mechanisms for quantum inertia, quantum gravity, force-carrying virtual particles and wave particle duality are presented. Proof is challenging and limited for such extensive claims, as TDSER does not modify the behaviour of spacetime, rather it is shown to align with and create existing frameworks. Hence this article, in attempting to describe an overall picture, falls between theoretical physics and science philosophy. It is a call to action to develop these ideas further; the potential, a consistent cause-and-effect basis for physics at all scales.

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1. Introduction – A Broken Universe

The universe, or rather our understanding of it, is broken or at least incomplete. Between unseen dark matter whose gravity is required for the formation of galaxies and unexplained dark energy, responsible for its accelerating expansion, over 95% of everything in the universe is missing [1],[23]. In the most widely accepted theory of creation; the big bang, a possibly infinite universe with ready-made spacetime dimensions appears out of unexplained primordial energy, expands at infinite speed, known as inflation, then inexplicably slows a fraction of a second later, releasing energy and the building blocks of our universe, in what is known as the hot big bang [1],[22]. Unexplained universal gravity then pulls all matter together to form stars and galaxies, regardless of separation, at distances well beyond that which Einstein's bending [5] of spacetime can explain. Then there's time. An integral part of our reality, yet there is no generally accepted explanation for what it is... a dimension, a property of the universe? However, if everything, including time, originated in the big bang, then where has the unique moment you started reading this article been for the last 13.8 billion years, and where did it go? It was fleeting, so it had movement, therefore it had energy, and that energy must be conserved. As what? Like a jigsaw puzzle with misplaced pieces, large sections can be explained by different mathematical models in isolation, but the overall picture is distorted and any picture where 95% is missing, no longer makes sense.

We also describe our universe largely in terms of effects; the constant speed of light, matter having properties of mass and inertia, that mass bends spacetime. Time, dimensions and forces all just exist. We accept these concepts without asking the most fundamental scientific question, why? What causes these effects? This article presents a series of ideas, starting with time itself, and culminating in a proposition for the first moment of creation, which is postulated has the potential to bring a consistent cause-and-effect basis, to each of the effects listed above. There is a compelling correlation with our reality, and some mathematical basis is presented. However, this is far from a definitive proof, given the extent of the claims made. This article is a call to action for the wider scientific community to consider these proposals in relation to the debate on the nature of time, gravity, dark energy and dark matter.

Two paradigm shifts are presented, based on simple mathematical equivalence and the law of conservation of energy. Offering candidates for the misplaced pieces in this cosmic jigsaw. Firstly, that spacetime has or is fundamentally composed of energy and secondly that the proportional equivalence of mass and energy established by Einstein, can therefore be applied to Newton's laws of motion, in relation to spacetime. Once fitted, a modified big bang must follow, one that potentially provides an insight into the nature of time, dark energy, dark matter, gravity and much more. There are elements of speculation in the overall picture presented, and for reasons that will be explained, limited proof. However, I ask you to keep an open mind and consider the words of another man whose controversial theories were initially dismissed as "entirely too speculative."

"We cannot solve our problems with the same thinking we used when we created them." Albert Einstein.

2. Spacetime Energy Equivalence

We exist within 4-dimensional spacetime [2], but what are the dimensions of space and time made of? In General Relativity [5], spacetime is visualized as a fabric, matrix, construct, manifold or continuum, whose geometry is determined by mass-energy. We go to great lengths to avoid the fundamental question of what creates this geometry? It is not nothing. Nothing has no structure, no dimensions, no compressibility based on localized mass-energy. So spacetime is fundamentally made of something. If everything in our universe was created from energy in the big bang, then the law of conservation of energy requires that at the very least, energy be woven into the resulting fabric of spacetime, and possibly that there is a fundamental equivalence between spacetime and energy. There is also simple mathematical evidence, hidden in plain sight, within many of the most established relationships we take for granted. Take Newton's definition of energy as work done, where the amount of energy E can be calculated for the specific case, where a constant force F is applied, multiplied by the distance L over which this force acts [4]:

$$E = FL. \tag{1}$$

This demonstrates a simple equivalence between energy and spatial dimensional displacement L , where the constant force F applied, is the equivalence coefficient between L and E , or simply that there is a proportional equivalence between energy and spatial dimensions. Energy either creates or is bound within spacetime to create spatial dimensions. If space and energy are equivalent, so too by inference is spacetime and therefore time itself. Reference 3 also demonstrates the further equivalence of time, based on equation (1) and is shown below, at the Planck scale [9] as:

$$E_p = F_p \cdot L_p. \quad (2)$$

Where E_p is Planck energy, F_p the Planck force and L_p the Planck length. Any spatial dimensional length can be calculated from the relationship:

$$L = vt. \quad (3)$$

Where v is velocity and t , time. At the Planck scale we can then substitute L_p with the speed of travel c , the speed of light, and the time taken t_p , the Planck time, giving:

$$E_p = F_p ct_p. \quad (4)$$

So, the energy required or work done, given a constant force F_p applied is given by:

$$E = ctF_p. \quad (5)$$

Equation (5) then demonstrates the equivalence of energy and time, with cF_p being constant, and therefore the equivalence coefficient. Reference [3] similarly demonstrates the equivalence of space and time and therefore spacetime with energy, using Coulomb's Law and Newton's Laws of gravity. We use these equations without ever considering the inherent fundamental equivalences of spacetime and energy which they describe.

Reference 14 explores the dual nature of time as a form of energy and a dimension of space. A proposition at the heart of this article. Citing relativity, time dilation, gravity, time energy uncertainty and entropy in thermodynamics, as examples of phenomena where time and the spatial fabric of space are intrinsically and fundamentally linked and therefore influence each other. Take time dilation due to velocity for example. When an observer is moving relative to another, time slows for the moving observer. This effect is due to the conservation of energy. As an object's velocity increases, its kinetic energy increases. This increase in energy slows down time for the object, thus demonstrating a fundamental connection between time and energy. The Heisenberg time-energy uncertainty principle states that the product of the uncertainties in energy and time are inversely proportional. The more precisely we try to measure energy, the less accurately we can determine the corresponding time interval, and vice versa. The existence of this principle suggests that time and energy are intimately related and cannot be precisely determined independently. In thermodynamics, energy is closely tied to the concept of entropy, which measures the disorder in a system. Disorder and entropy increase with the passage of time. Time is intrinsically linked to the concept of change. Thus, the relationship between time and energy becomes evident through the link to entropy, suggesting that time can be considered a form of energy. Time is also required to facilitate the transfer of energy from one form to another in chemical reactions, quantum interactions, and the conversion of potential energy into kinetic and other forms of energy.

The equivalence of mass and energy is demonstrated in Einstein's most famous equation, equation (7) below. Note that as energy bound as mass, creates objects with spatial dimensions, this further backs the notion that energy and spacetime are one and the same. Or at least that energy is required and bound within such structures to create everyday objects [14]. That this organization of energy matches exactly the configuration of spatial dimensions comprising spacetime, yet not to be fundamentally composed of energy bound on a similar basis, stretches credulity. Time is an inextricable element of spacetime, it has movement. Anything with movement has energy, so again should we not therefore conclude that space and time must have energy. In the inflation phase of the big bang theory, it is the conversion of the energy of expanding spacetime into mass-energy which initiates the hot big bang [22]. Expanding spacetime therefore has energy. Spacetime is still expanding, so

if you accept current inflation theory, spacetime currently has energy. The expanding spacetime of inflation was purportedly produced from primordial energy, so the law of conservation of energy requires spacetime to be energy at both the start and end of inflation.

There are plenty of other clues that energy and spacetime are synonymous. Apparently empty space has energy, zero-point energy and creates energy fields in field theory [6]. According to quantum mechanics [18] energy can be borrowed from empty space, so empty space must therefore possess energy. Photons also make ripples in a background electromagnetic field [12] and another field, the Higgs field is believed to impart the properties of mass to particles with spatial dimensions [11]. The fundamental quantization of both energy and quantum time in quantum physics further suggests this linkage [14]. These observations and concepts, imply dimensional structure and therefore energy in these planes. According to the big bang theory, spacetime was created from primordial energy, so there is literally nothing else spacetime could be made from. Spacetime also behaves as energy does; carrying gravitational and electromagnetic waves and storing energy; the gravitational potential energy in Newton's apple, readily converted to kinetic energy as it falls. Something must create the dimensions of space we travel through. So, some of that, albeit highly dispersed energy, must therefore also be aligned along or be bound with spatial dimensions and electromagnetic planes. So, the first assertion of this paper, the first proposed misplaced piece, is that spacetime dimensions are fundamentally composed of or bound by energy.

3. The Equivalence of Mass and Energy and Implications for Universal Gravity

Newton's second law [4], says that where there is a change in momentum or acceleration a , of an object with mass m , a proportional force F , is created:

$$F = ma. \quad (6)$$

Einstein demonstrated that mass is a concentrated form of energy, using equation (5), where the rest energy E , of an object or particle, equals its rest mass m , times the speed of light c , squared [5]:

$$E = mc^2. \quad (7)$$

Equation (7) demonstrates the fundamental composition of all matter. It is composed of energy or fundamentally is energy. It has been argued that the equivalence relationship between mass and energy remains relativistic even for bodies at rest and cannot be used in a Newtonian context. However, this ignores the fact that mass and energy are fundamentally the same things, static, in motion and whether relativistic or not. One can be converted to the other in nuclear reactions. The same mass, before conversion, exerts an inertial force when pushed, governed by equation (6). So, the amount of mass in equation 1 is therefore proportional to the energy it contains. Hence equation 4 can be re-written as:

$$F \propto Ea. \quad (8)$$

Equation (8) provides a falsifiable hypothesis, that whenever there is a change in the momentum of energy, a force is created. The proportional equivalence of mass and energy must also therefore also be applicable to mass in all Newton's laws of motion. Given the equivalence of energy and spacetime, these laws of motion must also therefore be applicable to the energy of spacetime itself. These proposed paradigm shifts have profound implications. Some are direct consequences, however, this article endeavours to present the potential for this approach to describe an overall and coherent picture at all scales, so there are necessarily substantial elements of conjecture. Positioning this paper somewhere between a research paper and a work of science philosophy.

What evidence is there to support such claims? Firstly, let us test equation (8) against inertia and universal gravity; the observation that all matter in the universe is attracted together, regardless of separation,

at distances well beyond those which Einstein's bending of spacetime can explain. If we push and therefore change the momentum of an object with spatial dimensions, and therefore spatially aligned energy (whether binding or constructing that dimension), equation (8) predicts a force is created. The object has inertia. According to Newton's third law (again treating mass and energy interchangeably), if a force acts on a mass (energy), an equal and opposite force must also act upon that which exerts the force. So, the inertial force created is reciprocal.

We also know that spacetime is expanding everywhere [1],[3] and has spatial dimensions, and therefore spatial energy, thus creating energy momentum change along those spatial dimensions. Equation (8) requires a reciprocal force is present, acting in all spatial dimensions. Gathering all similarly aligned energy together, providing a cause-and-effect basis for universal gravity. The gathering of all spatial energy against the vectors of spatial expansion.

However, conventional physics says no, it ignores the fundamental proportional equivalence of mass and energy in equations (6) and (7) and contests that the 'force' of gravity exists without energy movement, that mass bends spacetime (unexplained) and objects move in straight lines through the resultant curved space [5]. Yes, the results of this approach elegantly describe gravity, well except on the universal and quantum scale, but how can we justify this exception? Laws of physics always apply, as do mathematical equivalences. We cannot simply ignore them to fit our theories, especially theories like gravity, which are patently incomplete. Surely a force of some type is required by Einstein's model, for mass to bend spacetime in the first place? There is in fact no basis upon which this exception can now be justified, within an expanding universe. Consider the following.

The universe is expanding everywhere and has always done so; unexplained dark energy is reputedly creating new spacetime (not just expanding existing space, which would dilute its energy and properties) [1],[3],[23]. This process must deliver a change of momentum of spatial energy, everywhere. So, the conventional assertion that gravity exists without a change in energy momentum is false. If we follow equation (8), as the universe expands everywhere, spatial forces must be created. Forces which act reciprocally, in all spatial planes, drawing all spatial energy, including that which composes all matter back together. A universal force of gravity is therefore predicted. This aligns with observation both on the macro scale described, but also in respect of the gravity experienced by any object, which would consist of the same force, but many times stronger, as mass is a highly concentrated form of energy.

According to Newton's third law (again treating mass and energy interchangeably), if a force acts on a mass, an equal and opposite force must also act upon that which exerts the force [4]. In the case of universal gravity, the gravitational force exerted by universal expansion on any mass, must create a reciprocal force, acting on proximate similar spacetime energy (whether created by dark energy or existing spacetime). So proximate spacetime energy must be pulled towards and therefore be deflected and bent in the presence of mass. Delivering the second consequential claim; that a Newtonian force creates Einstein's bending of spacetime, potentially providing a cause-and-effect basis to reconcile these disparate theories of gravity [7],[8]. In section 6.1 we will delve into the exact nature of this compressive force and derive a correlation with established equations on the Planck scale.

Universal gravity and the bending of spacetime by mass, are verifiable observations, predicted by equation 8. Falsifiable evidence that the earlier modification to Newton's second law, using the mathematical equivalence of mass and energy in equation 8 is valid. This is however far from the whole story on gravity and mass, both of which we will return to develop several times more. To fully understand the implications and fit for these paradigm changes, there is only one logical place to start. At the beginning, with the big bang.

4. Implications for the Big Bang

I will temporarily and reluctantly start from the same starting supposition, as the conventional big bang. That of an incredibly dense region of distorted spacetime with ready-made dimensions, which is somehow manifested from unexplained primordial energy and undergoes infinite expansion contrary to general relativity [5], in a process known as inflation. Expansion stops a fraction of a second later (again unexplained) and the resultant energy released coalesces to form all the matter and radiation in our universe. This is known as the hot big bang.

Applying equation (8) to inflation, predicts a modified big bang. Inflation creates infinite spatial energy momentum change and therefore simultaneous exponential reciprocal forces must arise everywhere, predicting the following consequential effects which are the basis for a new, spacetime hypothesis. Time Dilated Spacetime Energy Release [7],[8] or TDSEER:

1. These reciprocal forces must logically end inflation, creating massive simultaneous and uniform compression of spacetime everywhere. Providing an excellent candidate to initiate a uniform hot big bang.
2. Creating severe compression of spacetime, which according to general relativity [5], distorts it along a common temporal plane, resulting in time dilation.
3. Time dilated release of compressed spacetime along the temporal axis must follow, creating the 4th dynamic dimension of Minkowski spacetime [2] used to derive Einstein's general relativity. TDSEER posits that this is what we experience as time. Once expanded that moment is in the past and the universe has expanded, the effect also potentially providing the basis for dark energy.
4. The gravity from this energy, hidden from view along the temporal axis, is then an excellent candidate for much of the dark matter in our universe.

Each point is elaborated upon below. Note that TDSEER does not fundamentally change the nature or equations that describe our reality, so these propositions are, extensively qualitative, as the quantitative mathematical framework of general relativity [5] to describe spacetime already exists. TDSEER suggests the 'why'. A common root cause for each of the known, yet unexplained effects of time, dark energy and dark matter.

4.1 The End of Inflation

This first claim is simply a mathematical consequence of the infinite spatial energy momentum change during inflation and equation (8). Exponential reciprocal forces will result in all dimensional planes and similar energy must be pulled back uniformly and to the same extent everywhere. With a force pulling such energy back, expansion cannot continue at infinite speed. It must slow, so infinite inflation must end, pretty much as soon as it starts, in isothermal compression. Conventional theory offers only conjecture for why this occurs – the breakdown of a hypothetical 'inflaton' field [22], being one of the most convincing candidates to explain why the universe inflates then reheats after inflation. This proports to maintain the law of conservation of energy through inflation and the hot big bang, however its creation demands an infinite energy imbalance, a problem the TDSEER model will tackle head on in chapter 6. Compression potentially provides the reheating necessary for the heat signature of the cosmic microwave background. It is contested that this starting point, for subsequent universal expansion, also has a better fit with other observations. Firstly, black holes compress spacetime back towards a dimensionless point in space, at any location in spacetime, and not to a single point of origin. This points to an initial state of spacetime compression everywhere at the start of the big bang. The conventional big bang's infinite expansion also creates infinite dilution, no matter how many zeros you add on to the end of the amount of energy present at the start. An infinite universe therefore precludes the temperature necessary for the current big bang model, which includes temperature driven quark-hadron combination and nucleosynthesis [22], although a finite universe does not. Reciprocal dimensional forces must logically halt inflation and are excellent candidates to initiate an isothermal hot big bang, by causing sudden uniform deceleration, both compressing and potentially fragmenting spacetime energy into the building blocks of matter and radiation, logically to the same dimensional blueprint. A claim that we will return to and justify later.

4.2 Time Dilation

General relativity [5] demonstrates that spacetime is bent by matter into a 4th dimension, the temporal plane, and that this compression of spacetime slows time. The effect is so severe that within a black hole, time essentially stops and matter that fell into a black hole billions of years ago still travels to its core, to us observing

outside from uncompressed spacetime. Its presence is then only revealed by its gravity. Massive compression predicted by equation (8) during inflation, must compress spatial dimensions along the temporal axis everywhere and create uniform time dilation. Release from this state would therefore be spun out over billions of years for observers, like us in previously released spacetime. This potentially explains where the moment you started reading this article has been since the big bang.

4.3 Time and Dark Energy

The time dilated release of compressed spacetime creates a constant uniform flow of spacetime along the temporal axis everywhere. An infinite supply of compressed time dilated spacetime energy layers or what I will now refer to as 'spacetime moments,' were created, then released continuously over billions of years. Conventional inflation expands spatial energy to infinity, but what about the 4th dimension time? We have evidence of infinite expansion here too. 13.8 billion years of moments, each second divisible by billionths by an atomic clock or much further considering Planck time (5.4 e-44 seconds), all arriving along the same temporal plane that spacetime compresses along.

Dynamic time dilated release and decompression of these spacetime moments, creates continuous movement in the temporal plane, which TDSER proposes, is what we experience as time. Expansion transitions into all spatial dimensions (the reverse of gravitational compression), enabling cause in one moment and set of spacetime coordinates, to move to effect in the next, everywhere. A beat synchronized by the uniform conditions of compression of this modified big bang. One you could set your watch by.

Infinite dynamic spacetime release creates a vector in the temporal plane, explaining why we can successfully model spacetime as a 4-dimensional manifold using tensor calculus as the basis for general relativity [2], [5]. TDSER does not fundamentally change the behaviour of spacetime, so there can be no new mathematical framework to establish its validity. The mathematical framework which describes TDSER spacetime already exists. Proof for TDSER is therefore challenging, hence the qualitative nature of this discussion. Mathematical evidence for TDSER must therefore look to a more fundamental level – to what creates the most basic equations which govern both our universe and provide the basis for TDSER in the first place; namely equations (7) and (8). Creation and derivation of these equations, based upon a proposed fundamental structure for spacetime, are presented later in sections 6.1 and 6.8.

You could come to the same conclusion, in respect to the nature of time, simply from the observed expansion of the universe, with no dilution of its properties. Additional spacetime is therefore being created, currently attributed to dark energy. There are however 4 dimensions to spacetime, if space is being created to expand the universe, time is also being released everywhere. So universal time and universal expansion are inseparable. Universal expansion creates time and vice versa. There is also a basis for this conclusion within equation (3):

$$L=vt \text{ or } t = L/v. \tag{9}$$

Consider the time that an object in motion takes to reach a new spatial position relative to its starting point in simple Euclidean space. Equation (3) defines the time taken as a change in spatial dimensions, divided by the velocity or rate of travel. However, what we are measuring, is actually a difference in the constant beat of time across the cosmos, universal time, at each location, during this transit. Although, this beat can be affected locally by mass-energy or speed as described by general and special relativity [5], [10], at low velocities and constant mass-energy density, this beat is constant. Applying this same dimensional definition to universal time, requires spatial dimensional displacement everywhere and motion or a rate of change within spatial dimensions. The only universal spatial dimensional displacement present everywhere, is universal expansion. Therefore, the magnitude of spatial expansion must be the numerator L, in a dimensionally similar expression for universal time. In terms of the denominator v, the velocity, or rate of this expansion, we have two potential candidates – the speed of universal spatial expansion and / or motion along the temporal plane. According to general relativity spacetime is bent along the temporal plane and transitions into spatial dimensions, so this motion is inherently the same process of decompression, if it results in spatial expansion. There is no evidence of any other energy

aligned along the temporal plane. Universal time is therefore set by the spatial displacement due to universal expansion, divided by the velocity of that expansion through temporal and spatial planes. This matches the definition of time proposed by TDSER, that we experience time due to the constant release and expansion of spacetime moments along a temporal plane from a condition of extreme uniform compression, at a rate regulated by uniform time dilation.

Further, time is dynamic and any motion needs a driving force. Again, we have only one precedent for a driving force for spatial expansion. One that general relativity says transitions from spatial planes to the temporal axis – spacetime compression. As a massive star moves through spacetime, the fabric of spacetime is compressed and bent along spatial and temporal planes then rebounds to flat spacetime. Spacetime decompression to provide this driving force everywhere implies a previous state of universal compression.

Decompression from this compressed state, which I will refer to as subspace, creates the acceleration of energy and with it the reciprocal forces required for universal gravity described earlier. Firstly, along the temporal axis creating reciprocal forces, effectively bending spacetime everywhere. Then into spatial dimensions, both effects pulling all spatial energy together against the trajectories of expansion. Universal gravity.

Expansion occurs in the moment, we call now. Once expanded that moment has passed and spacetime has expanded everywhere, conserving its energy into the moving fabric of space. Time is dynamic, it passes. Anything with movement has energy and according to the first law of thermodynamics, energy must be conserved. No other definition of time offers this. Time dilation explains where each unique moment has been since the big bang. Time is irreversible, decompression occurs in one direction only. Once released that moment has passed. The arrow of time points along the temporal plane, at the moment of release.

Time dilated spatial energy decompression is also therefore the basis of dark energy; ongoing release of spacetime and the potential energy stored from the extreme compression at the end of inflation, explains continuous universal expansion. The conditions present during the big bang are the only ones, which we currently know of, capable of creating spacetime. Where are the extreme conditions needed for spacetime generation in the voids of space, which conventional theory says are expanding due to dark energy?

4.3.1 General Relativity and Accelerated Universal Expansion

The extent of this decompression must be proportional to the local energy density present; being set by the concentration of spatial reciprocal forces at that location and created by the energy momentum change of TDSER. Any decompression of TDSER therefore matches the localized compression of spatial dimensions by massive objects. As the rate of this decompression sets how we experience time. Time must run slower in regions of higher gravitational compression (explaining gravitational time dilation on a cause-and-effect basis). TDSER into an expanded and therefore less energy dense universe, explains the accelerated expansion currently observed. A tipping point has been reached where gravity acting on a diluted universe can no longer slow its expansion.

4.3.2 Special Relativity

To be credible, any theory of time must also be consistent with special relativity. Energy movement within an existing universe is regulated by reciprocal forces which increase with momentum change. Applying Newton's first law, and again equating mass with energy, dictates that TDSER and any other energy released will accelerate to a constant terminal velocity in spatial dimensions. With severe compression, spatial dimensions are initially aligned along the temporal plane, before encountering additional resistance and slowing to match the local velocity of expansion as they push into spatial planes, against the existing energy that composes it. Thus, TDSER predicts a universal speed limit for its release along the temporal plane and indeed all forms of energy in spacetime dimensions. The speed of light. This is consistent with Minkowski spacetime [2], where four axes are defined as the vectors (x, y, z, ct) , where c is the constant speed of light. The product of time and the speed of light create the 4th dimension, aligning TDSER with the existing mathematical framework that describes general relativity. The Minkowski metric, used by Einstein in his development of special and general relativity, can be used to find the spacetime interval s , between nearby points using the equation:

$$ds^2 = -c^2dt^2+dx^2+dy^2+dz^2 \quad (10)$$

Nothing can move faster than time itself or it would be moving back into a moment, not yet released. We now also have a basis, a why, for the effect that light travels at a constant speed. Note that TDSER is not relativistic on this basis, an assertion revisited in section 4.5. An object moving in any direction will be caught by fewer moments of TDSER, so time slows relative to that experienced by a stationary observer, the effect only being noticeable when we approach the speed of TDSER in the temporal plane. Thus, providing a cause-and-effect basis for special relativity [10]. There is another strange effect of special relativity, namely length contraction in the direction of travel. As objects with spatial energy (mass) accelerate towards the speed of light, this speed limit on the energy that forms them, dictates that they must also reduce in length, in the direction of motion. In conclusion, TDSER offers a perfect fit with how we experience time and relativity.

4.4 Dark Matter

The gravitational pull from the energy of unreleased TDSER moments, compressed invisibly along a temporal axis, presents an excellent fit with the properties associated with dark matter. Present everywhere since the first moments of creation, yet detectable, like a black hole, only through its gravity. Notice that spacetime moments once released have no associated subspace component, explaining the voids between gravitationally bound strands of dark matter. It is the voids in our universe that are expanding, creating a spider's web of invisible dark matter across our universe [1],[3]. These increasingly isolated stands of dark matter create the macro structure of our universe, where a localized increase in gravity permits stars and galaxies to form. We have been searching for the best part of a century for new particles or modifications to theories of gravity which might explain dark matter [23]. Hiding this energy along the temporal plane, explains our lack of success.

4.5 Mass and Relativistic Mass

Any particle with mass and therefore composed of energy in spatial dimensions cannot achieve light speed (the relativistic behaviour of matter), having combined reciprocal forces from any force directly applied, in addition to the ever-present energy momentum change due to TDSER, and the reciprocal forces that expansion creates. The later, on its own, is sufficient to limit such spatial energy to the speed of light, so no particle with spatial energy (mass) can ever attain light speed. TDSER has only the later force acting upon its spatial energy and is therefore non-relativistic. TDSER brings cause-and-effect to the relativistic properties of matter.

Up to this point, the claims made are direct consequences of equation (8) and the equivalence of spacetime and mass as energy, applied to Newton's laws of motion. Further elements of TDSER are a further step removed. Although logical, and presented to offer an overall picture, some elements lack a mathematical basis or correlation with existing frameworks and must therefore be regarded as conjecture. TDSER offers no new equations, other than equation 8. It cannot, as it does not modify the behaviour of spacetime. It seeks to describe, on a cause-and-effect basis, why spacetime behaves as it does. I will however present qualitative evidence for TDSER in sections 6.8 and 6.9 where TDSER can bring common sense to both wave particle duality and force carrying virtual particles. The overall fit with TDSER and observation is compelling, consistent, and logical and justifies wider scientific scrutiny and debate.

Applying equation (8), means that universal expansion or TDSER must create reciprocal forces in all spatial dimensions and hence additional forces around any particle with spatial energy, therefore potentially imparting it with properties we associate with mass. TDSER argues that this essentially creates a mass bearing or Higgs field [7],[11], but there is more in this model to mass, than a simple reciprocal force. Bizarrely, the mass of a proton or neutron is many times higher than the sum of its component particles [7],[11]. However, applying equation (8), means that any spatial energy deflections (a change in energy momentum), create reciprocal forces thus behaving as mass does in respect to gravity and inertia if given a push, and also bend spacetime. So, particles with spatial energy or interaction between energy rich particles, for example, extremely tightly bound quarks within a proton, must create spatial energy deflections and create reciprocal spatial energy forces, magnifying the properties we associate with mass. Break such a particle apart and these mass bearing deflections simply

dissipate, whenever the interaction stops. Matching observation and perhaps providing a clue as to the true nature of force carrying particles, which is explored in more detail later.

4.5 A One-Off Hot Big Bang

TDSER requires a 'one-off' hot big bang. Reference 7 conjectures that this is likely driven by radiation pressure [2] and the breakdown of gravity (aligned reciprocal dimensional forces); due to the dimensional chaos caused by breaking apart the energy which creates such dimensions, during the hot big bang. TDSER proposes that this creates an 'advent horizon,' like 'popping a cork' on spacetime compression, thus also ending the hot big bang. A one-way barrier is created, over which a one-off hot big bang, followed by ongoing time dilated decompression of 'cold' spacetime moments continues, to this day.

5 Gravity in a TDSER Universe

Let us once again return to gravity. There is no modification to Einstein's mathematical framework, there is however a substantial re-interpretation due to TDSER of why this framework works. With TDSER, the famous bowling ball analogy, where the ball distorts an elastic sheet, which represents the fabric of space holds true, and with it all Einstein's equations in 4-dimensional spacetime. Except now, the fabric is composed of spacetime with an underlay of spacetime yet to be released. A subspace layer or 'advent horizon' over which spacetime moments are continuously released. The fabric of space is distorted along the temporal axis by the mass of the ball. Spacetime is also compressed in all spatial dimensions around the ball. Spacetime is released across this 3-dimensional 'surface', however the ball is not actually in contact with this 'surface', they can never meet. That moment has yet to come. The ball floats on a layer of 'fluidized' spacetime, as it expands into space, to an extent determined by the energy density of the local universe around the ball. Like a localized pressure, which determines the rate of evaporation of a fluid.

A Newtonian force created by TDSER acts on the concentrated spatial energy of the ball, the greater the mass of the ball the greater the reciprocal force on spatial energy and the greater the local compression of spacetime. This bending of spacetime dimensions aligns them along a common temporal axis. A balancing force from the decompression of spacetime acts on the ball in the opposite direction. The net force acting on the ball is therefore zero. A heavier ball sits deeper in this depression and is impacted by a greater concentration and hence force from TDSER. With no net force acting on the ball, it moves in straight lines over a curved spacetime landscape, just as Einstein suggested. Hence the predictions of Newton's and Einstein's equations are very similar. There are slight differences; Newton's predictions are based solely on mass, whereas Einstein's predictions are based on all the energy present, in which Einstein included what he called the 'energy of gravity'. With TDSER this energy of gravity is now explained. The fabric of space now includes subspace or dark matter energy and universal gravity, as described previously. So, Einstein's equations will be more accurate in highly compressed regions of spacetime. The difference is enough that Einstein's equations correctly predict Mercury's orbit, whilst Newton's equations do not. Newton's equations, away from such conditions, successfully describe the motion of all objects or energy in response to every force.

TDSER creates an elegant and compelling fit with our reality. However, as with the conventional big bang, it still has an unjustified starting point. One with an infinite unexplained energy imbalance and ready-made dimensions. So, the full TDSER big bang described below, starts further back, at the moment of creation, but starting from absolutely nothing.

6. TDSER and Creation

Any theory of creation is necessarily conjecture. However, whatever that first instant was, would it not be inherently simple? Also, if we understood the first moment of creation, would we then have a blueprint to understand everything that follows? The basis for a theory of everything. The TDSER big bang crucially starts with absolutely nothing. No time, no energy, no dimensions, or forces. It is difficult to imagine. We know only one thing about it for certain. We are here, so at some level, this condition was unstable. It follows that there must

have been a change or a rift in this condition. Whatever comes next, must also sum to zero, otherwise we have an unexplained and infinite energy imbalance. Positive something and negative something, that sum to zero:

$$0 = +1 \text{ add } -1 \tag{11}$$

In our universe, the most basic component of creation is energy. Negative energy, to balance our equation, is speculative. However, without it we must abandon both the law of conservation of energy, and also basic mathematics. So, I ask you for some latitude here to demonstrate a compelling fit with equations (8,11), and our reality. In the first 'quantum fluctuation' to create +1 and -1, a pull towards reconciliation or cancellation is logical. If we have any separation, then there is a debt to be repaid. Except, as our universe exists, there can be no such reconciliation. So, -1 and +1 must be offset in some way, such that they cannot meet and cancel.

6.1 Dimensions and Force-Energy Orbits

Crucially, we have no dimensions yet, so the point of creation must, by definition, be dimensionless. What is a dimension, if not an alignment of energy and forces along a common axis? So, this first quantum fluctuation has created the first fledgling dimensions, or separate energies that together compose our dimensions. Being dimensionally offset, they can never meet. Spatial dimensions are squeezed together with immense force in the centre of stars but never meet.

If energy creates dimensions, their origin, must be a dimensionless point. Any energy leaving the surface of a sphere, will do so at 90 degrees to a tangent to its surface. Leaving from a point, then they are also perpendicular to each other, matching the relative orientation of our dimensions. Logically, what happens next, is repeated both on the smallest and largest scales in our universe. Energy affected by a dimensionally offset force towards reconciliation, will follow a stable orbit. Planets orbit the sun, apparently due to gravity pulling along an offset temporal plane, due to the bending of spacetime. Centrifugal forces, electromagnetic forces, and strong nuclear forces all create stable orbits evidenced in the structure of atoms and electromagnetic field lines. Equation (8), says that when there is a force, we must have a change in energy momentum, movement. Energies must therefore move and continue to change momentum. The only credible solution is an orbit. Orbits can be a circle, an ellipse or even a pendulum motion, however they all exhibit very special properties. Firstly, there is always a change in angular momentum, at every point along their trajectory. Secondly, the forces acting at any point on this trajectory are balanced. Orbits are stable. In these orbits the outward pull of angular momentum is matched by the inward pull towards reconciliation. Two dimensionally offset and stable orbits are created. Positive energy (red in figure 2) feels a pull towards reconciliation through a dimensionless point (the black dot) to its negative energy twin (in blue) and vice versa. I will use negative energy and force interchangeably, as in this model, force is how we experience the effects of negative energy within our spatial dimensions. Force in this model, is the evidence for the existence of negative energy.

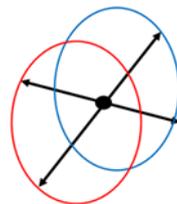


Figure 1 Stable and balanced energy force orbits, concentric on a dimensionless point.

At any point along these orbits, there is a pull towards reconciliation through the dimensionless point, the orientation of which is constantly changing, thus creating a stable concentric force. Any dimensionally similar energy we introduce within this 'sphere' of influence must also be deflected by this force. Spin an object on a string around your hand and you will feel this change in angular momentum. Spin it fast enough, there is a constant concentric pull. TDSER proposes that balanced force-energy orbits are the most fundamental structures in our universe. That they exist synchronously with a single fundamental force, which is simply the pull towards

reconciliation from dimensionally offset positive and negative energy. It is these structures, once propagated, that TDSER suggests will create familiar spatial dimensions, but also an electromagnetic plane. We will go on to demonstrate a compelling fit with TDSER and observation at all scales, but is there any mathematical basis for the model suggested? If this proposition is valid, then there should be correlation with established laws and equations which describe our universe at the most fundamental scale. In fact, whatever basic structure emerges, it must be responsible for and indeed create these laws and equations, which are then reflected on a macro scale. There can be only one correct solution for the first moment. One that must create the fundamental laws and dimensional structure which govern our reality. I will now provide a few examples.

6.1.1 Correlation with Newton's Second Law

The structure proposed provides a fundamental basis for equation (8) and hence Newton's second law. In any orbit there is always a change in angular momentum of energy (or mass) and an instantaneous concentric force, which balances the outward centrifugal force created by its angular momentum. In a universe created from such structures, this relationship will be reflected everywhere. We have already demonstrated that equation 8 has the potential to explain universal gravity, dark energy and time.

6.1.2 Correlation with Planck Force

Again, treating energy and mass interchangeably. A centrifugal force F , acting on a non-relativistic object (energy) in an orbit is given by equation (12)[15]:

$$F = mv^2/r. \quad (12)$$

Where m and v are the mass and velocity of an object respectively and r is the radius of the orbit. The previous discussion on mass proposes that energy within TDSER, which this model proposes is fundamentally composed of orbits, which is non-relativistic. If we consider the most fundamental scale of the universe described by Planck's equations [9],[16]. The Planck unit of force is the gravitational attractive force of two bodies of 1 Planck mass each, that are held 1 Planck length apart. If the above model were to describe the most basic structure at the smallest scale possible in our universe, two identical orbits would be separated by a Plank length, twice their radii. Each orbit pulling energy towards respective central dimensionless points. If we look at accepted definitions for the Plank force F_p and Plank energy E_p equations (13) and (14) respectively [16]:

$$F_p = E_p/L_p, \quad (13)$$

and
$$E_p = m_p c^2. \quad (14)$$

So,
$$F_p = m_p c^2/L_p. \quad (15)$$

Returning to equation (12), the centrifugal force within an established spatial universe, F is half the attractive force between the 2 centres of mass-energy, half the Plank force at the Planck scale. The mass m is m_p . The velocity v must equal the speed of light, c and each radius is half a Plank length, so equation (12) becomes:

$$0.5F_p = m_p c^2 / 0.5L_p. \quad (16)$$

Equation (16) now simplifies to match equation (15). This demonstrates a fundamental mathematical agreement between the proposed model and Planck's equations. Suggesting that the force towards reconciliation can be modelled using the Planck force. This aligns conjecture on balanced force-energy orbits, with an existing established mathematical framework [9], [16] which accurately describes our reality, its universal constants and the behaviour of other forces including gravity, electromagnetic interactions and in the case of equation (14), the energy bound by nuclear forces.

6.1.3 Correlation with Newton's Law of Gravity

Newton's law of gravity. Equation (17) was derived to explain planetary motion [4], based on a gravitational force between the mass of a planet m , and the sun, mass M , moving around the sun in a circular orbit of radius r ,

$$F \propto mM/r^2. \quad (17)$$

A simple derivation [3] uses the centripetal force exerted by the sun on a planet,

$$F = mr\omega^2, \quad (18)$$

where ω = angular velocity and T is period of revolution of the planet around the sun, M denotes the mass of sun, and F is the centripetal force exerted by the sun on the planet. However, $\omega = 2\pi/T$

so,
$$F = mr(2\pi/T)^2 = 4\pi^2mr/T^2. \quad (19)$$

According to Kepler's third law, $T^2 = Kr^3$, where K is constant for all planets.

Therefore
$$F = 4\pi^2mr/Kr^3 = 4\pi^2m/Kr^2 \quad (20)$$

Hence,
$$F \propto m/r^2 \quad (21)$$

Therefore, the force F , exerted by the sun on the planet is directly proportional to the mass of the planet and inversely proportional to the square of the distance of the planet from the sun. Since the force is mutual, the planet will also exert a proportional force on the sun in the opposite direction. Thus, the force exerted by the planet on the sun will also directly proportional to the mass M , of the sun.

Therefore, once again;
$$F \propto mM/r^2 \text{ or } F = GmM/r^2 \quad (17)$$

Where G is the universal gravitational constant. This relationship can also be derived at the Planck scale, for masses m and M [16]:

$$F = (l_p M / r m_p)(l_p m / r m_p) \quad (22)$$

At the most fundamental scale, where there is no particle combination into planets, only two fundamental particles with mass-energies m and M . These relationships should also hold true at this fundamental scale, in order that they can be reflected on the macro scale. Therefore, within any dimensional plane, there must be 2 interacting mass-energies in the form of orbits. Otherwise, there is no centripetal force from which the relationship is derived. Each energy orbit having a centre of mass, that pulls towards a concentric point. This point must also be concentric in all 3 spatial dimensions. The force of gravity occurs equally in all 3 spatial dimensions, so 3 identical spatial energy orbits (or multiples thereof) must be present in each fundamental particle m and M being attracted. This structure matches that proposed by balanced force-energy orbits. This model suggests that it is the basic orbital structure that is again required and indeed creates Newton's law of gravity at a fundamental scale.

6.1.4 Correlation with Coulomb's Law

Coulombs law [20],[21] is expressed using an analogous format to equation (17), inferring a similar fundamental basis. If we consider our fundamental particles to have charges q_1 and q_2 , the force between them, can be calculated using:

$$F \propto q_1 q_2 / r^2. \quad (23)$$

There is then a clear inference to be drawn, if there is an equivalence between charge and energy, demonstrated below. Then there is a further energy orbit in electromagnetic dimensions, creating an electromagnetic field, for particles that carry a charge. Reference 3 justifies the equivalence of charge and energy thus. If we write Coulomb's law in Planck units, the Force F_{q-p} , between two electric charges q_p is:

$$F_{q-p} = k_e q_p^2 / L_p^2 \quad (24)$$

Where k_e is the Coulomb constant, the Planck electric charge is q_p can be written [3] as:

$$q_p = k_2 q_s = v(hc/k_e) \quad (25)$$

Where k_2 is the equivalence coefficient of Planck units and Stoney units, q_s the charge in Stoney units and h is the reduced Planck constant, and the Planck length, G is the gravitational constant, L_p is given [3] by equation (26):

$$L_p = v(hG/c^3) \quad (26)$$

and relativistic energy E [3] is given by:

$$E = c^4 G = k_{se} \quad (27)$$

Hence equation 24 can be written:

$$F_{q-p} = k_e h c c^3 / k_e h G = c^4 G = k_{se} \quad (28)$$

Formulas (27) and (28) confirm the proposed equivalence of charge and energy. Indeed, an electric spark is a vivid demonstration of the equivalence of charge and energy.

6.1.5 Requirement for a dimensionless point

In each example above, the mathematical framework already exists. TDSER and balanced force-energy orbits are consistent with and indeed suggest why these equations and laws exist. Notice that the centre of mass for particles with spatial dimensions and charge are coincident within fundamental particles. However, as spatial and electromagnetic planes are independent, the right-hand rule for a magnetic field around a current carrying conductor, works regardless of spatial orientation. This is impossible unless spatial and electromagnetic orbits share a common centre, out with spatial and electromagnetic dimensions: a dimensionless point.

6.2 Synergies with String Theory

The notion that rings of energy or orbits describe our reality on a fundamental basis is not new. String theory is a theoretical and mathematical framework which tries to describe the behaviour of the universe on the quantum scale. It uses dimensional energy rings, called strings, which travel through space rather than point-like particles to explain behaviour at a subatomic or quantum level [6]. These strings vibrate at different characteristic frequencies, thought to correspond to different properties. There is an obvious synergy with string theory. Within a string or orbit, there is always a change in angular momentum, so a force must be pulling energy towards a common centre. This not only holds the energy in a string together, but it also provides string theory with a tension, such that the strings can vibrate at a characteristic frequency. Indeed, for the notion of any quantum unit, be it energy or time, there must be a fundamental binding force, or it cannot exist. Note, that if a force is holding together a fundamental energy string, it must also bring into question whether forces in the conventional sense are indeed carried by fundamental particles A topic discussed further in section 6.7. Once more, the proposed structure of spacetime potentially provides a why, which aligns TDSER and balanced force-energy orbits with an established mathematical framework which describes our reality. The rest of this article sets out a highly summarized and largely qualitative conjecture, as to how this fundamental force and structure might then create our reality and TDSER.

6.3 Inflation, Propagation and Structure

This section must be considered conjecture. I can offer no proof for the process of propagation. Only that it is logical and the universe created matches our reality, TDSER and as we shall see in section 6.4, potentially explains quantum gravity, quantum inertia and spacetime compressibility. Returning to the creation of the first balanced force-energy orbit. There is no time yet, no movement along a temporal plane. Even if an orbital trajectory was along the temporal plane, there is no resistance to energy movement within that orbital plane, so these energies must move at infinite speed until we create a spatial universe, in which reciprocal forces can moderate their velocity. If energy is drawn in the absence of time, then an infinite amount of energy is instantaneously available. There is however, still cause-and-effect. Otherwise, there is no order, only chaos. So, energy drawn in any plane,

is either drawn continuously or must instantaneously return to its point of origin. In doing so, returning to the exact conditions present during the first quantum fluctuation. Logically, what happened in that first 'instant' must repeat and energy is again drawn from this rift to the same blueprint. As this process is instantaneous, energy is drawn continuously. Orbits must be or will become full. Additional energy must therefore either create a new dimensional orbit, or another concentric orbit, in the same dimensional plane. Akin to turning up the power and adding another line of force to a magnetic field. A multi-dimensional structure of concentric energy orbits must result.

This process effectively creates a continuous and potentially infinite energy engine, breaking 0 into +1 and -1. Propagation of this energy structure must follow; with continuous instantaneous energy flow and the ability of energy to jump to new orbits. An infinite stable universe is the logical outcome. A cosmos where such structures align along dimensional energy planes to create familiar dimensions and are yet free to deflect and create waves. An infinite, but stable universe, where the sum of all energy and forces is always zero. Initially propagation is infinite, there is no resistance, inflation. However, as propagation creates dimensions with the fundamental structure which creates equation (8), this equation must apply to further propagation. Propagation creates a change in energy momentum, within all dimensional planes, and hence equation (8) creates corresponding exponential reciprocal forces. We have a basis for inflation and its demise, and in fact all the claims made in the modified TDSER big bang. Crucially however, we now have a credible starting point and cause-and-effect for what follows. This model also provides a concentric point for all dimensional strings, within such a structure to orbit. Again, consistent with black holes and spatial compression, which compress mass and spacetime towards dimensionless points anywhere in space and not back towards a common origin of our universe.

This model suggests a universe built from spatial orbits, dimensionally consistent with matter, but also having independent electromagnetic orbits. Allowing both spatial and electromagnetic alignment to create dimensional fields. Whereas current field theory has similar dimensional fields created by messenger or virtual particles which appear and disappear spontaneously [6],[14]. Electromagnetic interactions occur at 90 degrees relative to each other, regardless of spatial orientation. Suggesting 2 dimensions – electrostatic and magnetic. An electric motor will function the same, regardless of its movement spatially. This suggests that aligned 2-dimensional electromagnetic planes must cut across all spacetime, such that their interactions and vibrations occur across a 2-dimensional electromagnetic field [6], evidenced by electromagnetic field lines, which pass through all spatial dimensions. However, unless embedded as part of a joined spatial matrix, how can these electromagnetic fields be evenly distributed within 3-dimensional space, yet still be independent of spatial dimensions?

The suggested model solves this problem, as we have quantum units of spatial and electromagnetic orbits distributed based on their spatial footprints, but each having an electromagnetic orbit or micro dimension, which orbit the same dimensionless point, which is completely independent of spatial dimensions. Dimensional alignment of these 'quantum units' then creates both the spatial structure of spacetime, and electromagnetic and spatial fields capable of deflection. Allowing vibration of these fields to carry waves and energy and thus behave exactly as current theories suggests. Chapters 6.6 and 6.7 will describe how virtual messenger particles and wave particle duality arise from this model. Essentially, this model suggests a fifth state of matter, one so dilute it is barely detectable, except for the fields and vibrations which betray its presence. In much the same way Brownian motion [17] betrayed the presence of atoms before their discovery. This notion is far from new. The idea is not dissimilar to the concept of an aether, which fills the vacuum of space and carries waves. A concept which was popular until the Michelson-Morley experiment [19] in 1897 to measure the speed of light relative to the earth's motion and thus detect the effect of an aether wind, which was considered must affect it. No change has ever been detected, even with sensitive modern equipment, and the concept of an aether has been widely discounted, largely upon the basis of this result. However, in the TDSER model proposed in section 4.3.2, it is the speed of TDSER, the speed of time, which limits the speed of light. Without spatial dimensions a photon would not experience any resistance to movement through spacetime, whether travelling through an aether headwind

or not. Only spacetime compression based on the local mass-energy density would slow the speed of TDSER and therefore light, so no change in the velocity of light should be the expected outcome of this experiment.

6.4 Spacetime Compressibility, Quantum Gravity and Inertia

If TDSER is correct and spacetime compression initiates the hot big bang, it is logical to conclude that spacetime must also be composed of less compressed energy strings or orbits than those which compose matter and radiation. Orbits in various dimensions which are compressed into particles and radiation with the same dimensions, during the hot big bang. Orbits are 2-dimensional. Spatial energy will therefore have orbits in length and breadth, depth and length and breadth and depth. Note that each dimension occurs twice. They are therefore aligned through shared dimensions and bound together to create 3-dimensional space. Any deflection of a spatial orbit will create a change in energy momentum within the third spatial dimension and with it a reciprocal force due to interaction with TDSER. Spatial energy in 3 dimensions interacting with and therefore being deflected by TDSER or other spatial energy therefore creates properties we associate with mass; reciprocal spatial forces (gravity) and reciprocal compression of spacetime in all dimensions surrounding it. Shared spatial dimensions bind a stable 3-dimensional matrix, centred on a common dimensionless point.

We can simplify this discussion, by considering only a single orbit. If a particle with spatial energy enters a larger spacetime orbit, they both feel the effects of additive concentric forces. Spacetime is therefore compressed by the presence of matter and already compressed matter also gets squeezed. If spatial orbits are centred on a common dimensionless point and bound together by shared dimensions as described, as well as pulling through spatial dimensions, under extreme compression, all spatial dimensions would be pulled towards the dimensionless point along a new common axis, the temporal plane. This provides us with a full cause-and-effect explanation of why matter compresses spacetime, and also any matter present. The concentric orbital force within each orbit, matches its outward centrifugal force, which we demonstrated earlier matches the derivation of Newton's law of gravity. Thus, correlating balanced force-energy orbits with the universal gravitational constant, G . An ever present, hence instantaneous Newtonian quantum gravitational force towards reconciliation, now also explains Einstein's compression of spacetime on a quantum scale. We have a potential fit with the illusive quantum gravity. The more matter added, the greater the compression.

If the matter particle is given a push, it will accelerate. The proportional pull back towards the dimensionless point in spacetime, is then larger exiting the spacetime orbit than is the pull inwards, it receives on entry. This provides a cause-and-effect mechanism for inertia at the quantum scale. Particles moving at a constant speed experience no net resistance. Move the particle on and the larger spacetime orbit returns to its original trajectory, a balance of its energy momentum and the concentric force. Spacetime in this model is therefore fully compressible. Such deflections do not expend energy, the particle is not slowed by this interaction, separate spacetime orbits are deflected - matching spacetime behaviour as observed, and explaining why the earth is not slowed on its path around the sun.

6.5 Particle Formation

The exponential growth of gravitational forces expected to end inflation, must compress spacetime orbits together. If orbits with the same dimensions are pushed within each other, similar sized orbits, with comparable concentric forces due to equation (21), would further compress to a similar extent, locking them together, and stabilizing dimensionally similar concentric orbits into what we might then recognize as particles or radiation.

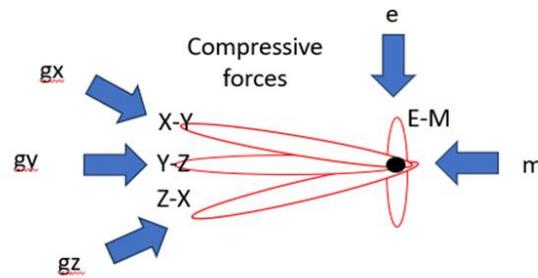


Figure 2 Compressed structure of a basic quantum unit

Figure 2 depicts a quantum unit under extreme compression of the hot big bang where spatial orbits are compressed towards a common temporal plane. Arrows of dimensional reciprocal forces, created from any energy momentum change, are depicted g_x , g_y , g_z in spatial orbits and E and M for electrostatic and magnetic planes respectively. Note compression and the cumulative addition of concentric forces increase the intensity of concentric forces. Particles may then become bound together and confined within other orbits. A 'Russian doll' of strong force shells or EM orbits would abound under conditions of extreme compression, perhaps eventually capable of confining like charged quarks into protons, and protons and neutrons into atomic nuclei [7]. However, as we shall discuss in the next chapter, a preferential asymmetry is required to explain the preferential confinement of like charged nucleons. An atomic structure of particles constrained in concentric spatial and electromagnetic orbits, matching that which we observe within the structure of atoms, is a simple logical extension of the model proposed. See Figure 3 below.

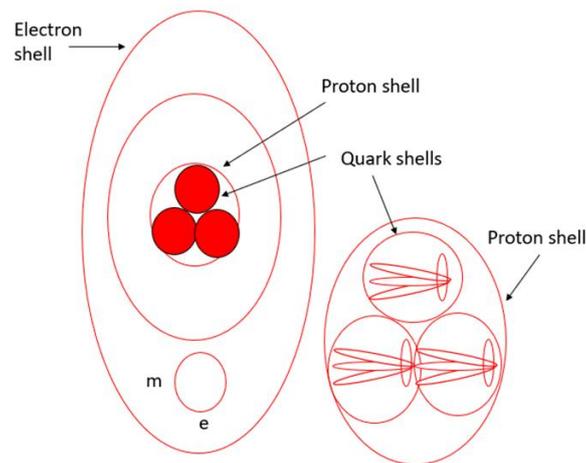


Figure 3 The Russian doll of concentric particle orbits

Extreme compression everywhere means that there is nowhere for such particles to escape, unlike with the current expansion models. Thus, facilitating confinement. The proposition is that a single fundamental force towards reconciliation is responsible for all other forces and is present from the first moment of creation. Gravity, inertia and nuclear confinement all make sense on this basis, and we will develop a model for the electromagnetic force in section 6.9. Current theory suggests that different forces separate from an undetermined fundamental force at times which fit current models and observations [1], [22]. That like charged particles, which energetically repel each other, are confined inside quarks and atomic nuclei in an expanding universe. Although the energies predicted are sufficient, preferential confinement of powerfully repelling particles in a rapidly expanding environment is counter intuitive. Once more this model will offer up a simple and logical alternative.

6.6 Charge and Matter Anti-matter Asymmetry

One of the most perplexing mysteries in modern physics is why we exist at all. Current theory provides no explanation for why we have a matter universe. Under laboratory conditions, whenever we create matter, it comes with an oppositely charged anti-matter twin and the two rapidly annihilate each other in a shower of high energy photons. For example - an electron and its anti-matter pair, the positron will annihilate, the resultant energy forming 2 high energy photons. So, based upon this, the universe should simply be a sea of photons.

However, laboratory conditions do not have the compression proposed by this modified hot big bang. With the TDSE hot big bang, spatial orbits are being pushed inside other spatial orbits, and EM orbits within other EM orbits. Spatial dimensions can be bent and deformed under extreme compression and can store energy; gravitational potential energy stored in Newton's apple above the earth, or the energy released in nuclear reactions. Particles have different properties, relating to their dimensional composition: mass for particles with spatial orbits. Spatial orbits are bound symmetrically into the 3-dimensional structure of space. Compression of such orbits will therefore be symmetrical. However, if we consider the electromagnetic (EM) orbits, these are free to deflect, such that the electrostatic dimensions are deflected either towards or away from spatial dimensions. Asymmetric deflection of EM orbits would be expected. For every quantum unit pressed up against another and deflecting in one plane, another with the opposite deflection is created. Pushing similarly deflected EM orbits within each other will logically stabilise these deflections into particle properties. TDSE proposes that these deflections in the electrostatic dimension create the property we recognise as charge. Squeezing unlike orbits together will cancel out these deflections. Reference 7 further conjectures that deflections in the magnetic orientation may impart particles with angular momentum or spin. The magnetic properties of particles being a combination of both their charge and spin. However, focusing upon charge, such deflections should create neutral particles and an even number of positive and negative particles. Some electromagnetic orbits may also become fully detached within this high energy soup of particles and matter anti-matter annihilations. Without spatial orbits they would exist as radiation. Stabilizing whole quantum units within other similar units will create 3-dimensional spatial particles with a positive, negative or neutral charge. If the deflection we call positive charge brings these orbits towards spatial dimensions, they will become preferentially confined in spatial particles. There must then be more negative electromagnetic orbits available for combination with those particles without spatial dimensions - electromagnetic particles or radiation. There will be more electrons than positrons.

In the chaos of 'annihilations' this asymmetry is all that is needed - the debris created consists of an excess of positively charged spatial particles - quarks and negatively charged electromagnetic particles - electrons. Notice that twisting an electromagnetic orbit, energy partially twisted into spatial dimensions would impart a small amount of mass following the principles established earlier, and store large amounts of potential energy. If this model is correct, then there is a much simpler explanation for anti-matter 'annihilations' - the electron and the positron are basically electromagnetic orbit combinations with opposite twists. When they interact, the twists of potential energy are released, leaving 2 higher energy particles, now without any spatial deflections or mass, but of higher energy proportional to the released spatial deflection (energy) responsible for their mass which has been destroyed. Hence a positron and an electron on meeting will result in 2 higher energy photons, the mass destroyed in the process matches the excess energy carried by the resulting chargeless photons. Further decay, combination and confinement of particles formed into other orbits can potentially give rise to the standard model of particles, with positively charged mass bearing particles confined within the strongest inner concentric orbits, like a Russian doll, as quarks. The building blocks of protons and neutrons. Fragments with spatial orbits occupy 3-dimensional space and have reciprocal inertial and gravitational forces i.e., they have mass. Any spatial dimensions combining with a negative charge to form anti-matter will be rapidly 'annihilated' or rather interact to neutralize their charges. The potential energy stored, releasing radiation as a sea of neutral photons and other particle combinations.

6.7 Radiation

Electrical and magnetic forces are always offset by 90 degrees and independent of spatial orientation. If such energy exists in strings or orbits, this suggests their orbits are similarly offset. A photon comprised of such orbits in electromagnetic dimensions, without spatial energy would travel at light speed, carving out offset peaks and troughs of electrical and magnetic energy with amplitude and hence wavelength determined by their energy, as they spin. An offset electromagnetic wave in effect, which interacts and deflects background electromagnetic energy orbits, creating waves without itself being slowed, matching our understanding of light.

6.8 Wave Particle Duality

Fire photons through parallel slits in a metal sheet and they will travel in a straight line and convey discrete packets of energy to a receiver on the other side. So therefore, photons are particles. Narrow the slits and they then behave as waves; being diffracted through the slits to form wave fronts, which collide in interference patterns on the other side. So, a photon is also a wave! This is 'wave particle' duality – it is both [13]. Even a single photon will appear to interfere with itself when passing through a narrow slit. Very peculiar indeed.

With TDSER the atoms of the walls of the double slit plate will have and therefore deflect electromagnetic energy, continuously released via TDSER. Expanding orbits effectively create circular waves of dimensional energy, centred on a dimensionless point. Innumerable dynamic interactions create deflections and moving electromagnetic peaks and troughs, capable of deflecting a 'particle' with similar dimensional energy, even at a short distance from the wall. Hence the exact outcome of an individual photon is a matter of probability. However, waves which are released in a regular and uniform manner and interact with stable structures form stable predictable interference patterns of peaks and troughs. Deflected by electromagnetic peaks, photons will follow a path through the troughs resulting in the barred detection signal we observe. Aligned peaks will shield areas on any detector and a probability driven distribution will result where troughs align. Even a single photon getting close to the side of a slit, will be deflected through this electromagnetic interference landscape. Its point of detection will mirror the probability mapped out by interference patterns of a larger number, thus appearing to act as a wave. Fit a larger opening and it will pass straight through unaffected like a particle. The behaviour of light in a TDSER universe matches observation and does not have single photons travelling through different slits then interfering with themselves on the other side. Wave particle duality is an otherwise unexplained 'fudge' and can be regarded as evidence for the existence of TDSER.

6.9 Force Carrying Virtual Particles

Much of the quantum world currently makes little sense. A quote popularly attributed to Richard Feynman is: "If you think you understand quantum mechanics, you don't understand quantum mechanics." For example, the electromagnetic force is conventionally carried by virtual photons. Infinite numbers of elevated electromagnetic energy peaks, centred on every particle that spontaneously and continuously appear and disappear in all directions everywhere [13]. Particles deflect each other, but also somehow attract, by exchanging virtual photons. Only those particles which interact exchange any energy. If the particles in question travel at light speed, such virtual photons must break the speed of light. Also, if particles carry forces, what holds these fundamental particles together? Our current explanation makes no sense!

In a TDSER universe, there is a logical common-sense cause-and-effect alternative. Within spacetime we have background electromagnetic dimensions, in which negatively charged particles will orientate themselves the opposite way relative to positive ones. TDSER will then create electromagnetic deflections in opposing orientations, creating an electromagnetic landscape centred on the charged particle – like charged particles create similar additive peaks, which if they encounter a similar particle, will impart their energy in that direction thus repelling the particle, all other peaks will simply dissipate. Dislike charges create opposing peaks which cancel, creating valleys in this landscape with moving peaks, albeit of different orientations all around, through which dislike charges are pushed together – attraction. TDSER creates peaks of electromagnetic energy. Peaks in the background electromagnetic energy centred on any charged particle, matching the earlier definition of a

virtual particle. TDSER creates energy deflections matching the definition of virtual particles which do indeed carry the electromagnetic force, but without breaking the laws of physics and basic common sense. Reference 7 provides conjecture on how other force carrying virtual particles for all the other forces might be created on a similar basis. Static charges, on the same basis, interact with TDSER to form peaks of electrostatic deflections in opposing orientations, when these peaks and troughs come close enough energy will transfer to cancel the charges. We get a spark as the energy transfers.

6.9 The Energy of Matter

If the model described above is correct, it is the confinement of energy within spatial orbits which creates particles with mass. Therefore, we should be able to fundamentally describe the energy of contained within mass, based on the energy it imparts, once released from confinement. There is an established relationship for how much energy mass contains, which has been proven experimentally. So, if this model is correct, a derivation based on TDSER should tally with Einstein's famous equation (7).

With TDSER, as spatial orbits expand along the temporal plane and move into spatial planes, they are subject to reciprocal forces, due to energy acceleration when expanding out of subspace. They will therefore rapidly attain the maximum constant equilibrium speed, the speed of light, being, as we demonstrated earlier non-relativistic. Then, as they expand into spatial dimensions, they must effectively push their way into full spatial dimensions, creating movement and expansion in those dimensions. They must therefore impart all the energy of their confinement and eventually attain an equilibrium size, matching the local energy density and expansion speed of the universe they have pushed into.

Any non-relativistic mass, within our universe, having orbits in 3 spatial dimensions and corresponding reciprocal forces, which travels through spacetime at a velocity v along a single spatial trajectory, possesses what we call kinetic energy, E . The amount of kinetic energy [4] for mass (and therefore energy) at low and non-relativistic velocities moving in a single plane and hence also non-relativistic spacetime energy, is given by the equation:

$$E = \frac{1}{2} m v^2 \quad (17)$$

The energy transferred to its surroundings is therefore that of non-relativistic mass moving at the speed of light. However, if we remember the earlier discussion on dimensional planes; orbits have 2 shared dimensions (length and breadth, breadth and depth or length and depth) and therefore their expansion takes place in 2 planes. So, each orbit imparts kinetic energy in both planes. Hence the kinetic energy imparted to spacetime by expansion of a single spacetime orbit is simply twice that given once again by equation (15) and once again, Einstein's equation (7):

$$E = mc^2 \quad (7)$$

This is the energy released from compression of spacetime, to the size it was when it confined into subspace. It must have a lower energy concentration (mass) than within matter particles, which are further compressed by the combined concentric forces due to orbit combination. However, from equation (7) mass and energy are directly proportional. So, the increased energy of confinement of such an orbit, is directly proportional to its mass. So, the energy stored in each of the compressed orbits in matter, is also given by equation 7. There are numerous spatial orbits in different dimensions confined to compose any matter particle, but again the multiplication due to the number of the energy of orbits gives a proportional multiplication of the mass, hence equation 7 also describes the total energy of confinement within any mass m . Providing a rather simpler derivation for Einstein's most famous equation, one based on balanced force-energy orbits.

I differ from Einstein's interpretation here; the mass is not destroyed in nuclear reactions. The mass equivalent energy of confinement is released and the spacetime orbits then expand to join the fabric of spacetime, apparently vanishing in the process. Orbits no longer form particles. If we had destroyed any of these balanced positive and negative energy paired orbits, the sum of the energy released would be zero. This also

means that stars are in effect creating additional spacetime, adding to universal expansion, beyond normal TDSER. A component of their solar wind and dark energy, which we might be able to quantify?

6.10 Quantum Entanglement

Any credible theory of everything, should have the potential to explain even the weirdest phenomena. Quantum entanglement, is a very weird effect, seen on the smallest scales and now proven experimentally. So-called entangled particles, created or separated in a common event, appear to have undetermined properties. For example, their spin appears to be unresolved until 'observed,' when they suddenly decide, apparently at random, to adopt a particular property. Upon this observation, the other entangled particle will instantaneously take on the opposite property. This effect holds true, even if the particles are separated by immense distances. Farther than light can travel in the time available. Apparently, these interactions break the speed of light!

Einstein was famously not a fan of this effect, calling it 'spooky interaction at a distance' and predicting its requirement mathematically, then presenting it as an anomaly in quantum theory, which meant that quantum theory wasn't the full story. A view, I hope you now share. It apparently flies in the face of cause and effect, the deterministic nature of the universe, where one thing leads to another. But if we replace the word 'observe' with 'interact', then it begins to make sense in this rather less strange new universe.

Photons can be entangled by firing a laser at a crystal, splitting a photon into 2 entangled photons. I am a determinist at heart, to me cause leads to effect. I strongly suspect that during interactions or splitting of particles, which result in entanglement, the resulting particles are indeed entangled in a very real sense. Observation at a very small scale involves interaction, as it requires some type of messenger particles to observe something, thereby affecting what is being observed. In the universe described, we have created dimensions and particles with energy orbits in an electromagnetic plane. This plane runs perpendicular to the temporal and spatial dimensions. The possibility of instantaneous effects between particles, connected in some way through entangled energy orbits in the electromagnetic plane, yet separated within spacetime dimensions is therefore completely credible.

With entangled orbits in at least one non-spacetime dimension, likely an electromagnetic orbit, two particles which at one time shared the same coordinates in spacetime, can still share such orbits, whilst moving away from each other through spatial dimensions. As an analogy, think of a 2-dimensional electromagnetic ring moving through a spatial displacement in Z. Movement in the spatial dimension of Z has had no effect on the ring. The EM coordinates of the ring are unchanged, as are the X and Y coordinates, whenever we travel through Z. If that ring connects two particles, through non-spatial dimensions, the ring is similarly unaffected by any spatial displacement. Only when one of the particles is observed or rather interacted with, in a manner which disturbs the electromagnetic orbit, is it forced to reconcile to one particle or another, perhaps gaining an electromagnetic orbit with spin, thus imparting that property to the receiving particle. The other particle reacts in an equal and opposite manner having lost its share of that orbit, ensuring that the balance of the universe is maintained. As these rings are moving energy orbits not solid, the chances of reconciliation to either particle are entirely random. Reconciliations take place through non-spacetime dimensions, thus at 90 degrees to the temporal plane. Energy movement is not governed by any reciprocal spacetime force, so reconciliation will occur at infinite speed, from a spacetime perspective. Quantum entanglement has no current explanation, once again TDSER offers a consistent cause-and-effect solution. Quantum entanglement provides further corroborating evidence for this model of spacetime.

7.0 Conclusion

This paper proposes and justifies that spacetime is fundamentally composed of energy. If correct, applying the established equivalence of mass and energy to Newton's second law explains both universal gravity and why mass bends spacetime. The current view that gravity exists without energy momentum change cannot be substantiated, in an expanding universe where the fabric of space is composed of energy and new spacetime is created (or released from confinement) everywhere continuously. Massive compression and time dilation must

therefore have been created during the inflation phase of the big bang. The resultant time dilated release of this compressed spacetime or TDSE, creates universal expansion and constant motion in the temporal plane, in accordance with general relativity. TDSE posits that this is what we experience as the passage of time, thus creating the 4th dimension of Minkowski spacetime. TDSE demonstrates a perfect fit with how we experience time and relativity. TDSE potentially explains both dark matter and dark energy and has the potential to bring common sense to the quantum world. Relativistic mass, wave-particle duality, and force carrying virtual particles, are cited as examples of phenomena, which are consistent with and indeed actually make sense, in a TDSE universe. TDSE does not change spacetime, being consistent with general relativity, string theory and quantum mechanics. TDSE explains why the current mathematical frameworks work. It does not replace them.

Conjecture on the first moment of creation is derived by applying the principles described above and starting from absolute zero. The model developed suggests the nature of a single unifying force and a candidate for the most basic structure of our universe. One which can be shown to correlate with established equations at the fundamental Planck scale and create Newton's second law and law of gravity. Much of the full TDSE model is far from proven. However, its potential to describe our universe at every scale, on a cause-and-effect basis, demands scrutiny from the wider scientific community. Potential solutions to anti-matter asymmetry and quantum entanglement are presented on a consistent basis. TDSE and a universe based upon balanced force-energy orbits has great potential, however it currently lacks sufficient mathematical proof, given the scope of the claims made. It is hoped that publication of this article will inspire others, to develop this proposition further. Perhaps then, when that time dilated moment finally arrives, physics can move out of the current unexplained dark ages of unexplained effects and into a new enlightened era of cause-and-effect.

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