Three-Dimensional Time and Zero Point Energy

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Abstract.

In a previous paper, Concepts of Three-Dimensional Time in Electrodynamics, the concept of three-dimensional Vector Time and Scalar Space is introduced and evaluated with respect to electrodynamics. The results is that I derive four additional Maxwell equations. In another paper, 'Concepts of Three-dimesional Time in Physics', the properties of 3D Vector Time are compressed into a Scalar Time field and the properties of 3D Vector Space are compressed into a Scalar Space field. Both scalar fields are also three-dimensional, but have very high uniformity, so time can be considered one-dimensional without impacting physics. In this paper, we will explore the properties of multidimensional time, primarily in its more familiar scalar form. In doing so, the similarity between the physics of Stochastic Electrodynamics and this scalar field of time becomes apparent. Three-dimensional Vector Time and Scalar Time, as well as 3D Vector Space and Scalar Space are coupled via motion, specifically velocity. Stochastic Electrodynamics [SED] is based on a motion, a jitter motion or zitterbewegung. This motion is referred to as Zero-Point Energy, and it couples the Zero-Point Field to matter. It is from this basis that I will expand the understanding of 3D Time and Scalar Time physics and show the commonality it has with Zero-Point Energy.

1.1 Introduction

The universe as we know it so far contains only five percent [4.9%, actually] visible matter. Of the rest of the matter, 27% is called Dark Matter and 68% is called Dark Energy.

Dark matter is postulated by astrophysicists to account for the large amount of mass that is required to justify the gravity necessary to explain the velocities of rotation and gravitational lensing of the large objects in our universe. The amount of visible matter could not account for this, so the hypothesis is that there has to be invisible, or Dark Matter, that we are unable to detect or see, to account for this much gravity.

A CERN webpage spoke of a theory of Dark Matter being extra dimensions, especially dimensions that are smaller than an atom. This seems to fit well with 4Time, since dimensions of space that are very small, like in an atom, are places where the motion is in 4Time.

Dark Energy, different from Dark Matter, is also postulated by astrophysicists to account for the fact that the universe is expanding. But not just expanding, but expanding at an accelerating rate. To account for this expansion of the universe, there has to be a source of energy that can sustain this expansion, which astrophysicist call Dark Energy.

Note: In this paper, 3D Space and Scalar Time is also referred to as 4Space and 3D Time and Scalar Space as 4Time.

1.2 Black Body Radiation

In 1901, Max Planck published his first paper on the radiation of a black body. In his paper, Planck introduced a new constant, h, which came to be known as Planck's constant, to accurately calculate the radiation emitted from a black body. What was disturbing at the time was that the radiation had to be quantized. This quanta of energy is small, but the field of physics up to that time believed energy to be a continuous phenomenon. At the macro level, this has little impact, but at the microscopic level, specifically the level of atoms and particles, it has a radical impact. Planck was not comfortable with the format of his equation. He worked on it for another ten years and then published a new paper in 1911. In this second paper, he had two terms instead of one in his equations, as shown below. In the first term in this equation, energy is dependent on temperature, and in the second term it is not dependent on temperature.

$$E = (h\nu/e^{[h\nu/kT]}-1) + h\nu/2 \quad (1)$$

In this equation, h is Planck's constant, ν is frequency, k is Boltzman's constant, and T is absolute temperature. The result of this equation is that matter always has a residual amount of energy, even at zero degrees. Because of this, this second term became known as the Zero-Point Energy [ZPE].

The concern with this term was that although the energy generated by each individual frequency is extremely small, the universe is expected to support an infinite number of frequencies, so the amount of energy density from all these frequencies is infinite. To solve this problem, the frequencies are limited to the point where the fabric of space breaks down, Planck's length. This frequency, which is on the order of 10^{44} Hz, is inserted into the equation 1, and the amount of energy density is recalculated. The result is still extremely huge, an energy density on the order of 10^{93} g/cm^3. Atomic energy, the most dense form of energy we knew before this, only has an energy density of 10^{14} g/cm^3. This energy density is so large, it has the capacity to vaporize all the known matter in the universe. The reason that the ZPE does not destroy matter is that it is extremely uniform, so there are no forces to create this destruction [1]. It is like a box that is closed and sealed at sea level. So at sea level, there is uniform pressure inside or outside the box. But if the box is taken deep under the ocean, it will be crushed by the outside force generated by the imbalance of pressures outside versus inside the box. Likewise, if the box is brought into the upper part of the atmosphere, it will explode because the force generated by the larger pressure inside the box. So the uniformity is critical to the balance of the universe as we know it.

1.1 Frequency cubed.

This extremely high-energy density of the Zero-Point Field [ZPF] is much more noticeable at very small distances than at large distances. This is due to the fact that the energy in the Zero-Point Energy scales by the cube of the frequency.

Zero-Point Energy is proportional to frequency^3

To understand this better, I will use an analogy of the frequencies generated by a piano.The piano supports 88 different frequencies. Assume on this piano all the keys can be played at the same time, that is piano strings, can be vibrated simultaneously. We can add up the energy of all these 88 piano strings at once just like the Zero-Point Field by cubing each frequency and summing the energy of all 88 frequencies.

But let's assume that the piano is now limited to 22 keys, but not centered around middle c, but the 22 keys are at the high frequency end of the piano [shorter length strings]. If we activate all 22 keys and add these energies in the same manner we did the 88 keys, the expectation is that it would be clearly less than the 88 keys. But remember, the energy of the Zero-Point Energy increases at higher frequencies and is dependent on the frequency cubed.

To give a perspective of how powerful this dependency of energy on the frequency cubed is, let's take an example of a single note. The lowest frequency supported by the piano is 27.5 Hertz, or vibrations per second, and the highest is 4,186.01 Hertz. If the energy difference of these two notes were just based on the frequency to the first power, the energy difference would be 152. But if the difference is based on frequency cubed, the energy difference between the lowest and highest piano key is approximately 3.5 million. So it is the high frequency, short piano strings, that would give this tremendous energy.

Because of this frequency cubed dependency, the energy *difference* between the 22 high frequency keys and all 88 keys when they are played simultaneously is less than two percent. The 22 high frequency keys provide more than 98% of the energy density that is already achieved by playing all 88 keys. The rest of the 66 piano keys only provide less than two percent.

This striking analogy of the power of the frequency cubed term gives you an insight into why the high frequencies, like those at the atomic level, dominate the contribution to the energy density of the Zero-Point Energy value.

1.2 Stochastic Electrodynamics [SED].

Out of this second equation, a second interpretation of quantum behavior is developing, a field called Stochastic Electrodynamics [SED]. SED postulates that the Zero Point Energy [ZPE] is an energy that manifests from a gradient, or change in the balance of the Zero-Point Field [ZPF]. As noted above, it is the difference in potentials, or pressure in the analogy, that creates the energy and forces. This ZPE is a jitter motion that is imparted to matter at the most fundamental level. The Zero Point Energy consists of virtual particle pairs, in the form of electron-positron pairs, that oscillate between an undetectable presence in this Zero-Point Field and a very brief detectable presence as photons in the universe of matter. During the brief time as photons, these photons can absorb and emit electromagnetic radiation, hence interact with matter. At a given ZPE density, the amount of virtual particle density is fixed. This virtual particle density fixes the amount of energy imparted to real particles during the brief interaction.

H. E. Putoff asked the question why all the electrons have not run out of energy and crashed into the nucleus of the atom, since, as they orbit the nucleus, they are constantly radiating energy. He calculated that the electron has the orbit radius it has because the electron absorbs just the right amount of energy from the ZPF to maintain this exact stable orbit. If the energy density of the ZPE decreases, the electron's path will get smaller, and the electromagnetic attraction of the nucleus might slowly pull the electrons in, unless it absorbs enough energy to counterbalance this electromagnetic attraction. Likewise, if the energy density of the ZPE increases, the orbit of the electrons will increase, and they could escape the electromagnetic attraction, or coulomb force, of the nucleus.

Since the atomic frequencies detected by our instruments are dependent on the radius of the electrons' orbit, and the ZPE affects the orbits of the electrons in all matter, this means that the energy density of the ZPE impacts the precision of the atomic clocks we use.

1.3 Three-Dimensional Time

In the paper 'Concepts of Three-dimensional Time in Electrodynamics,' [1] the idea of dual symmetry, where in 4Space electric fields are sourced from electrical monopoles and electromagnetic induction, while magnetic fields are only sourced from electromagnetic induction. In 4Time, three dimensions of a Vector Time field and a Scalar Space field magnetic fields are sourced from magnetic monopoles and electromagnetic induction, while electric fields are only sourced from electromagnetic induction.was expanded to include.

The idea from the Reciprocal System Theory [2] of 3D Time and Scalar Space means that length, area, and volume are in terms of seconds, $seconds_2$ and $seconds_3$ and movement in time is in terms of meters. In that theory, it was explained that movement in 3D Space requires time, that is, dx/dt, and movement in 3D Time requires space, represented as dt/dx, or inverse velocity.

In 3D Space, electric fields are sourced from electric monopoles, and the magnetic fields are a flux without monopole sources. It lands up that the electric field is a flux in 3D Time, and the magnetic field is derived from monopoles that exist in 3D Time, the opposite of 3D Space. So the symmetry of monopoles and flux is captured with these additional dimensions of time and space. In addition, velocity in 3D Time is always faster than the speed of light from the perspective of 3D Space. When Scalar Time or Scalar Space is referred to, it is implicit that it is a three-dimensional scalar field that is treated as a one-scalar variable due to extreme uniformity. For clarity, the definition of a scalar field is a field that only has a single value for each location in that field. A vector field, by comparison, has a value or magnitude and a direction for each location in the field.

The following was captured in the summary of the above-mentioned paper:"*These 8 electrodynamic equations give the full symmetry between space and time, impacting how electric and magnetic fields relate to these extra dimensions of spacetime. These additional degrees of freedom, as radical as they might currently appear, allow for magnetic monopoles in 3D Vector Time and Scalar Space, where motion is always faster than light.*

In another paper, 'Concepts of Three-dimensional Time in Physics' [3], in the summary I state,

"*Movement in time manifests as energy and acceleration in time manifests as a force. The familiar Scalar Time field is 3D Vector Time compressed into a 3D Scalar Time field. This scalar field must have extremely high uniformity since Scalar Time is used as a one dimensional scalar variable, from the smallest dimensions of the atom to the largest dimensions of the cosmos, without affecting the physics. It appears we have much more to learn about time.*

3D Vector Time is easier to imagine, but movement in Vector Time requires Scalar Space, resulting in a reciprocal velocity from the perspective of 3D Vector Space. Just like the Scalar Time field manifests as a uniform scalar field, that is, as a uniform density in 3D Space, so it could be imagined that Scalar Space field is a uniform density in Three-dimensional Vector Time."

To understand time better, especially 3D Vector Time, it is helpful to compare it to 3D Vector Space. In 3D Vector Space, we generally use the earth's surface as a reference for location. We can identify a location on Earth, in terms of, let's say for this analogy, x, y, and z coordinates and label it the origin. We can move away from that location in any direction and then return to that exact location at any future time. As long as it is referenced to the earth, it is an absolute location. If we reference it with respect to our sun, it is not the same location anymore since in the time we moved away and back to this origin on Earth, the Earth has moved in its orbit around the sun. But if you wait long enough, you can get to the same location

in the orbit again. If you reference this location relative to the galaxy, it gets more complicated. So with space, you can normalize your position coordinate system so you can return to an absolute location.

But this is not how it is for time. For this analogy, let's assume we have three dimensions of Vector Space and Scalar Time, our typical experience of spacetime as we currently define it. If we mark time just as we move out of the origin, walk in any direction and then come back, we are at the same location in space, but we can never go back to the same time. At every moment, time is changing constantly. We can never go back in time, physically. So this three-dimensional Scalar Time field is always increasing in magnitude, no matter what direction you choose. The first time measurement becomes $t=t_0$ seconds, and then we measure from this moment. This method is the same, no matter what clock is used and when that clock started. The clock could be celestial, solar, atomic, it makes no difference. All we can do in time is measure a change, a delta. When motion is involved, we measure a change in space and divide it by this change in time [dx/dt]. All the directional properties of motion are captured in space, since time has no directional properties when physics is done in 3D Vector Space and Scalar Time.

To complete this analogy, let's move into Dewey Larson's [2] new neighborhood of spacetime, where time is three dimensions and has the property of direction in all three dimensions. We can measure any location in terms of seconds. The location can be defined in terms of t_x, t_y and t_z. It is possible, just like space, to move away from that location and return to it. It is well-defined. But now space is scalar, and like Scalar Time, it is always increasing in magnitude. To a time traveler in this neighborhood, it has the same issues as Scalar Time has to a space traveler. In this neighborhood, you can leave and come back to the same location in time, but space is always changing. To measure motion, you take a change in time and divide it by a change in space, that is, dt/dx or the inverse of space velocity. So space becomes the variable that can only be measured in terms of a change, or delta. In the RST theory, it is shown that the properties related to 3D Vector Time are energy and force.

In regards to Scalar Time that we are familiar with, these properties can only manifest in a scalar form. The only form of energy we know of is a scalar form which is independent of direction and so can be a property of this three-dimensional Scalar Time field. But force as it is currently defined is not a scalar, and so it cannot be a property *of* Scalar Time but is affected by Scalar Time. But force can be a property of 3D Time, since force is a vector and so is 3D Time.

1.4 Time fields and Zero-Point Energy

Zero-Point Energy and the Zero-Point Field are related as follows: The Zero-Point Field is potential energy with extremely uniformity. Zero-Point Energy is the motion that results from differences, or asymmetries, in the Zero-Point Field potentials. This Zero-Point Energy is a scalar field, since the motion is in all directions, so no particular direction can be associated with this energy field.

There are five properties of the Zero-Point Field that are typically associated with this field. First is the property of undetectability, the second is extreme uniformity, third is it is everywhere in space, the fourth is is that it is the source of atomic motion, and the last is that it is a scalar field. Zero-Point Field is undetectable due to the fact that it is Lorentz invariant, which means that constant motion through the field doesn't make it detectable, but accelerated motion does make it detectable.[2].

Zero-Point Field becomes detectable when its potential energy is converted into kinetic energy as a motion, called Zero-Point Energy.

Zero Point Energy has six properties that are important.

1. It is not detectable.
2. It is extremely uniformity.
3. It is everywhere in space.
3. It is the source motion.
4. Has the property of energy density.
5. It is a scalar field.

We measure this kinetic energy of the Zero Point Energy as a frequency, which is period of time and a period is just a change in time, so Zero Point Energy shares this same measurement with Scalar Time.

The properties of the Scalar Time field are as follows.

1. It is not detectable.
2. It is extremely uniformity.
3. It is everywhere in space.
3. It is the source motion.
4. Has the property of energy density.
5. It is a scalar field.

Time's uniformity comes from the fact that we can treat it as a single value in a 3 dimensional scalar field. Scalar Time's uniformity comes from the fact that we can treat it as a single value in a three-dimensional scalar field throughout the universe, from the smallest parts of the atoms to the largest parts of the cosmos, time is the same.

It is important to point out that it is the scalar field of time that is undetectable, not the difference in the value of the scalar field of time, which is what is measured as time in three-dimensional space. This is just like the fact that Zero-Point Field is undetectable, but the difference in Zero-Point Field, which manifests as Zero-Point Energy, is detectable.

Our measurement of time is coupled to velocity, so there is no way to measure time without a reference to space. With time, we are able to measure the change in location of time, but we cannot measure ***a location*** in time independent of motion. It is these locations in time that make up the 3D Vector Time field, which is undetectable. We can measure the kinetic results of ZPE on matter, but we cannot measure the potentials of ZPF.

So location in time is undetectable to us, but we have managed to use the change in time locations as our measure of time very effectively. But as shown in my first paper, multidimensional time has very important information that we are not using due to our limited view of time, just as the concepts in Zero-Point Energy are opening our minds to new possibilities in physics [1]. Potentials do not require motion, but they do require location. Gravitational potentials are purely the potential difference of different locations. For electromagnetic potentials, if no gradient is possible, no electric or magnetic fields are possible. Just like gravity is a potential generated by location, so time has potential generated by locations in the field of time. A simple analogy would be the probability, or potential, of a particular outcome in the future has different values for different vectors in this time field. These potentials have gradients, and therefore field densities, associated with them. Where these gradients manifest in the 3D Time field, scalar energies should manifest in the Scalar Time Field just like ZPE. So motion is embedded in the very fabric of matter

and is the generator of spacetime. Velocity is the ratio of the amount of space to the amount of time. In our part of the measurable universe, this ratio is 299 million kilometers for every second of time.

With a Scalar Time field, asymmetries in the undetectable time potentials of the 3D Time field generate the energy density associated with that field. In addition, I would expect that there would be a similar cutoff variable in this process, probably a frequency in time that limits the amount of energy density that is manifested in the Scalar Time Field. In the physics of ZPE, if the energy density of the ZPE increases, the value of a quantum of energy changes for every single electron in the universe at the exact same time [3]. Like the energy density of the ZPE, the density of the Scalar Time Field would have the same function, a universal time keeper for all of matter at the most fundamental level, with frequency being a critical measurable variable of the 3D Time field.

The speed of light is a Scalar Space field ratioed to Scalar Time field, generally uniform in all directions. One very interesting, and frustrating, fact is that the speed of light, being a scalar value, cannot be used to couple the location in 3D Time field to a location in the 3D Space field. In another paper, 'Electromagnetic Potentials in Three-dimensional Time', by the author, it is shown that scalar electromagnetic potentials in 4Space and 4Time are the same. So scalar electromagnetic potentials are the coupler between 4Space and 4Time, but vector potentials have different properties, one is a charge density and the other is a flux.[4]

Hopefully a better understanding of the Vector Time and space fields in the future will allow this ability by looking at a possible correlation between the Zero Point Field, a scalar field, and the known scalar potentials which are common to both 3D Space and Scalar Time and to 3D Time and Scalar Space.

2 Oscillating 4Space and 4Time

The oscillation between 4Space and 4Time spacetime realities is covered in the Multidimensional Time book [3]. One spacetime is always progressing, that is expanding, where every location in that reality is moving further apart from every other point, much like molecules of air do in an expanding balloon. In response to this expansion of one spacetime, the other spacetime is contracting. This contraction manifests as a gravity, since it brings all locations in that spacetime closer to every other location. It is the net balance of these two opposing forces that determines just how fast the observable expansion or contraction is happening in the spacetime reality one is in.

The existence of these two spacetime realities appears continuous, but it is postulated that at a deep level of reality, the universe is oscillating between these two spacetime realities. An analogy would be the 3D movies that we go to see. Two slightly different versions of the same movie are interlaced and so their presentation to us is oscillating between these two versions at a fast enough rate that our brain puts together these two different versions and gives us the experience of one continuous enhanced 3D version of the movie.

This oscillation of the photons between 4Space and 4Time, in one moment expanding and the next moment contracting, could account for the jittermotion inherent in the Zero-Point field. If the net jittermotion is zero, then no kinetic energy is measured coming from the tremendous potential energy stored in the Zero-Point Field. But if there is a small asymmetry between the expansion in one spacetime reality and the contraction in the other, then there will be measurable kinetic energy, which manifests as this jittermotion.

2.1 Mass

In an article called Zero Point Energy, by the Calphysics Institute, their scientists remind us that the Higgs field does not explain the origin of inertial mass of ordinary matter. The article states: "*The Higgs field applies only to the electro-weak sector of the Standard Model. The mass of ordinary matter is overwhelmingly due to the protons and neutrons in the nuclei of atoms*." In the same article, it states, "*The origin of inertial mass of ordinary matter is thus a wide-open question*."[7]

In the Reciprocal System Theory [2], mass is defined in terms of inverse velocity. The theory postulates, that motion in space is not possible without time, that is, a dx/dt. If matter is moving in 3D Space, its location is changing because of time. In the equation F=ma, mass is represented as $1/c_3$, that is $time_3/space_3$, a unit of 3D Time. Since velocity in time is the inverse of velocity in 4Space, this inverse velocity cubed, $1/c_3$, is used as a coupler between force and acceleration.

In papers on ZPF and ZPE, the authors have worked out formulations to show that mass is due to a reaction of the ZPF to accelerated motion in the field of ZPF, which is everywhere. This reaction to accelerated motion of charge is inertia, which is measured as inertial mass in Vector Space and Scalar Time. So mass is not an innate property of matter, as theory states. In the ZPF paper "Beyond $E=mc_2$", the authors state: "*In our formulation, the m in Newton's second law of motion, F=ma, becomes nothing more than a coupling constant between acceleration and an external electromagnetic force*."[5]. In my paper, Energy was shown as a property of the 3D Time Field with units of time/space, or 1/c, as postulated by the Reciprocal System Theory. If the equation $E = mc_2$ is solved for mass, then mass = E/c_2, and E has been shown to be equal to 1/c, so mass is $1/c_3$. So mass is energy in three dimensions of time. Again, in the same paper "Beyond $E=mc_2$", the authors state the following, based on the derivation of mass from ZPF: "*In the view we will present, Einstein's formula is even more significant than physicists have realized. It is actually a statement about how much energy is required to give the appearance of a certain amount of mass, rather than about the conversion of one fundamental thing, energy, into another fundamental thing, mass.*" Later in the same paper, they are more explicit: "*Mass is energy."* [2] The 3D Time derivation of mass says exactly the same thing, where energy is a property of time. So mass is not an innate space property of matter; it is a result of energy generated by motion in 3 dimensions through the field of time. [5] In addition, the Reciprocal System Theory states that motion in time is in opposition to motion in space. The theory of ZPE and time appear to correlate pretty well.

2.2 Scalar Time Field, Dark Energy and Dark Matter

Physicists have proposed that while the frequency limit for the Zero-Point Field can be as high as Planck's frequency, there is likely a cutoff frequency at which density of ZPE is limited to. One approach to estimating a cutoff frequency is to estimate the energy density and solve for the cutoff frequency. If the energy density of visible and dark energy is taken into account, and then this equation is solved to determine an upper limit of frequency, the result is in the low Tera Hertz [10_{12}] range [8].

Cosmologist found that in order to explain the expanding universe, there has to be matter that is creating a negative pressure, or expanding force, that accounts for this expansion. Since the energy cannot be detected, it is labeled dark energy.

Beck et al, have proposed that with a cutoff frequency in the low THz range, the energy density of ZPE matches that of the energy density of dark energy. They postulate that the ZPE could be the source of this dark energy as well, since it manifests as a negative pressure, causing the expansion of the universe. [6]

It does not seem unreasonable to use this same idea of a cutoff frequency, since frequency is a property of time, as a limit of how much of the 3D Time Field manifests in the Scalar Time field. In this way, the density of time in the Scalar Time field is determined, and as the density of time changes, so does the very fabric of this Scalar Time field, and therefore effecting the density of matter.

As mentioned in the previous section, the Reciprocal System Theory states that motion in Scalar Time field is in opposition to motion in the Scalar Space field. So if motion in Scalar Time is toward all other locations, motion in Scalar Space would be away from all other locations. So a contraction in Scalar Space is met with opposition to an expansion in Vector Space and Scalar Time.

A good example is air in a balloon. If a balloon is filled with air in a cold room and then brought into a warm room, the increase in heat will transfer to the air molecules, which then vibrate more vigorously. Each molecule will then push every other molecule away from it and the balloon will expand uniformly in all directions, that is, a scalar expansion. The opposing force will be the electromagnetic attraction between the molecules of the balloon. In this case the balloon expands because the energy of the vibrating air molecules is greater than the attractive force of the balloon molecules.

If the same balloon is brought outside into the cold weather, the molecules will lose energy through the loss of heat and each molecule will move closer to every other molecule as the contracting electromagnetic force of the balloon molecules, contracting uniformly in all directions, is now greater than the outward force of the air molecules inside the balloon. This results in a scalar contraction.

An expansion of our universe is what astrophysicists are currently measuring, and they postulate this Dark Energy as the explanation for this expansion. In this paper, I believe there is a good correlation to the scalar expansion of time as the basis for this Dark Energy.

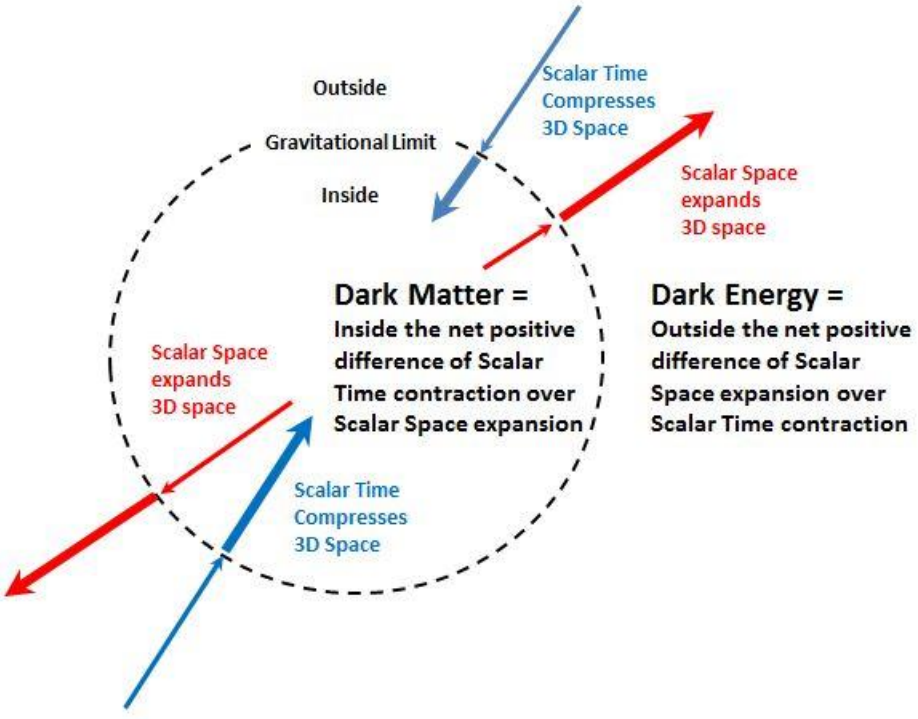

Figure 1. Dark Energy and Dark Matter

The Gravitational limit is the place the RST theory states that the force of the scalar expansion exactly matches the force of scalar contraction. Inside, this gravitational limit, the force of scalar contraction dominates, pulling matter closer together [thicker blue arrow signifies that that force of scalar contraction is greater than the red scalar expansion arrow]. This force of scalar contraction, fundamental to the fabric of spacetime, could be the Dark Matter the astrophysicists are looking for. Outside the gravitational limit, the force of scalar expansion dominates, as shown by the thicker so the fabric of spacetime expands. This expansion could be the Dark Energy that is postulated.

With the 4Space and 4Time model, this balance of expansion and contraction is seen to be conserved between these two spacetimes. If the expansion in 4Space slows down and reverses, as is the expectation of astrophysicists, then in 4Time, the contraction has to slow down and reverse into an expansion in order to conserve this balance, a balance toward unity. As posed before, the question then becomes, what is the driver that is causing 4Space to expand and 4Time to contract? Is it part of a greater cycle like so many cycles in nature? Here that question remains unanswered.

The energy density in time was noted as the speed of light squared higher than that of space. With 34.6 billion times more energy, if the amount of matter was equal parts of space and time, then 4Time would account for so much more than 95%. It would appear that only a portion of the energy density of time manifests into 4Space matter. This limitation could be like the limit on the number of frequencies that the Zero-Point Energy can support, a limit that is necessary to keep the universe in balance. This limit is discussed in more detail in the next section.

2.3 Conclusion

The extreme uniformity of the ZPF, and of Time, means that there is a Balance. Without the balance, the gradients would manifest force that would rip matter as we know it apart. For every action, there is an equal and opposite reaction. The model of an eight-dimensional Vector Space and Scalar Time and Vector Time and Scalar Space allows for this model of opposite reaction.

This paper has focused on the common properties between time and zero-point energy. In this paper, as well as in my previous papers, I derive and delineate some properties of Time postulated by the Reciprocal System Theory, but include new properties as well. There are a number of properties of 3D Scalar Time fields that are shared with Zero-Point Energy, such as undetectability, uniformity, motion, density, and frequency. In addition, the ZPE is the universal time keeper for all matter, a property associated with time, so it is plausible that these time fields are the same as ZPE. Just as a cutoff frequency limits how much Zero-Point Energy density manifests out of the Zero-Point Field, so too a cutoff frequency could be applied the amount of time scalar density that manifests out of the 3D Time Vector field. A more dense time field would mean the locations in the time field are closer together, and since we use the change in time locations as our measurement of time, it would change time as we measure it.

The postulate of the Reciprocal System Theory that motion in time is in opposition to motion in space could account for the energy, labeled dark energy, and this opposition is the expansion that is measured in our universe. This correlates time to gravity, and in an earlier paper, time to magnetism. Hopefully in the future, we can uncover what this relationship might be.

The oscillation between 4Space and 4Time, when there is asymmetry between the energies of the two, could account for the manifestation of Zero-Point Energy as the ‘jittermotion’, which is nothing more than an oscillation between the expansion and contraction of Scalar Time and Scalar Space.

The origin of mass is not well-known, and Stochastic Electrodynamics has provided a very interesting insight that mass is the coupling between force and acceleration and mass ***is*** energy, exactly as it is in the 3D Time [5].

The field of Stochastic Electrodynamics provides a new way of looking at our universe, as does the dimensions of 3D Time and Scalar Space. I believe the overlap of these two theories, multidimensional time and Stochastic Electrodynamics, will give us new insights into spacetime that were not available before. It is possible that viewing ZPE as a time phenomenon could lead to faster insights into dimensions of spacetime beyond the four we currently work with.

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Version

1. Original
2. Jan 03,2014. Update correlation of ZPF to scalar potentials, section 4.
3. Nov 30, 2015. Update to include gravity as a time phenomenon, as well as the link of time to magnetism.
4. Nov 12, 2016. Change email address. Add in note about proper time, as defined in relativity in section 1.4