

There is an important clue in this difference between the formulas. There is awkwardness between these two formulas that should not persist. This point can be demonstrated by altering the second formula:

$$f = \frac{dE}{dx} = \frac{mv_p dv_p}{dx} = ma$$

The point is that Newton's force formula for gravity should be easily manipulated into all of the forms shown above. What is specifically not clear is how to show:

$$\frac{Gm_1m_2}{r^2} = \frac{mv_p dv_p}{dx}$$

What I wish to show is that one is theoretically derivable from the other. To be more accurate, there is a connection in this new theory; however, it leads to a new perspective on the nature of force.

Two new clues are available to help decipher this riddle of the force of gravity. One clue is that the units of G are velocity to the 4th power. The second clue is that force is dimensionless. The new theoretical tool which this makes available is that force times force or force divided by force is still force. In other words, a single force can be the product or quotient of any number of other forces. The units still match because there are no units.

The new units of the universal gravitational constant inserted into the force of gravity formula allow me to move easily between the different fundamental forms of a force equation. First I recognize that an incremental change in velocity has units of velocity. This means I can anticipate that:

$$G = v_1 dv_1 v_2 dv_2$$

If this is true, then, I can write:

$$f = \frac{Gm_1m_2}{r^2} = \frac{v_1 dv_1 v_2 dv_2 m_1 m_2}{r^2}$$

Yielding:

$$f = \left(\frac{m_1 v_1 dv_1}{r} \right) \left(\frac{m_2 v_2 dv_2}{r} \right)$$

And since:

$$r = n_r dx_c$$

Then:

$$f = \frac{1}{n_r^2} \left(\frac{m_1 v_1 dv_1}{dx_c} \right) \left(\frac{m_2 v_2 dv_2}{dx_c} \right)$$

Rewriting this into a general form:

$$f = \frac{1}{n_r^2} \frac{dE_1}{dx} \frac{dE_2}{dx} = \frac{1}{n_r^2} f_1 f_2$$

When the radial quantum number is equal to one then:

$$f = f_1 f_2$$

This suggests that Newton's basic formula for force of gravity consists of the product of two other measures of force. I will shortly give a physical interpretation for these two forces. For now I develop further mathematical representation for the force of gravity. Acceleration can be expressed as:

$$a = v \frac{dv}{dx}$$

I substitute this into the force formula given a few steps above:

$$f = \frac{1}{n_r^2} m_1 a_1 m_2 a_2$$

Comparing this to Newton's force of gravity formula, I convert the formula above into:

$$f = (a_1 a_2) \frac{m_1 m_2}{n_r^2} = (a_1 a_2 dx_c^2) \frac{m_1 m_2}{n_r^2 dx_c^2} = (a_1 a_2 dx_c^2) \frac{m_1 m_2}{r^2}$$

I then conclude that:

$$G = a_1 a_2 dx_c^2$$

What is this acceleration that helps to form the value of G ? I can reasonably anticipate our macroscopic concept of gravity is formed from quantum values of a primary value of gravitational force. What I mean is: Two particles of matter, either protons or neutrons, would experience the first quantum level of gravity at a distance of one photon length.

This is what I will anticipate to represent the first quantum level of gravity. As a first approximation I don't include an electron as one of the particles because they are almost insignificant in our macroscopic measurements of gravity.

In order to test this hypothesis I solve for the acceleration contained in G . Since I am thinking in terms of two identical particles, their accelerations are equal and I can write:

$$a_G = \left(\frac{G}{dx_c^2} \right)^{\frac{1}{2}} = \left[\frac{6.673 \times 10^{-11} \frac{\text{meters}^4}{\text{sec}^4}}{(5.0 \times 10^{-11} \text{meters})^2} \right]^{\frac{1}{2}}$$

Yielding:

$$a_G = 1.6 \times 10^5 \frac{\text{meters}}{\text{sec}^2}$$

I need to compare this result with the acceleration predicted by using Newton's gravitational force formula:

$$f = \frac{Gm_1m_2}{r^2} = \frac{\left(6.673 \times 10^{-11} \frac{\text{meters}^4}{\text{sec}^4} \right) (1.672 \times 10^{-27} \text{kgm})^2}{(5.0 \times 10^{-11} \text{meters})^2}$$

The acceleration of one of the protons is:

$$a = \frac{f}{m_p} = \frac{7.5 \times 10^{-44} \text{newtons}}{1.672 \times 10^{-27} \text{kgm}} = 4.5 \times 10^{-17} \frac{\text{meters}}{\text{sec}^2}$$

Comparing this result to the acceleration obtained using G it appears there is no connection. However, there is a connection if I make a comparison using force instead of acceleration. The force on a proton using the acceleration I obtained from G is:

$$f = m_p a_G = (1.672 \times 10^{-27} \text{kgm}) \left(1.6 \times 10^5 \frac{\text{meters}}{\text{sec}^2} \right)$$

Yielding:

$$f = 2.7 \times 10^{-22} \text{ newtons}$$

I observe this force to be the square root of the value of force obtained using Newton's formula. The units of Newton's formula would make this into a real dilemma. However, recognizing that, in this theory, force has no units removes this dilemma. One force can be the square root of another force. What needs to be explained is: What can be the physical interpretation of the product of two forces?

The answer to this question comes from recognizing that there are two ways to measure the acceleration of the two protons. A remote stationary observer would measure each proton as having equal accelerations with respect to the observer. A local observer located on one of the protons would measure an acceleration of one proton with respect to the other proton. This observer's measure of acceleration would

be different from that obtained by the stationary observer. The path of the theoretical connection between the two is to use force.

For the stationary observer there is a different value of force with which to work. He uses a value of force that will predict a proton's acceleration with respect to him. This is not the same value of force that must be used to measure the acceleration of one proton with respect to the other proton. For the local observer:

$$f_L = m_p a_L$$

For the remote observer:

$$f_R = m_p a_R$$

I now use as a guide the formula derived above which shows Newton's force of gravity to be the product of two other forces. In other words, I assume the value of the remotely measured force to be the square of the locally measured force. The mathematical expression of this is:

$$f_R = f_L^2$$

Or:

$$m_p a_R = m_p^2 a_L^2$$

Newton's formula gave me the remote value of acceleration. Now I solve for the local measure of acceleration:

$$a_L = \left(\frac{m_p a_R}{m_p^2} \right)^{\frac{1}{2}} = \left(\frac{a_R}{m_p} \right)^{\frac{1}{2}} = \left(\frac{4.5 \times 10^{-17} \frac{meters}{sec^2}}{1.672 \times 10^{-27} kgm} \right)^{\frac{1}{2}}$$

Yielding:

$$a_L = 1.6 \times 10^5 \frac{meters}{sec^2}$$

This is the measure of acceleration I obtained using G . I conclude that the mathematical expression of G is:

$$G = a_{pL}^2 dx_c^2$$

The interpretation for this result is: The fundamental gravitational constant is the square of the local acceleration due to gravity of one proton toward another proton multiplied by the square of the distance between them. The distance is the length of one photon.

There is an appearance of an artificial aspect of this result. Since the acceleration due to gravity is formally defined using the fundamental gravitational constant, then the equation can seem to be defining G with an expression that ultimately contains G . This is not the case. The reason is that the acceleration due to gravity in this theory is due to the variation of the speed of light.

The variation of the speed of light is the fundamental given from which all effects are derived. Therefore, the phrase, the local acceleration due to gravity, is to be understood as the local acceleration of light. When read this way, the equation actually defines G in terms of the variation of the speed of light.

Particle Polarity .

The empirical evidence of electrical type effects demonstrates that there is a cause of polarity and it is connected to particles of matter. Electrons will voluntarily move toward protons. Electrons will voluntarily move away from other electrons. The effect named polarity, as with all effects, must be caused by the primary cause. The primary cause is the variation of the speed of light.

I have already used, for the purposes of defining the size of the hydrogen atom, the idea that electrons cause a positive exceleration of light and protons cause a negative exceleration of light. There is, therefore, a natural polarity of the change of velocity of light. This is the starting point to begin theorizing the polarity of electrical effects.

The speed of light is under the control of particles of matter. The theoretical model of the light-field, which I have used only for convenience, is superfluous. Since particles of matter are already defined, there is nothing else needed. The particles of matter are the form of existence of the primary cause that I have called light-fields. In an analogous manner, it can be argued that there is no universal background of emptiness. The integrated extensions of particles are the definition of space.

Although particles can theoretically be said to be infinite, the effect we measure as the mass of a particle is detectable almost solely within the length of a single photon. Beyond this distance, the particle's effect becomes greatly diminished as evidenced by the difference of magnitude between electrical force and gravitational force.

What have been known as charged particles are high and low points in the continuum of space or, as space can more accurately be defined, are high and low peaks in the continuum of the control of the speed of light. They are high and low points in the speed of light. Their overlapping effects are what I have defined as the background light-field. I

will use this visual aid again here. The background light-field is a relatively constant speed of light. Its variations are measured as the effect we call gravity.

I picture electrons as the high peaks and protons as the low peaks with respect to the background light-field. Since electrons and protons are attracted toward each other, I anticipate that there is something about the polarities of their accelerations of light that causes this attraction. If this is the case, then it implies that the variation of the speed of light is one of two fundamental aspects of the universe.

There are, it seems to me, two causes of change in the universe. There is, of course, the variation of the speed of light. The first aspect is that there are permanent sources of a change of velocity of light. These sources are called particles, and they guarantee there will always be variations in the speed of light.

The second aspect is that light acts to neutralize variations in its speed. The movement of an electron toward a proton accomplishes a minimization of their individual effects upon the speed of light. In other words, their opposing effects increasingly overlap and tend to counteract each other. It is as if the speed of light needs to try to be a constant.

The existence of individual electrons and protons disrupts this goal. The combining of electrons with protons is an approach toward this goal. Also, the movement of one electron away from another electron has the same effect. I define a positive electrical polarity for matter if the speed of light increases with distance from the particle. The polarity is negative when the speed of light decreases with distance from the particle.

The effects we have known as electrical repulsion and electrical attraction are the result of these two opposite polarities causing particles to move in a manner that tends to neutralize changes of the speed of light.

Photon Electromagnetism .

I have treated the electromagnetic properties of photons as if they were represented by a two dimensional tilt. This is a gross simplification for what would actually occur. The photon is assumed to be perfectly pliable in order that it is able to accurately record any history of changes in velocity. The idea is to account for all force effects by using unique shapes for the photon.

The photon is assumed to be very thin. This does not foreclose on the possibility that the thickness of the photon may change. I am only considering at this time the linear shape and orientation of the photon. It can be pictured as a short piece of soft wire which will accept any three dimensional shape. A photon can be bent into various forms. These forms include all practical possibilities. Also it is assumed that some force effects can be accounted for by only twisting the photon. Any variations of twists can be included into the shape of the photon. In principle a photon could be shaped like a corkscrew or could contain sharp bends.

All of these possible variations of bends and twists result from overlapping light-fields, or particles, which are changing their velocities with respect to each other. The photon acquires a recorded history of the changes in light speed that it has encountered. It also is sharing a portion of its historical record with the light-fields it encounters. It acquires and transfers energy. For the photon and light-field to interact, the light-field must have a gradient. If a photon traveled through a flat light-field, there would be no interaction.

Every possible kind of change of velocity can be recorded onto the photon in this manner. Sometimes there may be only very subtle differences between photons. One phenomenon that might be accounted for in this manner is when two spectral lines are found where only one is expected. It is this phenomenon that originated the idea of electron spin. While there clearly must be some difference between the two electrons, they would also have experienced very similar histories of changes in velocity. They have a very close relationship.

Perhaps the great similarities and the minor difference will be accounted for by defining two resulting photons with exact shapes but being mirror images of each other. Whether it is mirror image or some other kind of symmetry, the photons could share almost all of the same spectral properties while differing only by being reversed in some single manner.

Gravity

All effects are the result of a change in the speed of light. Therefore, there must be a relationship between the effect we call gravity and that which we call electromagnetism. It has been assumed in modern physics, as a fundamental given, that the magnitudes of electric charge of an electron and proton are the same. Certainly within the limits of accuracy of measurements, empirical evidence indicates they can be treated as being identical. However, caution should be exercised in reaching an absolute conclusion. If we cannot measure absolutely, then we do not know absolutely.

It is known there are force effects differing so greatly in magnitude that one can completely mask the other. For example, gravity is completely masked by electrical force because their effects differ in magnitude by approximately forty powers of ten. It is risky to close out new possibilities by insisting that the magnitudes of the electric charge of the electron and proton are exactly equal.

Force results from the variation of the speed of light. There are two aspects of this variation. One is the continuous variation of the speed of light. Another is the discontinuous variation. The first is the light-fields we call particles of matter. The second is the increment of change in the speed of light stored in photons. Electrical force is explained by attributing positive and negative accelerations of light to different particles of matter. Where, then, does the effect of gravity come into play?

This theory says that gravity is also caused by the variation of the speed of light. Freely falling bodies of matter change their velocity as a function of the changing velocity of light. The simplest expression of this effect is to say the accelerations of light and of matter are equivalent.

Even though I use exceleration and acceleration to explain the effect of force, they are not themselves the same thing. They are different types of measurement of the same event. For the purpose of explaining the physical basis of gravity, I will use the measurement of exceleration. The usefulness of the concept of exceleration is due to its being a measurement of change of velocity with respect to distance.

Since all effects of force are the result of the interaction of photons with particles, then it can be instructive to visualize what occurs over the incremental distance of particle change of velocity. All such distances are smaller, usually much smaller, than the length of a photon. However, distance is always involved and, therefore, intervening circumstances are not constant. In other words, effects theoretically constant at a point in space are usually not constant in observable events because distance is involved.

When measuring the effect called gravity, increments of distances are involved across which the speed of light is varying. This variation of the speed of light reveals itself in a change of energy of a passing photon. If a point in space is used to observe the passing of a photon, then during the passing of the photon the changing speed of light will cause the energy of the photon to vary. If the photon is moving into an area where the speed of light is increasing, then the length of the photon is increasing and its degree of tilt is decreasing. In other words, the stored electrical force of the photon is decreasing in magnitude. It is this change in the magnitude of electrical force which is the origin of the effect we call gravity.

Another useful way of visualizing the cause of gravity is to picture two photons moving through a changing light-field in opposite directions and moving very near to the same point. The two photons have their leading ends about to cross approximately the same point. Even if the photons received their initial stored force under identical circumstance, they will cause two different magnitudes of effects. It is the difference in magnitude of photon energy that is the origin of the effect called gravity.

It is assumed that at any particular point in space where electrical force is considered to be neutral, that there are actually vast numbers of electrically charged photons moving in all directions, and their average electrical effect can be considered to be zero. There is, in this theory, the prediction that observable things are not truly neutral and there is a measurable resultant effect.

I consider the case where two photons are approaching a point from opposite directions and in the neighborhood of a charged particle. Even though at a given point the effects of the photons might cancel out, this cannot be the case for the total effect of the photons upon the charged particle. A background light-field gradient makes neutrality beyond the point impossible. The effect between photons and matter does not occur at

a point. The effect is felt over the detectable extension of the light-field of the particle. The particle will then be caused to move in response to the photon made stronger by the light-field gradient. This response to the stronger photon is the cause of the effect we call gravity.

There is another useful way to visualize what is occurring. It is assumed that one proton sends out simultaneous identical photons to a remote isolated electron and an equally remote isolated proton. The receiving electron and proton are exactly the same magnitude of distance away from the first proton. It is assumed that this distance is such that both receiving particles are measurably affected by the light-field of the first proton, but are not measurably affected by each other. It is also assumed that the first proton is fixed in space. The electron will interact with the photon and as a result the electron will move toward the first proton. The second proton will interact with its photon and will move away from the first proton.

Even if the energies of the two photons were identical, their resultant electrical effects would not be the same. Since each receiving particle is moving during the time it takes to receive the total energy of its photon, different changes of distance with respect to the light-field of the stationary proton would change the total amount of energy delivered by its photon. The electron would move more closely toward the stationary proton. Its deeper penetration into the light-field of the stationary particle would cause it to receive more energy than would the second proton. It is this difference in total received change of energy which is the origin of the effect we call gravity.

In all these examples the cause of gravity is the same thing. It is the change in the speed of light over the incremental change of distance the particle travels while absorbing a photon's energy. In other words, it is the change of length of a photon and the corresponding change in the tilt of the photon during the fundamental increment of time. If there are two hydrogen atoms in proximity to each other, and only their own respective light-fields have gradients, then they will be attracted toward each other by a force proportional to their two masses.

Each atom is almost electrically neutral except for the resultant light-field gradient, which causes gravity. Their resultant gradients make each atom appear a very little bit like they are positively charged. If electric charge were true then all atoms would repel each other. Since there is only the change of the speed of light, then the examples given above may indicate why atoms are attracted to each other.

The reason is that the electrons are attracted toward each opposite atom more strongly than the protons are repelled. This stronger attraction results from the electrons moving in the direction of a stronger light-field gradient. The protons are repelled much more slightly into the direction of a weaker gradient. This means that two photons, interacting with the two kinds of particles and which are identical at the initial time of impact, will have their energies changed slightly in opposite directions of magnitude during the period of interaction.

The change in magnitude of energy for each photon will be half of that of the total change of potential energy of the light-field. This is an approximation that can be made based upon a linear interpretation of the change in energy. The change is zero at the beginning and reaches the maximum value at the end of the interaction. Treating the problem linearly means the total change of energy transferred to the particle is one half the change in potential energy.

Each particle receives one half the change in potential energy for the direction it is moving. Since the changes in potential energy are different for each, then it is one half of the difference between the potential energies that propels one atom toward the other. This is just an approximation. Since the gradient of the light-field is not changing in a linear manner, then we can expect the difference in potential energies to be very slightly higher than when it is calculated linearly. The force of gravity then should become stronger as the atoms become closer.

Gravity is pictured as being generated by the imperfect neutrality of the electron and proton of the hydrogen atom. Therefore, gravity exists only outside the hydrogen atom. What is then the case for more complex atoms? Do they have gravity inside the atom? The answer lies in an understanding of neutrons. This understanding will show that neutrons also generate the gravity effect. There is, therefore, gravity inside all atoms containing neutrons.

Newton's formula for the force of gravity treats it as if it were exactly inversely proportional to the distance of separation squared. This assumes the universal gravitational constant to be truly a constant. Since this constant is a function of the change in the speed of light, it is not really a constant. It is decreasing with distance the same as is the speed of light. For example, Mercury should experience stronger gravitational pull than expected based upon a universal gravitational constant measured with respect to earth.

It is interesting to observe this new interpretation of the effect called gravity as leading to both contraction and expansion properties of the universe. It follows from the work here that gravity results from the formation of atoms. That is, particles of opposite polarity join together to form atoms that are very nearly electrically neutral. When atoms are interacting with one another they respond in the manner described above. This is true also for electrons interacting with atoms.

On the other hand, individual protons would experience reverse gravity. An isolated proton caught in a gravitational field will move away from the source of gravity. Such protons would tend to isolate themselves from all positively charged or neutralized matter. They would have a repulsive effect against that kind of matter. This means isolated protons would push the universe apart while atomic matter attracts other atomic matter. Loose electrons would try to capture the isolated protons turning them into atomic matter that would move to join other atomic matter. However, when energetic photons knock an electron sufficiently far away, the proton will seek to move back into isolation.

A New Equivalence Principle

There is a claim by Einstein that because a person in free fall experiences no sense of being under the influence of a force there is then for him no force of gravity. He is merely doing a very natural thing as explained by the general theory of relativity. In general relativity the force of gravity does not need to be explained any more than does the experience of moving at a constant velocity with no resistance.

This claim, if correct, gives gravity a different nature than all other forces. Since gravity actually has the same nature as all other forces then Einstein's claim must be wrong. The error he made, in simplest terms, was to ascribe something to gravity that belongs to all acceleration. In principle, any *body* undergoing pure acceleration will feel nothing. The cause of the acceleration is not a factor if the acceleration is pure and complete in its application.

There is certainly something felt during most accelerations so what is it? What is felt is distortion and compression. If a body is pushed on one side only, it will undergo compression. If a body is pushed at one small part only, it will undergo both compression and distortion. We feel the effects of changes in the distance between our molecules and atoms. We feel nothing if all particles in our body suddenly accelerate in perfect unison. During free fall due to gravity this situation is very closely approximated.

What then is to be said of the principle of equivalence? Let us examine a common example cited in support of this principle. The example is of a sequestered scientist inside a windowless room. The point stressed is that there is no way for the scientist to determine whether he is feeling the effect of gravity or the effect of acceleration. Since the scientist cannot devise a test to determine why he remains standing on the floor, the conclusion is made that gravity and acceleration are the same phenomenon. In other words, if we can't tell the difference then there is no difference.

There is a revealing connection between this example and the importance of first properly understanding force. This connection is: An analysis of force tells us there is a difference between the effect of gravity and the effect of acceleration. In the case of gravity we know there are two forces at work on the scientist. Gravity exerts a force on him trying to pull him downward. The floor of the room is exerting a second and separate force pushing upward against him. There are two equal but opposite forces at work. These two forces cause compression and distortion.

In the case of acceleration there is only one force at work on the scientist. This force is the floor pushing him upward. Therefore, the difference between the two situations is a difference in the number of forces at work. The fact that the scientist cannot distinguish between the two cases does not prove gravity and acceleration are the same thing. All he needs is a window to prove they are different.

What we do learn is that we cannot distinguish between different combinations of force so long as they add up to the same effect. In these two cases the effect felt is not

acceleration. It is almost identical compression and distortion to the scientist's body. Therefore, it is force that is suggested to be of a common nature. The equivalence principle belongs to all force.

Nuclear Physics

Nuclear physics is the crucial next step to take in this theory. I am not at this time offering a formal introductory analysis of nuclear reactions. I need to take more time to comprehend the current fundamental understanding and empirical evidences of nuclear physics. All theory involves conjecture. I hope that, up to this point, I have provided a theory with strong substance and little conjecture. From this point on there is mostly conjecture. Before proceeding I want to stress that all we know from empirical evidence is the mechanical universe is gauged by changes in velocity.

Perhaps particles such as neutrinos exist and perhaps they don't. There are many other mysterious particles that are believed to exist. My own approach to the problem of identifying which particles do exist and which do not is first to acknowledge that we know only that there are nuances to empirically measured changes in velocity. We should try to explain these nuances. However, empirically speaking, they will always remain just changes in velocity. The tendency to identify new particles or new dimensions as the causes of these nuances is risky. It's analogous to the risks encountered in field theory.

Once we decide we have found a new particle or a new force field, we are tempted to stop our search. We do not feel a need to look further unless new empirical evidence provides a nuance that seems to challenge our belief. Since our only source of information about the universe is photons carrying increments of changes of velocity, all of our interpretations of this information are strictly beliefs. Beliefs can change.

We should use helpful ideas, but we should not rest upon them. This can sometimes be hard to do. I point out to the reader I have practiced this resistance myself as demonstrated in this book. I found myself forced time and again to discard accepted hard-core ideas. One instance, during which I felt particularly uncomfortable, was accepting the realization that there is no such thing as electric charge. Once I understood this and forced myself to search for a new meaning behind the empirical number we identify as the magnitude of electric charge, I was able to find a new and, I believe, better theoretical answer.

As we look deeper into atomic reactions, I suggest we resist assuming new primary causes. Or, at least let us avoid insisting that those we must invent are real. It is essential for a unified theory to move seamlessly between all areas of physical phenomena. For the reader who finds merit in this theory thus far, here is a point where you can move beyond my work. I will make some suggestions as to how I would approach interpreting nuclear reactions.

First, I would begin with as few particles of matter as possible. The two I would choose to begin with are the electron and positron. Also, there are some theoretical tools to carry along. All effects must be traceable to variations in the speed of light. For example, the strong nuclear force might be evidence that when fundamental particles are very close together, the slope of their combined light-fields may reverse itself for a small distance between them.

One other tool to try using is to assume, first, that photons must be involved. For photons to be involved in nuclear reactions, their length must be caused to shrink drastically. They would have to be at least as small as the size of a proton. Such small photons require that the local speed of light be proportionately reduced.

A tool that can always be counted upon to work in all circumstances is what I have called the fundamental increment of time. It is always an absolute constant. The discussions that follow are not part of a rigorous presentation of theory. They are intended to be suggestive of ideas that may be useful for extending this theory.

Neutrons

Neutrons are defined as being electrically neutral. This definition is not logically maintainable. The neutrality of a neutron cannot unquestionably be interpreted as electrical neutrality. The reason is that one neutron cannot pass through another neutron or any other particle of matter. It also cannot be the case that neutrons can bang against each other because they are tiny balls of matter. There is no evidence at all that there is anything material about matter. The concept of materiality is a theoretical invention reflecting macroscopic interpretations.

Field theory and materiality are incompatible. In this theory it has been argued a particle of matter consists only of a light-field. It is assumed here that neutrons also consist of a light-field or a combination of light-fields. It has also been argued there can be no effect of force without the catalysts called photons. Therefore, I further assume the interaction of neutrons with other particles through photons. If this is all true, then neutrons cannot be completely electrically neutral. Neutrons, like all matter, exhibit the property of gravity. Gravity is electrical in origin. It is an extremely subtle electrical effect.

Since a neutron can cause the effect of gravity, then neutrons cannot be completely electrically neutral. This is consistent with my fundamental postulation that all effects are the result of the variation of the speed of light. If the variation of the speed of light is the cause for all effects, this requires there cannot be absolute neutrality. Absolute neutrality, i.e. a constant speed of light, would result in no effects.

Neutrons must also be defined using the variation of the speed of light. Simplicity suggests a neutron might be formed from the combination of a proton light-field and an electron light-field. This combination would allow for the appearance of electrical neutrality while accounting for the effect of gravity. Empirical evidence supports this

approach. When a neutron disintegrates it separates itself into an electron and a proton. It is then reasonable to assume that if it separates into an electron and proton, then it probably consisted of the combination of an electron and proton or at least of their possible constituents.

In fact, the similarity of gravitational effects between a hydrogen atom and a neutron suggests some probable physical similarity between the two. It is assumed this similarity consists of an electron orbiting a proton. How can an electron orbit a proton at such a close distance? What is required is that the two light-fields combine in such a way so as to shrink the size of a photon down to less than the size of a neutron.

This means the local speed of light inside a neutron is sufficiently lowered to allow this amount of shrinkage to occur. To an outside observer, who defines the speed of light as a universal constant, the effects of the very low speed of light would be interpreted as being due to objects of very large mass.

Formation of Atoms .

The acceleration of light raises the question of a polarity for mass. It is assumed that the acceleration of light due to a particle can be positive or negative. I define a positive polarity for mass if the speed of light increases with distance from the particle. The polarity is negative when the speed of light decreases with distance from the particle.

I will assume, since the source of a positive acceleration of light attracts the source of a negative acceleration of light, that there is a natural goal or speed which light is directed to achieve. I will further assume this goal or speed to be constant. That is to say, the acceleration source moves in a direction that will accomplish the most diminishing effect upon the acceleration of light.

The proton moves toward the electron and vice versa because opposite accelerations of the speed of light tend to cancel each other out. Particles, which are the source of the imbalance of the speed of light, try to move in directions tending to cancel out the imbalance they cause. There are important limitations on the ability of particles to achieve some balance in the speed of light. I will give two of them here.

One is, the particles do not move toward or away from each other just because of the gradients of their light-fields. They can only react to the intermediaries of light, the photons. The existence of light-fields does not cause any direct action between particles. If it weren't for the existence of photons, particles would have no means for revealing their existence to one another. Particles need photons as the catalysts to enable them to move.

The photons are the catalysts because they carry acceleration with them. The amount of this increment of acceleration will not normally be the precise amount that would allow for a secure balancing of effects to occur. The particles accelerate in response to

the history of motion of other particles. The timing is late, and the acceleration is not the correct amount needed at that late instant of time.

Photons gain their increments of acceleration from the motion of the particles. Acceleration is being passed back and forth. This exchange of acceleration back and forth between photons and particles will not let either of them achieve a lasting balance. Usually there will not be a balance achieved between the light-fields. The normal condition is that the only balance that can occur often enough to allow for a predictable universe is the balance of acceleration between photons and particles. When this kind of balance is achieved, atoms form. Even more than this, perhaps protons and the like also form in an analogous manner.

Protons

Empirical evidence used to support quark theory shows protons not to be primary particles but to consist of other more primary particles. Since quark theory depends upon the existence of electric charge, then there is a need for a new theory concerning the structure of the proton. Electric charge does not exist. Therefore, quark theory must be wrong.

It would seem to be the case that, since a proton measures to have an apparent electric charge equal but opposite to that of an electron, there is a connection between a positron and a proton. If we could work with only electrons and positrons to build the universe, this would be an attractive alternative to current quark theory.

I speculate, at this point, that a proton consists of two positrons and one electron circling each other at distances less than the empirical size of a proton. While this idea will not be further developed here, it is interesting to also speculate that a neutron might then consist of two electrons and two positrons tightly bound together by photons under conditions where the speed of light is greatly reduced.

The key to understanding unexpected variations of the masses involved is to recognize that each mass is dependent upon the relative speed of each particle. If combined masses are larger than expected, it is because the particles are moving at speeds that significantly lower the local speed of light within confined spaces that are very much smaller than the size of an atom.

The difference in the masses of combined particles, from their expected values, is the key to solving for their higher speeds. The speeds of the constituent particles must be higher in order that the speed of light be slower. The speed of light must be slower in order that the length of local photons becomes smaller. The substantial lowering of the local speed of light is required for photons to be small enough to mediate interactions on such a small scale of size.

Quark Theory and the Speed of Light

In quark theory, electric charge is divided between sub particles by fractions of three. In this new theory, electric charge is the fundamental increment of time. This increment of time cannot be divided. It is the fundamental constant of the universe. There must then be a different divisible quantity that is responsible for the apparent success of quark theory. Since all the quarks have been found it could seem incredible to suggest they do not exist. However, as pointed out in the very beginning of this work, nothing has ever been empirically observed except velocity and change of velocity. Each quark represents a specific pattern in change of velocity. It could be the case that the patterns result from different causes that fit the same patterns.

When we fit a theory to a known empirical pattern we should not take permanent comfort from the theory even if it does predict the next steps in the pattern. It is the pattern itself that is doing this. The theory does not add to the pattern. It only adds an interpretation to it. There is nothing which the theory can predict which was not already contained within the initial assumed foundation upon which the theory was developed.

Furthermore, our theories are restrictions on the truth. As we learn more, the limitations of our theories become apparent. The pattern, having become more complete, then requires a new theory. If electric charge is really the fundamental increment of time, then we need new theory for everything, including quark theory, using electric charge.

The work performed earlier, showing how the speed of light varies within the hydrogen atom, also shows a different quantity that may be inherently divided into fractions of three. This quantity is the only given in this new theory. The speed of light within the hydrogen atom is divided into fractions of three. The light-speed predicted by a lone proton is $1/3 C$. The light-speed predicted by the combination of the electron and proton is $2/3 C$.

This division of the speed of light within the hydrogen atom relates to atomic dimensions. How can it also be applied inside a proton or neutron? Sub particles are interacting with one another in a way that appears to form a larger particle such as a proton. It may be this division of the speed of light applies on the much smaller scale of sub particle interaction. Whatever the case is, sub particle properties must be derivable completely from the effects of the variation of the speed of light.

If a proton is made up of sub particles, then these sub particles must be interacting with each other by means of photons. Strong, very slow speed light-field strengths can shrink photon length dramatically. Using these super shrunken photons, sub proton particles could be expected to be orbiting one another at extremely small distances. Their interaction may occur at a reduced scale, but not necessarily with a change in character from the interactions at the larger scale where an electron and proton interact.

Creation of Matter

The creation of matter from pure energy is a routine physics experiment. This possibility was first predicted by Einstein's pinnacle formula which equates energy with mass times the speed of light squared. His equation and its interpretation are not accepted as being correct by this new theory. There does not appear to be any reason to expect that the light-field of a particle can be changed into a photon. There is equally no reason to expect that two photons colliding can change into a light-field. In any case, there is reason to try to use the minimum number of miracles.

Since there is no prediction for converting back and forth between energy and matter, then what is the possible explanation for the apparent success of this routine physics phenomenon? The explanation must lie within the atom. It is repeatedly shown that photons of sufficient energy can appear to convert themselves into new matter and antimatter when passing near the nucleus of an atom. It is reasonable to conclude that the matter and antimatter must have already been a part of the atom and its nucleus. This may be the reason why photons cannot be converted into matter in free space.

What can explain the reverse effect? When matter and antimatter collide, the matter disappears and energetic photons are produced in its place. From the perspective of this new theory, it would appear that if matter and antimatter join together and become undetectable then their individual effects upon the acceleration of light have neutralized each other. The resulting photons are the evidence of the changes of velocity undergone by the particles as they join together. The photons were not created by the collision. They are always in existence and the means by which change of velocity occurs. The energy they carry is always given to them by particles that have changed their velocity.

The particles also do not go out of existence. If we can no longer see them then it is because they are no longer changing their velocity on a scale that is perceptible. It does not automatically follow that the new matter which results would also have completely lost its ability to cause the effect we call gravity. In other words, the result of the joining of matter and antimatter is the disappearance only of a detectable effect upon the speed of light.

The energetic photons that are produced are simply evidence of the reaction between the two particles of matter. Nothing happens without photons being involved. The photons are carriers of changes in velocity. The photons are carriers of information. They are the record of what happened, and the immediate cause of what will happen.

If it is true that all empirically created particles of matter are actually already in existence within the atom and its nucleus, then this is one possibility for the apparent success of quark theory. If there are particles within particles, then the successful theory needs only to contain an accurate accounting of the observed patterns of changes of velocity.

Antimatter

A positron has the same mass but opposite electric polarity of an electron. In other words, a positron has the same magnitude of first photon acceleration but its speed increases instead of decreases with distance from the center. The light-field interpretation of a positron can be pictured as one that begins at the same magnitude of light speed as does an electron. The positron light-field, then, forms the mirror image of the electron light-field. Whereas the electron's light-speed decreases with distance, the positron's light speed increases with distance in a symmetrical manner. When these two light-fields are superimposed upon one another they would theoretically cancel each other's effects.

It is possible to give analogous explanations for other types of antimatter. Whatever the case proves to be, it must be compatible with the only primary cause existing within the universe. The variation of the speed of light is the primary cause and origin of all physical effects. Any presentation of any part of this theory will begin with this claim as its starting point. It will define particles only by their ability to cause a variation in the speed of light.

Complex particles would be defined as local combinations of simpler particles. This will include particles that may have only a very slight force of gravity effect. All force and its variation will be derived from the ability of photons to store increments of the variation of the speed of light. Neither matter nor photons will be converted or created.

It is indicated empirically that protons consist of combinations of more primary particles of matter. It is assumed, as a part of the investigation of the nature of matter and antimatter, that there may be only two primary particles. Even if there are more such particles, it is useful to begin with as few as possible and add others only when forced to do so. The two primary particles chosen for this purpose are the electron and positron. The attempt will then be made to form all other particles from combinations of these two. There is some empirical evidence for this possibly being the case. The creation of matter and antimatter occurs only very near to atomic nuclei.

It has been believed that the nucleus is included only to carry away extra momentum. It seems reasonable to assume the presence of a very strong interaction between the nucleus and any incoming energy just as would be expected if new matter did not appear. The result of that interaction could be the dislodging of nuclear particles.

In this theory it is not accepted that actual transformation of energy to matter occurs. Therefore, I look to the nucleus for the hiding place of positrons. The more complex forms of matter and antimatter may be constructed from varying combinations of electrons and positrons. The concept that photons may exist in an appropriate and proportionately smaller size makes this possible.

In other words, the speed of light is much slower within these very concentrated combinations of matter. A greatly lowered speed of light would give the appearance of

interactions involving very high mass particles. The change of velocity of all objects is a function of the change of velocity of light.

Whatever the situation is, it is not assumed that Einstein's energy and mass relationship actually predicts the transformation of energy into matter. Mass and matter are not the same thing. If energy and mass are interpreted as being equivalent, then there is no justification for going beyond predicting that the mass of a photon increases with increasing energy, and that the mass of a particle of matter increases with increasing energy. In other words, it has not been shown that mass has a nature synonymous with the postulated material substrate called matter.

It is noted that: It is highly suspicious that the material nucleus is needed at all. As I have shown earlier, the calculation of extra momentum for a photon is an error. With this error corrected, there is no need for the presence of the nucleus unless the matter to be created is actually matter to be dislodged from the nucleus.

THE STRUCTURE OF THE UNIVERSE .

Theorizing mechanically, the structure of the universe consists of the acceleration of light. The major details of this structure are particles of matter and photons of light. The particles of matter make up an immense number of microscopic sources of control over the speed of light. They control the speed and orientation of the photons. There are a far more immense number of photons than there are particles. All of these photons are under the control of the particles of matter. Conversely, all of the particles are under the control of the photons.

Natural Units of Measurement

Natural units are units not chosen for anthropocentric convenience. This new theory produces such units. They are those units of measurement belonging to the cause of all effects. That cause is the velocity of light. A natural unit of time is the period of time it takes for a photon to pass a given point. This is also the time it takes for light to travel from a nucleus of an atom to the first electron shell. The anthropocentric value of this period of time is 1.602×10^{-19} seconds. This is the natural unit of time, but it needs to be expressed as one natural unit of time. If this period of time is given a name such as photon-time (t_c), then the natural unit of time is one photon-time.

The natural unit of length is the local length of any photon 4.8×10^{-11} meters. Locally, this is the basis of all length measurements. The fact that this length varies from the remote perspective does not disqualify it from consideration. Locally it is a constant length everywhere just as the speed of light always appears to have the same local speed everywhere. The natural unit of length can be given the name one photon-length (l_c).

All natural units must be derived from the speed of light. This means the natural unit of mass must be derivable from the speed of light. This theory defines mass as the inverse of the acceleration of light. From the remote point of view, this acceleration is different for different particles. This fact is what characterizes each of them as unique types of particles. However, locally all particle masses are the same universal constant.

In the same manner that the speed of light always measures the same locally, so does its acceleration. This acceleration is calculated by dividing the speed of light by a unit of photon-time. In terms of units of seconds, this value is 1.602×10^{-19} seconds. Performing this division yields a value of acceleration of light of $1.87 \times 10^{27} \text{ m/sec}^2$. Taking the inverse yields the natural unit of mass as $5.3436 \times 10^{-28} \text{ sec}^2/\text{m}$ or kilograms.

If the natural unit of mass is given the name local-mass (m_l), then the natural, universal unit of mass is one m_l . How can this natural unit be used to measure masses that vary in value as they are measured from our remote perspective? This is done by using the inverse of the acceleration of light of a particle from our remote perspective. In this theory, this value is the mass, as we measure it, of any particle. The ratio of the remotely measured mass to the natural unit of mass gives a measurement of remote mass in terms of the natural unit of mass. From these three natural units all others may be derived.

Continuity and Discontinuity .

Particles of matter and photons are mechanical representations of continuity and discontinuity. The particles of matter are the mechanical interpretation of the continuous nature of the universe. The photons are the mechanical interpretation of the discontinuous nature of the universe. These two natures are not mutually exclusive in the sense of wave-particle duality. It is not these two natures that represent reality. It is their interaction that forms the universe. They are always interacting. Their process of interaction is continuous and unlimited by time or distance.

The limited speed of photons is what introduces time into the universe. The truncated, variable length of photons provides the tick of the clock. Their lack of continuity causes uncertainty, imprecision and vagueness. However, when their numbers are great, such as on the macroscopic scale, these qualities are reduced almost to extinction.

Cosmic Background Radiation .

The theory of relativity supports the concept of an expanding universe. Hubble's formula for red shift as a function of distance presents a picture of an expanding universe that is in agreement with relativity theory. Both of these are supportive of the idea of a big bang origin for the universe. The analysis of a big bang origin leads to the prediction of the cosmic background radiation. This radiation would have been created shortly after the big bang origin. It was released at the time atoms are thought to have formed. According to the big bang theory, the energy of this radiation would, over time, have greatly decreased as the universe expanded and cooled.