The Evolution of Matter through Cosmological Time

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This history of the universe is based on the single assumption that the mass of the electron gradually decreases over time. Except for the exceptions produced by this assumption, all of the other well established physical laws and constants of the standard model of physics remain intact. Near the beginning of the universe, the proton and the electron had identical masses and were a Primordial Matter/Antimatter Pair. After a chain annihilation of about 256 cycles, the electron's mass had decreased to the point where it could no longer annihilate with the proton. This left the 2^{256} electrons and protons that we have in the universe today. At this stage, protons and electrons could combine to form neutrons but not atoms. Long after, at the point where the electron became small enough to couple with a proton into a hydrogen atom, the neutrons began to decay and hydrogen atoms began to emit large quantities of photons. This initial burst of photons had the same wavelengths as the 2.7° Cosmic Blackbody Radiation spectrum of today. Since this very cold time, the temperature for hydrogen radiation has increased from 2.7° K to about 3000° K. The rate of the electron's gradual mass decrease can be determined by measuring the Hubble Constant. In the past, when the electron had more mass, the atomic spectra from distant galaxies had longer wavelengths and thus appears red shifted to us today. As the electron loses mass, and the atomic spectra heats up, the volume of atoms decreases. Heavy elements at the earth's center lose volume more slowly than the light elements in the earth's crust. It is this effect that drives plate tectonics and causes the continents to move apart.

1. Introduction

This is an alternative model to the Big Bang theory for the origin and evolution of the universe, that I have called the Living Universe. In the Living Universe, the evolution of matter results from the gradual decrease in the mass of the electron. The universe is said to be "living" because it has evolved through the reproduction of eternal particles of matter. Like any complex organism, the universe began as a single "cell" and then through constant cell division reached its present state.

In order to better understand its workings, the Living Universe is divided into several different eras in which changing "constants" and parameters transform the properties of matter. The passage from one era to the next is caused by both abrupt and gradual phase transitions in the nature of the interactions between the proton and electron and in the properties of the neutron and the hydrogen atom. The laws and the constants of nature are basically the same as they are in other theories of the universe except that, in the Living Universe, some of these laws and "constants" gradually transform over long periods of time.

To better illustrate the following history of the universe, I have used my own conceptual mechanical models of the photon, proton, electron, neutron and hydrogen atom. These models help me think about matter in a more concrete way, but they are definitely not needed to validate the Living Universe model. As long as you can accept the assumption that the mass of the electron can change, then the standard models of physics and quantum mechanics will work equally well to explain the basic dynamics of this evolution model of the universe. The basic parameters of my atomic models are the same as those of Quantum Mechanics except that photons have mass and particles are not points. In the Living Universe, all of the standard conservation laws of physics remain intact. In the Big Bang theory most are violated.

Before we can begin this absolute motion account of the Living Universe, we must begin with several fundamental principles around which the idea is constructed. These principles are equivalent to, but vary in significant ways from the principles and assumptions underlying the Standard Models of Physics and the Big Bang. These altered principles allow us to draw some unique conclusions about past and present transformations in the basic parameters of physics.

2. The Principle of Electron Transformation

Throughout the history of the Living Universe, the mass of the electron, relative to the proton, has been gradually decreasing, while its size (Compton wavelength) has been increasing at an inversely proportionate rate. This changing relationship between electron and proton gradually changes the properties and dynamics of the hydrogen atom in particular and of all the other elements in general. The change in the electron/proton mass and size ratios also causes changes in the "constants" of nature dependent on these ratios such as the Fine Structure constant α and the Bohr radius a_0. As the electron's mass decreases, the ionization energy of hydrogen increases and its whole spectrum becomes hotter. The Bohr radius decreases with the electron mass decrease. The Bohr radius is basically the distance between the proton and electron in the hydrogen atom. It is this dimension that determines the physical size and shape of atoms as well as the photons that they emit.

3. The Principle of Particle/Antiparticle Pairs

The Living Universe is made up exclusively of particle/ antiparticle pairs. The universe always contained at least one particle/antiparticle pair. The universe of today is the result of first the reproduction and then the continuing evolution of that original pair. For every positive particle there is a negative antipar-

ticle. In high energy events, particles can be created or destroyed but only in conjunction with their antiparticles. This process causes the number of protons and electrons in the universe to slightly fluctuate back and forth from their exact creation number of (2^{257}). In the same way, the numbers of positive and negative charges in the universe stays very close to (2^{257}) and are always in equal numbers.

Today, in the Living Universe the particles are the protons and the antiparticles are the electrons. Neutrons and hydrogen atoms are both examples of particle-antiparticle pairs. Both are made up of different configurations of a proton and electron. These two bodies are the basic building blocks of all the elements' stable and unstable isotopes.

4. The Principle of Absolute Photon Rest

All photons move at exactly *C* relative to the same absolute inertial reference frame of *photon rest*. All other particles and bodies of matter have an absolute motion of less than *C* relative to this same photon rest frame. All bodies have only rest mass M_r when at photon rest. The kinetic energy of a body relative to photon rest gives the body a quantity of kinetic mass $M_k = E / C^2$. All electrons and protons have identical mass because they were all created at photon rest. All moving protons and electrons have a different kinetic mass that changes with each change in motion. When a pair of identical photons are emitted from a moving atom, they are emitted at photon rest. These photons then appear red or blue shifted when measured from a moving frame. These two photons remain identical as they travel through space but will always be measured to have different values in any moving frame. Red and Blue shifting does not occur at emission. A photon's measured energy is increased or decreased by the energy of the moving observer.

5. The Principle of Pure Quantum Mechanical Interactions

In the Living Universe, there is no "action at a distance". There is no aether and there are none of the specialized forms of aether called fields. All interactions between atoms and photons are purely mechanical. There are no non-material wave interactions. All quantum waves are purely harmonic motions within the physical structure and shape of matter.

There is only one interaction and it is the common sense event of one body touching another. The four "field interactions" of physics are all bogus, because they are all mechanical in nature. There is no "unified field" solution to physics. There is only a non-field solution. The strong interaction is a kind of "nuts and bolts" phenomenon that mechanically holds protons and neutrons together. The weak force is very similar in nature except on a higher level of scale. The weak force is the way that electrons and neutrinos are mechanically held inside of protons to form neutrons. The electromagnetic force results from the physical touching and the pushing and pulling between the expanding external charge coils of protons and electrons. Gravity is simply the effect of slowly expanding matter. The surface of the earth expands upward and hits stationary "falling" bodies. In the Living Universe, the earth falls up!

6. The Principle of Space, Time, Mass, Momentum and Energy Interactions

The measured quantities for mass, space, time, momentum and energy, within the universe remain separate and constant over the passage of time. The mass of the universe is the same today as it has always been.

6.1. Space

Space is infinite and does not bend. It is the negative reality. It is not a "zero point quantum vacuum" with its virtual particles winking in and out. To give it a dimension you could say that it is nothing cubed. The only tangible property of space is its infinity. The very most that you can say about space is that it is an idea that is almost imaginable. The concept of three dimensional space can be very useful in measuring and calculating, but in reality, space can only be perceived as an infinite number of one dimensional momentum vectors. Local two dimensional space can be perceived as angular momentum. The only three dimensional perception of space is the gravitational expansion of matter.

6.2. Time

While space is a tangible void, time has no reality outside of a consciousness that is actively perceiving inertial motion. Time is simply the idea used to quantify the constant relationship between Mass and Space called motion.

A body in motion is carried along by its own momentum. There is no substance or field called "time" that pushes it along. It is momentum, and not "time", that takes us from the past to the future. Clocks do not measure "time". They monitor the conserved relationship $T = MS / p$ between mass and space called momentum $p = MS / T$.

6.3. Mass

Mass is the positive reality. Mass is the only thing that can be quantified in terms of space and time. Whereas space has no properties, mass is the only property. Mass is defined as resistance to change motion and it is the measurement of that resistance through force that defines space and time. Mass is a property of matter. Matter is mass with a shape. Too little cannot be said about mass. Mass just is. It is the only metaphysical assumption that need be made to explain physics.

6.4. Momentum

Momentum *p* is mass times space divided by time $p = MS / T$. Any time a *force* $F = MS / T^2$ changes a body's momentum an equal and opposite quantity of momentum is also changed. All bodies in the universe have an exact and absolute quantity of momentum relative to photon rest, but the total momentum of the universe relative to photon rest is a constant zero. The individual equal momenta of two lumps of clay moving toward one another cancel each other out, just as when they collide and remain stuck together at rest with zero momentum. When we measure a body's momentum, it is relative to our surroundings but every body has a hidden absolute momentum that is measured relative to the photon rest. The energy inherent in this mo-

tion has mass but there is no way to measure the mass or energy of a moving body except by stopping it.

Momentum is not to be confused with energy. A bullet and a recoiling rifle each have the same momentum but the bullet has far more energy than the rifle.

6.5. Energy

Energy is the quantitative relationship between Mass, Space and Time. It is a property of Mass that can be defined as motion and that can always be broken down into $E = MV^2/2$. Whereas a body's momentum is linear and absolute in space and time, a body's energy is absolute and non linear. A body's energy is contained in both its linear and rotational motions. The energy of the universe is conserved as it is transformed from one form to another. The kinetic energy of the two lumps of clay colliding together remains constant in the heat and sound generated by the collision.

There is no transformation between mass and energy as is implied by the formula $E = MC^2$. In the universe, the total individual quantities for mass and energy are constant. Energy has mass according to $E = MC^2$ but energy cannot be converted to mass because energy is mass. A pot of water heated on an electric stove gains mass that it takes away from the electricity. When a positron annihilates with an electron, the two photons produced each have a mass equal to electrons and positrons. In each of these photons, their mass and energy are equal according to $E = MC^2/2$. The photon has two distinct types of energy. The kinetic energy of its motion at *C* along its vector and the rotational kinetic energy of its two mass particles spinning a *C*. Photons have mass $M = E/C^2$ and energy $E = MC^2/2 + I\omega^2/2 = MC^2$.

Matter is produced by the dividing of photons. A photon is a perfect union between a positive matterbody and an exactly equal and opposite negative antimatter body. For example, when a positron and an electron annihilate, they combine together and then split into two x-ray photons. Each photon contains one-half of the electron's negative matter and one-half of the positron's positive matter, as well as, half of each particle's mass. These two oppositely spinning, rope like, particles join together within the photon and move forward at *C* with an undulating wavelike motion that gives the photon it characteristic angular momentum. This is the source of the wave particle duality. The photon is a mass particle that moves through space with a wave-like motion.

When a gamma ray photon splits into a positron and an electron, an opposite process takes place. The negative matter particle and positive matter particle within the photon separate from one another to become equal and opposite positive and negative particles (positron and electron). In these transformations between matter and photons and back again, there is no change in mass. The photons from a electron-positron annihilation have exactly the same mass as the original particles.

When a body is accelerated relative to photon rest, its mass is increased with its increasing kinetic energy. This kinetic mass M_k increases exponentially as the velocity approaches the speed of light according to $M_k = M/\sqrt{1 - V^2/C^2}$.

There is no transformation between mass, energy and photons. Photons have mass and it takes mass to make photons. Energy has mass and the mass of a photon's energy is the photon's mass.

7. The Principle of Gravitational Expansion

Gravity is a completely local effect caused by the gradual and constant expansion of matter. It can be quantified as an outward velocity from the Bohr radius. Gravity's only non-local characteristic is the way that this constant expansion proceeds with perfect synchronicity throughout the whole universe. Gravitational motion is the true measure of absolute time. The time measured by inertial clocks is altered by the motion of the clock due to changes in mass. A body's gravity proceeds in the same way, no matter what its velocity.

The actual mechanics of gravitational expansion are basically the mirror image of the mechanics of Einstein's General Relativity. In both General Relativity and the Principle of Gravitational Expansion gravity is the result of changes in the geometry of mass, space and time. In the Living Universe, gravity is not caused by the curvature of space and time but rather by the curvature of mass and time.

8. A New Big Bang Idea

The group of theories that collectively make up the Standard Model of the Big Bang have become generally accepted by the cosmological community even though they contain many paradoxical and contradictory conclusions as well as several gross violations of the most well established laws of physics. I will not go into many of the details of the Big Bang theory here, but will instead present a parallel but far less random history of the universe. I will then touch on various aspects of the Big Bang theory as they become pertinent.

This account of the evolution of matter in the Living Universe is based solely the Principle of Electron Transformation. This is a gradual decrease in the mass of the electron that transforms the properties and dynamics of the hydrogen atom. This principle states that since the very beginning, the mass of the electron (negatively charged matter) has very slowly but continually decreased relative to the mass of the proton (positively charged matter). This changing of the mass ratio between proton and electron greatly alters the intensity of the interactions between these two particles. This changing mass also governs the dynamics of both the formation and decay of neutrons and the radiation and absorptions of photons by atoms. As we follow this gradual transformation of mass back into time we find that the universe began in an event analogous to the big bang but far more orderly and lifelike. In the Living Universe the genesis of matter was more like the growing of a perfect algae bloom than the detonation of the ultimate explosion.

8.1. An Arbitrary Beginning

The initial condition for the Living Universe is not a singularity or even a beginning of time. It is an eternal duality. For those religious folks who like to begin their creation stories with a god, I am afraid that in this case, you must begin with both a god *and* a goddess. Here we will give this Yin & Yang dichotomy the more secular names of positron and antiproton. We can still re-

quire that each of these "gods" possess a unit of consciousness, so that we may be able to account for the origin and location of our own individual consciousness here at the present state of the universe's evolution of matter.

We need not say that this is the beginning of time. It is just an arbitrarily point in time that has been chosen to begin this story. By going any farther into the past, we would enter a very uninteresting period of time.

Just as the most basic component of today's universe is the hydrogen atom, the universe began with the single atom of antihydrogen. This atom sat at the "center" of what can be best imagined as an infinite three dimensional void. This single atom of *antihydrogen* was not unlike the hydrogen atoms of today except that its mass was the same as the mass of the entire universe today. We now say that an antihydrogen atom is antimatter in that it is made from a positively charged particle called a positron and a negatively charged particle called an antiproton. In this description of the hydrogen atom, the term "antimatter" will be avoided. There is only *positive matter* (protons, positrons, etc.) and *negative matter* (electrons, antiprotons, etc.). When gamma ray photons interact with matter, they can split into electron-positron pairs as well as proton-antiproton pairs. These are particle-antiparticle pairs. Since each fundamental particle is still always created or annihilated with a particle/antiparticle pair, it would be confusing to call either one "antimatter".

8.2. The Era of Gravitational Time

So, we begin the universe with the duality of a positive mass particle and a negative antiparticle. They are held in a bound state by their opposite charges. Both are stable except for the slow expansion of gravitational time. Both particle and antiparticle are slowly expanding gravitationally at the rate of gravitational time. This particle and antiparticle are much like the +positrons and -antiprotons of today, except that their combined mass is equal to the total mass of the universe today. They are joined together in a primordial atom of antihydrogen. Each particle expands independently with its own internal measure of gravitational time. These two independent gravitational clocks are almost perfectly synchronized but not quite. The negative particle is expanding gravitationally just slightly faster than the positive particle. This causes the negative particle to gradually lose mass relative to the positive particle. The mass and size of the particles grew closer together until the positive particle it was sucked inside of the negative particle and they became an antineutron.

8.3. The Antineutron Era

The universe is now a stable antineutron. This antineutron can be characterized as the combination of a positron and an antiproton. The antiproton has considerably more mass than the positron. However, as time passes, the antiproton slowly loses mass as it grows larger in proportion to the positron. Eventually the values for the masses and dimensions λ (wavelengths) of the two particles become identical.

8.4. The Era of Matter Bifurcation

The universe is now a true particle/antiparticle pair that annihilates into two particle/antiparticle pairs. This original particle/antiparticle neutron is not like any particle that has ever existed before or since. It is like the "God Particle" that has been predicted in some occult theories of nature or even analogous to the singularity of the Big Bang. Since the original positron and antiproton were bound together in a neutron, it makes the newly formed matter/antimatter pair able to annihilate into two neutrons rather than two photons. As soon as these two new neutrons are formed, they each undergo an internal alignment process and then split into four neutrons and then eight and then sixteen, etc. There was a great synchronicity to this process that caused each bifurcation to occur simultaneously throughout this growing cloud of neutrons. At each cycle, the number of neutrons was a power of two 2^2, 2^3, 2^4, 2^5, 2^6, ... 2^{256}. The time period between these individual powers of two is as yet undetermined. However, it must be assumed that at each step of particle duplication, enough time would pass for the individual splitting particles to move a considerable distance from one another before the next bifurcation occurred.

This process of serial neutron bifurcation proceeded with a perfectly synchronistic timing for perhaps 256 cycles. There is nothing special about the number 2^{256} . It is just that it is the most beautiful number that is quite close to Eddington's durable estimate for the mass of the universe of 10^{80} proton masses. The point being made here is that whatever the exact number of particles in the universe might be, it must be a power of two.

It is at this point where perfect synchronicity was lost between the two particles and the bifurcation process ceases. The mass of the negative particle has become less than the mass of the positive particle and thus they are no longer particle-antiparticle pairs capable of annihilation. What had been one antineutron composed of a positron and an antiproton has now become transformed into 2^{256} neutrons composed of 2^{256} electrons and 2^{256} protons.

8.5. The Cosmic Ray Era

This smooth and continuous process of neutron bifurcation, in which the number of particles in the universe doubled with each cycle, progressed unabated for perhaps 256 cycles with almost perfect synchronicity. The only flaw in the process developed as the Living Universe became more and more crowded with neutrons. Neutrons began to collide with one another with more and more force. In many of these collisions the two neutrons annihilate into four equal photons. These photons were stable and many of them are still with us today in the form of the most energetic cosmic rays. The others have become dissipated among the atoms of the universe in the form of heat and other kinds of energy.

In the Living Universe, the cosmic rays are ancient photons from the era of matter bifurcation. The energy of individual cosmic ray photons can be divided into 256 groups of photons. All photons in each group have the same energy and wavelength that are all based on the powers of two. As we go up the scale, individual cosmic ray photons reach enormous energies. At the upper end of this scale, a single photon could have a mass and energy approaching that of the whole universe.

Because of their scarcity, it is difficult to detect the more energetic of the cosmic ray photons. The most energetic cosmic ray photons that have been measured have energies of about 10^{21} electron volts or about 50 joules. This is enough energy to create

1,000,000,000 proton/antiproton pairs. In more familiar terms, it is the energy of a one liter bottle of water falling to the ground from a second story window.

The most amazing thing about cosmic rays is that their spectrum appears to have no upper limit! Unlike the blackbody spectrum, the energy/intensity curve at the upper cosmic ray spectrum straightens out towards infinity rather than curving down toward some maximum energy. The cosmic ray spectrum is such that photons of all wavelengths have the same energy intensity and contribute equally to the total cosmic ray energy. For example, if one particular cosmic ray photon has an energy of one unit and is detected at the rate of one per second, then another photon with an energy 60 times greater would only be detected at one per minute, and another photon with an energy of 3600 units would only be detected at the rate of one per hour. Each of these three photon groups contributes the same 3600 units per hour to the total cosmic ray energy spectrum. If we wait long enough to detect it, there is virtually no limit to the energies of the individual cosmic ray photons we might encounter.

The problem with detecting and measuring cosmic rays with energies of more than a few dozen Joules is that the combination of their increasing energy and decreasing intensity makes it almost impossible to design a detector that can accurately capture them. Even so, the curve points toward extremely rare cosmic rays with the energy of a thermonuclear bomb or even much greater.

It seems possible that the Tunguska event of June 30, 1908 was really the impact of one of these extremely rare apocalyptic photons! This explosion, in a remote area of Siberia, is estimated to have been equal to about 2,000,000 tons of TNT (10^{16} Joules), yet it made no crater and no debris from an impacting body has ever been found. A photon with this energy has a mass of about 110 grams and a wavelength of 10^{-41} meter. This photon would have been emitted from the 86th bifurcation cycle before the final one.

The most powerful cosmic ray photons, yet to be observed, cause the gamma ray bursts that come randomly from all directions of the cosmos. Imagine a 10,000 kilogram photon with a wavelength of 2 x10^{-45} m and an energy of about 10^{21} joules. Such a photon would produce a very intense, yet short lived, burst of gamma ray photons if it struck a material body. These bursts would be visible from the far reaches of the universe. Such a photon would have been emitted from the 102nd Bifurcation cycle. Gamma ray bursts have been observed with much greater energies than this and with durations of much less than a second.

8.6. The Neutron Cloud Era

During this time of repeated particle bifurcation, the mass of the negative antiproton continued to decrease until it was no longer the perfect antiparticle for the proton. As soon as its mass became less than the proton's, the antiproton effectively became an electron. This immediately stopped the annihilation / bifurcation process so that when the electrons and protons attempted their 257th bifurcation cycle, the electrons were instead captured by the protons and 2^{256} neutrons were formed. 2^{255} unstable antineutron God particles became 2^{256} stable neutrons.

What had been a universe of repeated reproductive pulses, now became a vast cloud of individual neutrons floating about the vast reaches of space. These neutrons lacked the internal energy to decay and were thus completely stable.

This stable neutron cloud lasted for a long time. As the cloud spread, individual neutrons collided and interacted with one another. They tended to form small groups that in turn became gathered into larger groups. Over time, this great universal neutron cloud became segmented into countless numbers of smaller and denser clouds on many different levels of scale.

8.7. The Neutron Decay Era

The universe is now a great diffuse cloud of stable neutrons. Externally the neutrons are all drifting away from one another and the great cloud is becoming segmented into separate smaller clouds on several layers of scale. Internally the mass of the electrons continually get smaller as their wavelengths grow larger. At the end of this era, the mass/wavelength ratio between the proton and electron has increased to the point where the neutrons becomes unstable and decay all at once. The reason for this simultaneous decay of neutrons is that, as the size of the electron increases, the values for the Fine Structure Constant α and the Circlon Constant $\theta = \sqrt{\alpha}$ also increase. The neutrons all decayed when the primary coils of the electron became larger than the secondary coils of the proton. For the first time, this made it possible for electrons to couple to the outsides of protons, form hydrogen atoms and emit photons.

8.8. The Neutrino Era

The universe is now filled with unstable neutrons that are all decaying at once. When these neutrons decay, the electron and proton are ejected at high velocity and equal momenta along the 2^{257} vectors that make up the universe's infinite number of spatial dimensions. The difference between the decay of these proto-neutrons and the neutrons of today is that there were no neutrinos emitted. These original neutrons were formed through particle/antiparticle annihilation and not from the electron capture process by which neutrons are formed today. In the electron capture process of today, an electron is forced inside the structure of a proton along with the creation of a neutrino-antineutrino pair. The neutrino is emitted into space and the antineutrino stays within the neutron until it decays. Today, when a neutron decays, it emits a proton, electron and an antineutrino at a whole range of different energies.

8.9. The Era of Nuclear Synthesis

The universe is now a seething mass of 2^{257} high speed electrons and protons that start colliding with one another. In most of these interactions the two particles bounce off one another and emit a photon but there are a great many other interactions that can occur in these collisions, if the velocities and trajectories are just right. The most common is that a proton and electron will couple together to form a hydrogen atom. In this process, the angular momentum between the two particles is released in a series of photons as the atom drops down into its ground state. If they hit just right and at the correct velocity, nuclear reactions can also take place. A proton and an electron can form a neutron. A neutron and proton can combine into a deuteron and another neutron can be captured to form a triton. Add another neutron and get a helium 4 nucleus. In this way, the nuclear reactions that

form the isotopes of all the chemical elements become possible. By the end of this era, countless nuclear reactions had produced small samples of all the known elements. In the Big Bang theory, it is only possible to make the light elements in stars and the heavy elements in supernova explosions. It can't explain the spectra of heavy elements that have been observed in the most distant galaxies at the beginning of the Big Bang's universe. In the Living Universe, 99% of the matter is hydrogen, helium and some lithium. However, the other 1% contains samples of all the other elements created at matter 's beginnings. Heavier elements are also being produced in stars and supernova explosions.

8.10. The Era of the Great Frozen Fire

The universe is now a vast cloud of hydrogen gas with a sprinkling of neutrons and other elements. All of these nuclei and atoms emit photons as they acquire electrons and cool. With all these hydrogen atoms producing the same basic spectrum of photons, the universe soon became filled with a mixture of photons that almost perfectly matched a blackbody distribution curve for the temperature of 2.7°K. This great, but very cold "frozen fire" swept through the whole universe at a temperature of 2.7° above absolute zero. However, this fire never really went out or even cooled off. After billions of years, the photons produced by this fire have not changed in wavelength or intensity. These photons have since been traveling about the Living Universe unchanged and are still with us today at the same temperature.

This temperature of 2.7°K is not a random number. It is the temperature of the hydrogen radiation spectrum at the point in time of electron transformation when it was possible of the first time for protons and electrons to form hydrogen atoms and emit photons. Before this transition in electron mass, it was only possible for protons and electrons to form neutrons.

8.11. The Galaxy Era

The universe now contains great clouds of cool hydrogen gas. Gravitational expansion is breaking these clouds apart and condensing them into smaller and denser clouds on many different levels of scale. This is the same interaction that segments atmospheric clouds into here on earth. The smaller clouds eventually condense into stars, the larger clouds make clusters of stars and the very largest are compressed into galaxies and galaxy clusters. This process of star and galaxy formation took a very long time before the stars could begin the thermal nuclear reactions that eventually produced starlight. The most distant galaxies, that are at the observational limits of the Hubble Telescope, are determined by their "red shifts" to be at a distance of about twelve billion light years. Cosmologists calculate that the big bang happened about thirteen billion years ago. This estimate is derived from reversing the presumed expansion of the universe and leaves little time for the very lengthy process of star and galaxy formation. In the Living Universe model, the cosmos is far older and there is plenty of extra time for the stars and galaxies to form.

8.12. The Starlight Era

After many billions of years of organization, the universe is now filled with galaxies whose smallest clouds are compressed by gravitational expansion to the point where they become so hot that hydrogen and helium nuclei begin to fuse and turn the clouds into stars. By this time, the electrons have become considerably less massive than the protons. This causes the hydrogen atoms to produce a spectrum of photons with shorter and shorter wavelengths. When we look deep into the universe and view these first galaxies, we see that the radiation spectrums of the various elements contain photons with much longer wavelengths than those photons have here on earth today. This effect supplies the true cause of the Hubble red shift. The galaxies are not moving apart, nor is the space in between them expanding. It is just that today, atoms emit photons with shorter wavelengths than they did in the distant past. In the Living Universe, starlight from distant galaxies has not become red shifted. What has happened is that the starlight within the Milky Way has become blue shifted by the shrinking mass of the electron.

8.13. The "Dark Energy" Era

The universe is now filled with vibrant young galaxies that are mature enough so that some of the stars have completed their life cycles and begin to explode in supernova explosions. These supernova explosions became more powerful as the mass of the electron became less. As the galaxies matured the supernovas became more and more powerful. If matter really is becoming more energetic, we would expect to find evidence of this as we look far out into the universe. Supernovas are so bright that they can be readily recognized at great distances. As they are observed at greater and greater distances they should appear dimmer than can be accounted for by their red shift derived distance.

In 1998, the High-Z Supernova Discovery Team at the Space Telescope Science Institute in Baltimore announced that they had discovered just such an effect. They found that distant supernovas appear 20% dimmer than could be accounted for by their Hubble shifts. The big bang people try to account for this phenomenon with their ad hoc fifth interaction called "dark energy". This new force is quite unlike the other four interactions. It is said to be a repulsive force of infinite reach that is stronger than gravity at cosmological distances but can't be detected at close range. When we look back on this era today we see that the more distant supernovas are less powerful than we would calculate from just their distance. This is because both chemical and nuclear reactions were less energetic then than they are today.

In the Living Universe, it is only natural that the electron transformation caused supernovas in the past to be intrinsically less powerful than today's supernovas.

8.14. The Quasar Era

Quasars are very large stars with surface velocities near the speed of light. An electron on this accelerated surface would have a kinetic mass that could be several times its rest mass. This greater electron mass increases the Bohr radius and causes atoms to emit photons with much longer wavelengths. This gives a quasar a large gravity red shift that is independent of its motion relative to an observer. Quasars are thus neither extremely bright nor extremely far away.

8.15. The Dinosaur Era

The universe is now much like it is today. The mechanics of gravitational expansion has assembled the solar system and the earth is teaming with many different life forms. The main difference from today's earth is that the electron was heavier than it is

now and the Bohr radius was larger. This caused the atoms, as well as the earth itself, to be larger than they are today. The result of this larger and less dense earth was a substantially reduced acceleration of gravity at the earth's surface. This weaker surface gravity made it possible for very large animals like the dinosaurs to walk and even run, despite their enormous weights.

The great paradox in the study of dinosaurs is that their physiology does not match their bodies. They are simply just too big and heavy to be held up by their muscles and bones. Today the biggest dinosaurs might float in a pond but they wouldn't be able to get out and walk or run. In the Living Universe, the dinosaurs lived in a world with less gravity and were thus able to romp and play and chase each other around just as smaller animals do today.

8.16. The Shrinking Earth Era

It is now today in the universe. The electron has lost mass since the Dinosaur Era and is now at 1/1836 proton mass. As the electron loses mass, it causes the atoms to get smaller and more energetic. This means that the earth is considerably smaller and the sun is getting hotter. The wavelengths of the hydrogen spectrum have grown shorter today than they were in the Dinosaur Era.

Another interesting property of the changing Bohr radius is the different effects it has on light atoms and heavy atoms. As the Bohr radius get smaller, it causes all atoms to also shrink in size. However, the rate by which an atom gets smaller is dependent on the number of its bound electrons. In this process of shrinking atoms, the light elements shrink proportionally more than the heavy elements.

This effect provides any easy answer to one of the most dif cult of the earth's geological mysteries. Geologists have long tried to supply a mechanism to explain the apparent break up and spreading apart of the earth's continents. Plate tectonics is the latest idea to explain this phenomenon but it sometimes opens up more questions than it is able answer. Even if all the evidence for continental drift could be explained by the movement of large plates in the earth's crust, there is still no underlying mechanism that can make the plates move in the first place. There is a great deal of geological evidence to support the idea that the earth once had a single large continent called Pangea. Between then and now, Pangea broke apart into a number of continents and islands that drifted over much of the remaining globe. The physical evidence for this whole event is really very good. There has long been evidence that the earth was expanding and the continents were moving farther apart. The problem is that no one has been able to come up with a physical system that can even come close to making the whole process work.

In the Living Universe, the shrinking of the earth's crust at a faster rate than the interior causes the surface to crack apart just as if it were the interior that was expanding.

8.17. The Era of Zero Entropy

Cosmologists have long adopted the very popular primary assumption that the universe is in a constant process of cooling down from a much hotter initial state. Mainstream cosmological theories have always been built around verifying this assumption. However, when we look for actual physical evidence to support this assumption we can find very little if any.

With the electron's mass getting smaller and smaller it is easy to see that the universe is actually getting hotter. The photon emission spectra for all the elements are gradually growing to greater energies and shorter wavelengths. It could be that this effect just matches the "heat death" predicted for the universe by the second law of thermodynamics. If the assumption is made that these effects are equal, then it can be concluded that the entropy in the universe is zero.

As the Living Universe cools from the dissipation of energy into longer and longer wavelength photons, it is also being warmed by the shortening wavelengths of atomic emissions.

8.18. The Chemical Era

As the mass/size ratio between the proton and electron grow, there are subtle changes in the chemical reactions that occur from protons and electrons coupling together. Chemical compounds in the distant past had somewhat different properties than they do today. I do not have any evidence for the above statement but it seems that it must be true. Such an effect may be hard to detect. Perhaps the chemicals that make up dinosaur bone were stronger then than they are now. Perhaps there was a point in cosmological chemistry about three billion years ago when the chemistry was just right for the spontaneous formation of DNA and other organic molecules. Since then, these molecules have reproduced, diversified, and joined together to preserve themselves. As Timothy Leary said, "We are all the result of an unbroken chain of life that is over three billion years." There is no place along this chain where at least some portion of our present bodies did not exist.

In the Living Universe, the evolution of life is driven by the changing parameters of cosmological chemistry. In the future, molecules that do not exist today may be possible. Certainly the intensity of chemical reactions will be different.

8.19. The Era of Conscious Thought

Perhaps the most remarkable thing about this a whole scenario of a Living Universe is that we are here to understand and discuss it. To understand the universe, we must first realize that the motion of the electron transformation through time gives the universe a conscious perception of time. In the Living Universe, the basic unit of consciousness is contained within the inner workings of the hydrogen atom. If atoms are not the basic units of consciousness then where does the consciousness of our bodies come from? Higher forms of consciousness result from the connection of many atoms and molecules that are then connected into symmetrical patterns. Our own consciousness is the result of about 10^{29} of these basic connections within our bodies. A 100 kg rock also has 10^{29} of these connections and thus has the same amount of bulk consciousness that we do. The difference is that our atoms are connected in far more intricate patterns than the rock's atoms. The rock may have consciousness but because of the more complex connections between our atoms, we have intelligence.

9. The Evolving Atom

Today the mass ratio M_p / M_e between the proton and electron is 1,836.152702. This has long been considered to be one of

the fundamental constants of nature but recent measurements of this ratio indicate that its value may be increasing with time. If this data is correct, and the mass of the electron is gradually decreasing in relation to the proton, then it means is that the values of the parameters governing the radiation of the hydrogen atom have also been slowly evolving with time. As the mass of the electron decreases only its charge remains constant. The Bohr radius a_0 gets smaller in proportion to the decrease in mass and the Fine Structure Constant α increases at an inversely proportionate rate. Also, the ionization photon of hydrogen λ_∞ decreases its wavelength and increases its energy with the cube of the decrease in electron mass.

The reason that these parameters change in relation to the electron's mass has to do with the universal constant for photon angular momentum $h/2\pi = YC/2\pi$. This quantity of angular momentum is the same for all photons regardless of their wavelength and it is also the angular momentum $M_eC\alpha a_0$ of the hydrogen atom at its maximum possible energy $E = M_e(C\alpha)^2/2$ when the electron is moving at $C\alpha$ at the Bohr radius a_0. In the past, when the electron had greater mass, it had to move both more slowly and at a larger radius in order to maintain a single unit of angular momentum $MeC\alpha a_0$. This requires that a hydrogen atom with a more massive electron has a lower maximum energy and longer ionization photon wavelength $\lambda_\infty = 4\pi a_0/\alpha$.

10. The Seven Link Mechanical Structure of Hydrogen

In order to understand how the hydrogen atom has evolved since it was created, it is first necessary to examine the dynamics by which the interaction of a proton and electron produces photons. Neither particle is able to produce a photon by itself. A photon is made up of a matterbody spinning at *C* and an antimatterbody spinning at *C* in the opposite direction. They are bound together in a gear-like interaction that matches their opposite *C* spin velocities perfectly. The antimatterbody half of a photon comes from the electron and the matterbody half comes from the proton.

Seven circlon links form the structure of a hydrogen atom. The smallest #1 link or primary coil is at the classical electron radius and the largest is the #7 link that produces the photons. Each link is 11.7 $1/\theta = 1/\sqrt{\alpha}$ times larger than the one before it. This makes it difficult to illustrate the atom at an accurate scale because the #7 link is more than $(11.7)^7 = 30$ million times larger than the #1 link. This makes it easy to see why an atom seems to be almost entirely empty space, even though it is actually a solid physical structure that is held together mechanically and not by any kind of field interactions. When moving, the atom is a solid projectile that both bounces off of and couples with other atoms and molecules to create other molecules. Molecules are held together by the same mechanical means that bonds the electron to the proton. At the nuclear level, protons and neutrons are held together in complex crystal like structures by the same mechanical principles. In deuterons and tritons the neutrons remain locked like spinning balls inside of the secondary coils of protons.

All matter and photons interact through purely mechanical means. There are no "actions at a distance" in nature. There are no "attractions", "repulsions", fields", dimensions", "space-times", "virtual particles" "color fields", "zero point energy", "dark energy" or "non-material waves". There is not even any "time". There is only matter and photons moving through absolute and empty *gravitational space*. As we shall see, even gravity is a purely local and mechanical interaction and there is no such thing as gravitational 'fields" or "gravitons". It follows that there can be no such thing as a unified "field" solution to physics. There is only a single complex mechanical interaction that will explain everything. In the Living Universe, particles are eternal and once formed maintain their identity. A photon maintains its identity as it travels through space for millions of years and then when it is absorbed, it maintains its identity within the atom.

11. Electron-Proton Charge Coils

The bare electron structure has a circlon shape consisting of three sets of spinning coils. The actual physical presence of the electron (mass) is contained within the primary coils at the classical electron radius $r_e = 1$ spinning on an infinite number of different axes. The secondary coils are 11.7 times larger $r_e/\sqrt{\alpha}$ and spin on an infinite number of axis that are all parallel to a single plane. The tertiary coil is another 11.7 times larger r_e/α and spins on a single axis.

From this basic stable structure, the electron generates a fourth circlon-like charge coil that rapidly increases in size while maintaining its primary coils at the same size as the electron's tertiary coil. The charge coil doesn't stop at an 11.7 times increase in size but keeps rapidly increasing until it encounters the charge coil of another electron or proton. The expanding charge coils of two electrons will push each other apart. However, when the negative charge coil of an electron comes in contact with the positive charge coil of a proton the two become intertwined and a hydrogen atom is formed. The positive and negative charge coils combine into the *stationary photon* coil that holds the atom together and pulls the electron closer to the proton. When the proton and electron join, the size of the newly formed hydrogen atom will be decided by the specific quantity of angular momentum contained in their previous motions. As they get closer together, energy is released in the form of photons that can have many different energies, but only one unit of angular momentum $I\omega = h/2\pi = M\lambda C/2\pi$. Each time a photon is emitted, the proton and electron are pulled closer together and their "orbit" contains one unit less of angular momentum. The atom will emit photons until it reaches a ground state where it has less than the one unit of angular momentum needed to emit a photon. If the atom is then struck by a photon or another atom, it can gain enough energy and angular momentum to emit more photons.

When the proton and electron's charge coils couple together they form a stationary photon. The oppositely spinning coils of the two charges are pulled into and adjust with one another until they become exactly the same size and occupy the same space. When these two opposite charge coils reach perfect synchronicity, the stationary photon splits into two photons. One photon is emitted into space at *C* and the other stays within the atom to maintain the link between proton and electron. This process con-

tinues until all of the atom's excess energy and angular momentum is converted into photons.

If a hydrogen atom has between five and six units $h/2\pi$ of angular momentum when it is formed, it will emit its first photon from the Pfund series of the hydrogen spectrum. Its second photon will be emitted from the Brackett series, the third from the Paschen, the fourth from the Balmer and the last from Lyman series. Hydrogen has a different photon series for each whole number of angular momentum $h/2\pi = M\lambda C/2\pi$.

The energy of the stationary photon is contained in the dual spins of the primary and secondary coils of both the positive and negative charge coils. When it splits in half to emit a photon, the circular velocity of the stationary photon's secondary coils is converted to the rectilinear motion of the photon's vector at *C*. The opposite primary coil spins of the negative coils (antimatter body) and positive coils (matter body) remain constant and stay with the photon after it is emitted.

Half of the photon's physical structure comes from the electron and half comes from the proton. The photon gets half of its energy $E = MC^2$ from the kinetic energy $E = MC^2/2$ of its motion at *C*. The other half comes from the rotational kinetic energy $E = I\omega^2/2$ of the opposite spins of its + matter body and - antimatter body coils. The photon gets its momentum $p = MC$ from the combined mass of the matter and antibody bodies moving along its vector at *C*. The photon gets it angular momentum from the wavelike motion of its vector. The angular momentum of the photon's spinning matter coil perfectly balances out the angular momentum of the oppositely spinning antimatter coil for net angular momentum of zero.

12. 2.7°K Cosmic Blackbody Radiation

The 2.7°K Cosmic Blackbody Radiation (2.7°K CBR) is usually referred to in the literature by other terms such as the Cosmic Microwave Background or the Cosmic Background Radiation. Such terms are very general and really say very little about the true nature of this phenomenon. It is like describing the Great White Sharks as just a "fish". To call this radiation "a background" is very misleading. In the universe at large, it has far more energy than all of the other forms of energy combined. Even here on earth, it is more intense than any other form of radiation except sunlight. Here, well within the Milky Way, starlight has about the same energy as the 2.7°K CBR. However, the 2.7°K CBR is really much more intense because 99% of starlight comes from within our galaxy and the 2.7°K CBR comes from the universe at large. The Cosmic Ray flux also has about the same average energy of as the 2.7°K CBR but a substantial but uncertain amount of these rays also comes from within the Milky Way. In terms of sheer numbers of photons, there is no contest. At least 99% of all photons in the universe are 2.7°K CBR photons.

The Big Bang promoters view the 2.7°K temperature as a random point in time that began shortly after the Big Bang at a temperature of about 3000°K and has been slowly cooling down ever since. As we will see, this assumption violates several of the most cherished conservation laws of physics. Within the principle of Electron Transformation, the temperature of 2.7°K becomes an unchanging universal constant that is derived from the radiation dynamics of the hydrogen atom. It is determined by the equation $CBR\ \lambda_\infty = 4\pi a_0/\alpha$. It follows that the temperature of the 2.7°K CBR has remained constant from the time it was formed until today.

The most important distinguishing characteristic of the 2.7°K CBR is its virtually perfect blackbody distribution curve for the temperature of 2.726°K. The classic blackbody distribution curve is a theoretical construct consisting of a series of photons with a great many different wavelengths. Each wavelength occupies a specific point on the curve at a specific intensity. It is not possible to create a perfect blackbody curve in the laboratory for any temperature, but over the last thirty years or so, the 2.7°K CBR has been measured several times to higher and higher resolutions and each time the results show a more perfect classical blackbody curve.

13. The Dipole Anisotropy

The only significant variation that has been measured in the 2.7°K CBR is its *dipole anisotropy*. It has been observed that its temperature is slightly greater in the direction of Leo and slightly less by the same amount in the opposite direction toward the constellation of Aquarius. The only reasonable explanation of this fact is that this is not a defect in the 2.7°K CBR spectrum but rather blue and red Doppler shifts caused by solar system's absolute motion relative to *photon rest*. From these two equal and opposite Doppler shifts it is a simple matter to measure that we are moving through absolute space at about 375 km/sec in the direction of Leo. In the Living Universe all motion is absolute and relative to the photon rest of the CBR photon isotropy.

This velocity is so fast that it is hard for a human being to relate to it. The kinetic energy $E = MV^2/2$ of the mass of each human being here on earth is greater than the total energy of the first plutonium atomic bomb to be exploded in New Mexico. We have no sense of the enormous amount of kinetic energy contained within our bodies but if one of us were to strike a large object at absolute photon rest, the heat created at impact would be equal to the thermal energy of the atomic bomb.

When it was first discovered in 1965, the 2.7°K CBR was quickly touted as the major evidence in support of the Big Bang theory. However, with a little closer examination, it became quickly apparent that this idea presented several difficult paradoxes that could not be explained within the standard laws of physics.

14. The Time Paradox

The time and distance that it would take for the approximately $z = 2000$ red shift of the 2.7° Cosmic Blackbody Radiation are far greater than the Big Bang's estimates of the universe's age and size.

The most distance galaxies and quasars have red shifts of less than $z = 10$. These are considered to be at the outer extremities of the universe and near the beginning of the Big Bang. This makes it is very difficult to explain how the 2.7° CBR photons could have become red shifted nearly 2000 times in the short period of time between the creation of matter and the formation of the first stars and galaxies. When they were formed, the photons of the

2.7° CBR were mostly from the radiation spectrum of the hydrogen atom. Today that spectrum is about 6000°K.

The Big Bang theory proposes that the 2.7° CBR photons were the result of a great burst of radiation that occurred when all of the electrons and protons in the early universe coupled together and began emitting photons for the first time. This part of the idea is true. Where the Big Bang theory goes wrong is in trying to assume that the 2.7°K CBR began at a temperature of 3000°K rather than at the 2.7°K that it is today.

The age of the universe in Big Bang theory is determined by measuring the increasingly red Doppler shifts determining the value of the Hubble constant. Then the assumption is made that these are real Doppler shifts caused by the outward expansion velocities of the distant galaxies. This assumed velocity implied by the Hubble constant is then reversed and it is calculated how long it would take for all of the matter in such a contracting universe to converge on a point. The latest measurements of the Hubble constant place the age of the universe at about thirteen billion years, yet the most distant quasars and galaxies, that we can observe, appear from their red shifts to be at distances of over twelve billion light years. How is it possible that light photons emitted by the hydrogen atoms in a star, some twelve billion years ago, are red shifted by less than ten times and the light photons emitted by the same atoms less than a billion years earlier are red shifted by nearly 2000 times? This problem cannot be explained by the Guth inflation theory. In the standard theory, inflation occurred during the first second of the Big Bang and the CBR was not produced until about 300,000 years later. In the Living Universe, neither the CBR photons nor the light from distant galaxies has been Doppler shifted.

15. The Space Paradox

The virtually perfect blackbody distribution curve of the 2.7° CBR photons is impossible to reconcile with some of the most basic assumptions and cherished laws of physics.

At first the Big Bang theorists explained the Hubble red shift with the metaphysical assumption that the galaxies are actually moving apart as the result of an enormous explosion of space, time and matter at the beginning of the universe. The Hubble red shift was proposed to be a simple Doppler shift caused by the outward inertial motion of distant galaxies that increased with distance.

Then in 1965, the Doppler shift explanation of the Hubble red shift lost all credibility when Bell Labs researchers Penzias and Wilson discovered the 3°K Cosmic Blackbody Radiation. (Actually they did not really "discover" this radiation since it had been observed by nearly everyone in the preceding decade as the snow and static signal picked up by any television set turned to a non-broadcast channel.) Subsequent measurements of this radiation showed that it had a virtually perfect blackbody radiation distribution curve for a temperature of 2.726°K.

Although Big Bang theorists such as George Gamow and Robert Dicke had predicted that there should be a remnant radiation left over from the Big Bang with a temperature of a few degrees above absolute zero, no one expected it to have a perfect blackbody distribution curve. Starlight radiation was emitted from the blackbody radiation at the star 's surface temperature of several thousand Kelvin. The shape of starlight's wavelength distribution curve is the same as the blackbody curve, but its intensity is thousands of time less than the blackbody radiation for its wavelength curve. Cosmic rays also have a temperature of about 3°K, but their distribution "curve" is more like a straight line. Blackbody radiation is unique for each temperature. It consists of a single precise mixture of photons with wavelengths spread out over several orders of magnitude. Each photon wavelength must fit the curve at a precise intensity. The maximum intensity photon for a blackbody wavelength/intensity curve is determined by Wein's displacement law.

If the expansion of the universe was the result of the galaxies all moving apart in different directions, as Hubble first considered, the 2.7° CBR would quickly lose its blackbody characteristics. To illustrate this, let's consider a past point in time when, according to Big Bang theory, the 2.7° CBR was twice the temperature that it is today: 5.4°K. From this point, if the universe were to double in diameter, its volume would increase by eight times and the energy density in a given volume of space would decrease by eight times. Such an expansion should have no effect on the energy and wavelength of the individual photons but their overall energy density would be reduced to 1/8. In such a case, the total energy of all the photons would be the same, but the temperature of the universe would now be 4.05°K. The most important effect of this expansion would be that the photons would no longer fit within a blackbody radiation distribution curve for this or any other temperature. The maximum intensity wavelength of the photons would still be $\lambda = 1 = 0.000535$ m but the maximum intensity wavelength of blackbody radiation for the temperature of 4.05°K is $\lambda = 1.34 = 0.000716$ m .

In order for the 2.7°K CBR to maintain a blackbody radiation distribution curve within an expanding universe, it has been necessary for proponents of the Big Bang theory to make the somewhat preposterous and purely ad hoc assumption that the galaxies are inertially stationary and do not emit Doppler shifted photons. Instead, they propose that it is the "space-time" between the galaxies that is expanding. This makes the galaxies appear to grow farther apart even though they are not actually moving with the kind of relative motion that produces Doppler effects. Without any kind of compelling evidence, the Big Bang enthusiasts claim that the Hubble red shifts are caused simply by the photons traveling through a slowly expanding "space-time". The Hubble red shifted photons are not Doppler shifted but rather acquire their increased wavelengths gradually as they travel through the expanding space between the galaxies. This is a special kind of "space-time" that only effects photons. The stars and the galaxies and the space within them does not expand and they do not grow larger. Particles, atoms, molecules, planets, stars and galaxies are all completely unaffected by this expanding space. It is claimed that this expanding space-time only exists on the outside of galaxies. The Big Bangers claim that, through this convoluted process, individual photons double their wavelength and decrease their energy and momentum by one-half every time the inter-galactic space doubles its diameter.

The primary problem with this assumption is that it violates the most fundamental laws of physics: the conservations of mass, energy and momentum. This assumption requires that as the

universe and the space within it expand, vast amounts of energy and momentum simply disappear into nothingness as photons increase their wavelengths and decrease their energy. In fact, in order to make their theory work, the Big Bang people are forced to conclude that well over 99% of all the energy produced since the universe began has simply vanished without a trace into the so called fabric of expanding space-time.

Experimental physicists have determined, in virtually all experiments ever performed, that energy and momentum are perfectly conserved in all individual interactions. It seems quite curious then, that theoretical physicists would be so quick to claim that the laws for the conservation of energy and momentum have no relevance for the universe at large! In the Living Universe, a photon has eternally constant parameters until it is absorbed or reflected. A photon can cross the universe and not change in the slightest.

The Big Bang theorists never even try to offer a reasonable explanation of how expanding space-time can increase the distance between galaxies and increase the wavelengths of photons but not increase the distance between the proton and electron within the hydrogen atom or change the intrinsic wavelengths associated with particles of matter such as the Compton wavelengths of the proton and electron. How is it possible that the space-time between galaxies constantly expands but the space-time within galaxies remains fixed? Does this mean that photons exist within a special kind of elastic space-time and that matter exists within a completely different rigid and unchanging space-time? In the Living Universe, there is no "space-time". There is only an empty void through which all photons travel at exactly *c* while maintaining their mass, energy and wavelengths.

16. The Antimatter Paradox

In all of the careful observations that have been made locally and within the universe at large, there is no convincing evidence for the existence of any but the tiniest traces of antimatter.

All high energy particle experiments show an absolute conservation of charge. Electrons and protons are easily created with high energy particles. However, they are always created with their oppositely charged antiparticles; positrons and antiprotons. The matter of the universe is essentially made up of electrons and protons. If it was created from "pure energy" during the Big Bang, it is absolutely necessary that equal numbers of positrons and antiprotons be created at the same time. Since these particles are stable and can only be destroyed by annihilating with their antiparticles into photons, where are all of these antimatter particles today? Except for the few electron/positron and proton/antiproton pairs that are created for a brief existence when cosmic rays strike the atmosphere, there is virtually no evidence that anything more than minute quantities of antimatter exist anywhere else in the universe. If anti-stars and anti-galaxies were interspersed about the universe, we could not help but notice the reworks produced when they collided with stars and galaxies. This would make the gamma ray background far more intense than it is observed to be.

The strongest evidence for the lack of antimatter is that no antimatter has ever been detected in primary cosmic rays. Cosmic Rays consist of photons, protons, electrons and small numbers of the stable nuclei of all the elements. The abundances of the various elements and their isotopes found in cosmic rays are very similar to the elemental abundances as determined from the spectroscopic examination of stars. Since cosmic rays present us with a reasonably accurate picture of the distribution of matter in the universe, the fact that they contain no positrons or antiprotons virtually precludes the existence of these particles in the universe at large.

The standard Big Bang model tries to explain this paradox with a complex, smoke and mirrors kind of a scheme, in which a supposed slight violation in parity causes a few more electrons and protons to be created than positrons and antiprotons. In his book **The First Three Minutes**, [1] Steven Weinberg calculates that these extra particles of matter occurred at the rate of about one for every 1,000,000,000 matter-antimatter pairs. His somewhat preposterous idea is that the electrons and protons that exist in the universe today are just the slight residue left over after the vast majority of the original electrons and protons annihilated with their antiparticles into photons. He must then conclude that all of the protons and electrons that exist in the universe today were somehow created without antiparticles.

Another problem, that seems never to be mentioned in accounts of the Big Bang, is the origin of the electrons. To the extent that measurements can be made, it appears that protons and electrons exist in equal numbers both locally and in the universe at large. Big bang theorists can offer no explanation for this fact. Since it requires far less energy to produce electron-positron pairs than proton-antiproton pairs, it would be expected that the electrons were produced at a later and cooler stage of the Big Bang. Also the parity violation needed to get rid of the positrons would have been quite different than that which eliminated the antiprotons. It is a strange coincidence indeed that left equal numbers of protons and electrons.

The major difficulty with using parity violations and annihilations to get rid of antiprotons and positrons is that there is no evidence of this great primordial annihilation in either the form of the photons produced or of the vast amounts of energy that they would have contained. According to Weinberg, this annihilation energy would be about one billion times greater than the present mass-energy of the universe or about 10^{80} Joules. This photon energy would be many orders of magnitude greater than all of the other forms of energy in the universe combined. The paradox is that no one has ever identified any photons or other forms of energy that they could attribute to this enormous annihilation of matter and antimatter. In contrast, there still remains a near perfect record of the 2.7° CBR that was produced a short time later when the residual electrons and protons coupled together to form atoms and then began emitting photons.

In the Living Universe, matter and antimatter have always been with us. Since it was once the antiparticle to the proton, the electron is antimatter to the proton is matter and the photon contains equal quantities of each.

17. The Energy Paradox

The quantities of energy needed for the dynamics of the Big Bang theory bear almost no relationship to corresponding quantities that we measure in the universe today.

A good round number for the mass of the universe is 10^{80} protons. This number has been kicking around since Eddington and can be arrived at quite easily by extrapolating galaxy counts. This converts to a total mass-energy for the universe of more than 10^{71} Joules. The latest measurements for the radius of the visible universe is about 13 billion light years. The quantities of energy that can be measured from the universe at large, fall into three distinct categories: the 2.7° CBR, starlight and cosmic rays. Each of these contributes about 3°K to the temperature of space in our corner of the Milky Way. About 99% of all starlight (excluding sunlight), as well as some substantial portion of cosmic rays, comes from the Milky Way galaxy. In contrast, the 2.7° CBR, which comes from the universe at large is by far the largest source of energy in the universe. Unlike the other forms of energy, the 2.7° CBR is not a round number but has been measured to have a nearly exact value of 4×10^{-14} Joules per cubic meter. Given a universe with a radius of 13 billion light years and we get a total energy for the 2.7° CBR of just over 10^{65} Joules. The Big Bang theory claims that the 2.7° CBR once had a temperature of 3000°K and with a total energy of its photons at 10^{68} Joules. It then claims that each photon kept its individual identity but between then and now, 99.9% of each photon's energy and momentum just vanished without a trace.

The Big Bang theorists also claim that when matter and antimatter annihilated near the beginning of the universe, it produced photons with a total energy of 10^{80} Joules. Even though this is a billion times greater than the present mass-energy of the universe, the Big Bang enthusiasts claim that all of these photons as well as their inherent energy also simply vanished without a trace.

Another source of somewhat measurable energy is the kinetic energy of the receding galaxies in the outer regions of the universe. If we consider a homogeneous universe with a radius of 13 billion light years, then about one-half of its mass (10^{53} kg) would be located in the outer 3 billion light years. If these outer galaxies have an average recessional velocity of 87%C then their kinetic energy would be about 10^{71} Joules. This energy is still more than a billion times less than the energy that disappeared from the matter-antimatter annihilation that was supposed to have occurred near the beginning of the Big Bang.

18. The Hubble Constant

For more than fifty years, there has been a substantial amount of astronomical observation dedicated to determining the Hubble constant to ever higher degrees of accuracy. It has been common for researchers to express the value of the Hubble constant in terms of velocity divided by distance. This choice of parameters gives the value a metaphysical character in that it describes an effect that is wished for but hasn't really been measured. This value implies that the Hubble red shift is a Doppler shift caused by distant galaxies moving away from us. However, all that is really measured is a gradual increase in the wavelengths of photons over great periods of time or distance. There is absolutely no justification for the relativity buffs to arbitrarily label this effect as a Doppler shift or even as a "red shift" without giving the other possible causes their due consideration. In fact, Hubble himself was very reluctant to label his discovery as a Doppler shift.

The cause of the Hubble red shift can only be explained in three different ways.

1. The photons acquired Doppler shifts when they were emitted from the atoms in receding galaxies. This explanation completely fails to account for the near perfect blackbody spectrum of the 2.7° CBR. Any general Doppler shifting in an expanding universe would quickly move these photons away from their blackbody distribution curve.
2. The photons gradually increased their wavelengths during the billions of years that they traveled through expanding space-time from their emitting atoms to the earth. This explanation is able to account for the blackbody spectrum of the 2.7° CBR, but only by completely violating the physical laws for the conservation of mass, energy and momentum.
3. In the Living Universe photons emitted by atoms today have shorter wavelengths than they did in the distant past. Very old spectral photons have longer wavelengths than new photons. This explanation for the Hubble shift can not only account the existence of the 2.7° CBR, but it also predicts its exact value $\lambda_\infty = 4\pi a_0 / \alpha$.

19. Conclusion

This account of the Living Universe does not deviate at all from the basic values and parameters of the standard model descriptions of the physics of the hydrogen atom. This is not so much the history of the universe as it is the history of the hydrogen atom. It merely follows the sequence of events that occur to hydrogen atoms as the mass of their electrons decrease. No exotic new particles have been proposed, it doesn't begin with a singularity and there is no violation of any of the most basic conservation laws. Unlike the Big Bang theory, no new laws, particles, dimensions or interactions need be introduced in order to explain the relevant astronomical observations. Nothing new is really said about the hydrogen atom. I picture the hydrogen atom with my circlon models of nuclear and atomic structure, but the circlon model is not needed to explain this whole scenario. However *you* picture the hydrogen atom in your mind, you should be able to plug that picture into the evolutionary scenario that has been presented here. The whole process logically flows from one sequence to the next without the introduction of any paradoxes or exotic ideas. The whole process strictly adheres to the widely accepted basic principles of both nuclear physics and the electrodynamics of hydrogen. Gravitational Expansion has been an integral part of this explanation but either Einstein's or Newton's theories of gravity can also work adequately within the presentation. The only thing new, in the Living Universe, is a novel way of explaining the evolutionary history of the hydrogen atom through a transformation in electron mass. The Living Universe model is compatible with basically all of the experimental data that has been accumulated for photons, atoms and particles of matter.

References

[1] Steven Weinberg, **The First Three Minutes** (Basic Books, 1993).