Ettinger Journals

Short Treatise on Why Dark Energy Does Not Exist

Replacing the concept of Dark Energy by applying Einstein's Equivalence Principle and removing Newton's Cosmological Principle

By Douglas B. Ettinger

Douglas B. Ettinger
11/8/2013

A Short Treatise on Why Dark Energy Does Not Exist

I. Table of Contents

A. Table of Figures

II. An Introduction to Why the Dark Energy Concept Should be Abandoned

This treatise explains how the dark energy concept emerged in the 1990's and why it should be abandoned in favor of an expanding universe theory requiring no new energy. An explanation of the standard model of cosmology and the cosmological constant is given. Its basis comes from the cosmological principle introduced by Isaac Newton and the recent concept of the Big Bang. Dark energy leads toward ideas of zero-point energy being present everywhere within a vacuum and leads away from the cherished laws of symmetry and conservation of energy and matter.

This paper further explains the principle of equivalence introduced by Albert Einstein and his colleagues. A simplified reason or logic is given to be understandable to most readers about how the principle was not applied correctly thus creating a conundrum that led to dark energy.

The principle of equivalence is then presented to actually show how dark energy is not required if it is applied correctly. An adequate reason is given to show why the expansion of the universe is accelerating without new energy being introduced after the Big Bang. Hence, symmetry and the laws of conservation can still be preserved.

Then the data of recent space missions such as the Planck probe are examined to show support for the new "hollow universe" concept of this paper. Also, other studies of the past century are analyzed to show why the "hollow universe" concept was never observed or analyzed. Most focus of space missions today is about determining the age of the universe by observing the redshift of microwave background radiation and the largest redshift of observable galaxies. The ages of galaxies were observed by Edwin Hubble to determine the Hubble Constant. But, his study only went in one direction and only as far as about 20 mega-parsecs (Mpc)[a], a very short distance compared to the total distance to the edge of the universe. Astronomers are not looking for the great void at the center of the universe because they believe it does not exist; they have acquired a mental block due to the dogma of the cosmological principle of a homogeneous density set forth in the 1700th century.

The old dogma was enhanced by the Big Bang Theory which explains that all matter and energy is spewed outward from a singularity point in a continuous fashion for a certain period of time. Then this matter and energy keeps expanding to fill space by hopefully obeying Newton's 2nd Law of Inertia. If no new matter or energy is added, then the universe should collapse on itself due to gravitation. But as observed the universe is actually expanding at an accelerated rate. Scientists, thus far, have devised dark energy, an energy that keeps being added to fill space and accelerate the expansion. This paper will propose a new way of creating this expansion without some mysterious process of adding more and more energy that disobeys symmetry.

III. The Rise of Dark Energy

Dark energy is a very recent concept that became accepted to explain observations of redshifts since the 1990s that indicated an expanding universe with an increasing rate of acceleration. This hypothetical energy is a form that permeates all of space homogeneously.[b] "According to the Planck mission team using a space telescope, and based on the standard model of cosmology, the total mass-energy of the universe contains 4.9% ordinary matter, 26.8% dark matter, and 68.3% dark energy."[c]

One proposed reason for dark energy is the cosmological constant, a constant energy density filling space as it is created by the galaxies moving apart. The other accepted concept is scalar fields such as quintessence, dynamic quantities whose energy density varies in time and space. It all sounds rather mystical. In classical physics the universe is thought to be like a giant clock that is wound and then left to unwind until it stops with no intervention from outside sources. However, these new concepts claim that after the Big Bang more energy is being added at an ever faster rate as matter expands and time moves onward. A very simplified sequence for this idea of the cosmological constant[d] is given by:

1. Big Bang creates energy and matter from a singularity point.

2. Matter expands due to kinetic energy and creates space.
3. Space creates vacuum energy or zero-point energy.
4. This dark energy continually increases its rate of production.
5. This added energy overcomes gravitational forces.
6. And, henceforth, the universe expands at an ever increasing rate.

The laws of symmetry do not apply here. Should they apply?

The idea of zero-point energy is derived from a quantum mechanical system where the energy of its ground state fluctuates. In other words, no scalar field can ever remain at absolute zero or 0 degrees Kelvin. The idea was given the stamp of approval by Albert Einstein and Otto Stern in 1913.[e] An interesting example is cited. Liquid helium does not freeze under atmospheric pressure at any temperature because of its zero-point energy.[f] This example's validity is questioned due to the pressure itself providing enough energy to prevent the ground state from being reached and maintained. A pure or absolute vacuum is also questionable. Any so-called vacuum should have a minute field in its space created by some very miniscule amount of fermions or bosons. The currently accepted idea that the vacuum creates fields of fermions or bosons is very alien. Perhaps a better perspective is that an existing, miniscule, undetectable field of energy already exists in the vacuum.

Whatever its importance in technology and pseudo-science, zero-point energy was grandly received and utilized by cosmologists in the 1990's to explain the observed increasing rate of the expanding universe via redshift and supernovae studies in other distant galaxies. This energy became known as dark energy. Let's assume that zero-point energy requires an existing field of fermions or bosons that is given to vacuum-like regimes as the universe evolved. Then no new energy need be added to the universe after the Big Bang. So if no new energy was added or no new fields were created from the black void or a pure vacuum, then what supplies the energy for the universe's accelerated rate of expansion? This question will be answered in another way by using the equivalence principle which deals with the equivalence of gravitational and inertial mass as was analyzed and emphasized by Albert Einstein.[g]

IV. First Attempts at Applying the Equivalence Principle

In equation form this equivalence is:

$$F = [\ \sum m_n + M\ ] \times a = [\ G \times M / r^2] \times [m_1 + m_2 + \ldots + m_n] = G\ [\ \sum m_n\ ] \times M / r^2$$

This equation form is simplified to be understandable by most readers. This is simply Newton's 2nd law of the inertia force set equal to the force created in a gravitational field in which both have identical masses. The net inertia mass after the Big Bang is set equal to {[$\sum m_n$] + M} where $\sum m_n$ is the sum of all packets of mass in the outer perimeter of the expanding universe centered approximately about the source of the Big Bang; and, M is the sum of all packets of mass inside a certain core boundary surrounding the Big Bang's point of singularity. The total mass of the universe is $\underline{\acute{M}}$ equal to {[$\sum m_n$] + M}. The packets of mass refer to stars, star clusters, galaxies, clusters of galaxies, superclusters of galaxies and even large scale ligaments of galaxies. The mass represented by M is assumed to be one body with a homogeneous density. The value of "a" is the average inertial acceleration and "G" is the universal gravitational constant.

The statistical average of distances between these sets of mass is "r". And, r_e is the assumed radius from the Big Bang singularity to the farthest known observable galaxy. The "r" value for the above equation is set at $r = ¾\ r_e$ which means the statistical average distance of all the packets of mass equal to [$\sum m_n$] is ¾ r_e the distance between the Big Bang singularity and the assumed, observable end of the universe. The singularity is the center of mass, M. See the diagram of Figure 1.

The current accepted value for the radius of the universe, r_e, is 46 to 47 x 10^9 light years (ly) or 4.4 x 10^{26} meters. The total mass of the universe is computed to be 6 x 10^{22} stars divided into about 200 x 10^9 to 1 x 10^{12} galaxies which is approximately 3 to 8 x 10^{52} kg to 3.4 x 10^{54} kg.[h] For the purposes of this paper let the total mass, $\underline{\acute{M}}$ = 8 x 10^{52} kg.

The following thought experiment follows. By using these values the total average gravitational force between all the packets of mass represented by [$\sum m_n$] and the inner core of packets of mass represented by M are calculated for phases of expansion and hypothetical conglomerations of masses over time. G is equal to 6.67384 x 10^{-11} $m^3kg^{-1}s^{-2}$ or $N(m/kg)^2$. If the two sets of mass, [$\sum m_n$] and M, are set equal to each other or ½ Ḿ = 4 x10^{52} kg then the total net current gravitational force becomes –

$$F = 6.674 \times 10^{-11} N(m/kg)2 \times (4 \times 10^{52} kg) \times (4 \times 10^{52} kg) / (0.75 \times 4.4 \times 10^{26} m)^2$$

$$= 9.8 \times 10^{41} \text{ Newtons} \approx \text{all the forces holding the universe together.}$$

This tidy number is extremely hypothetical, but does represent a certain grasp regarding the universe's entirety or the universe being an entity. Let this number be a starting point and call it F_c. Such a representation implies that the universe is completely interconnected like some computerized machine. Let's experiment with this awesome machine by using the only tools that man has for such a machine, his thoughts.

This machine expands over time from time zero of the Big Bang. Matter is created and is expanding and diverging. From time zero the average value of "r" is increasing. This parameter causes the total gravitational force to become smaller as time increases. As packets of mass are formed they continue to diverge but very often cluster or collide with other packets thereby decreasing the packets of mass over time. This parameter actually does not affect the overall gravitational energy or force. However, the packets of mass do move outward from the singularity point causing M's packets of mass to decrease and [$\sum m_n$]'s packets of mass to increase over time. These parameter changes do affect gravitational force by decreasing it over time.

Some very hypothetical and simplified values for these changing parameters will be used to illustrate how the overall gravitational force in the universe is affected which in turn ultimately affects the overall inertial force in the same way to preserve the equivalence principle. Let's choose 24 packets of mass forming at ¼ of the universe's present expansion, then 12 packets forming at ½ of the present expansion, then 6 packets forming at ¾ of the present expansion, and then finally the current expansion with "n" number of packets.

$$F_c = 6.674 \times 10^{-11} N(m/kg)2 \times (4 \times 10^{52} kg) \times (4 \times 10^{52} kg) / (0.75 \times 4.4 \times 10^{26} m)^2$$

Or:

F_c = G x 16 x 10^{104} kg^2 / 10.9 x 10^{52} m^2 = 9.80 x 10^{41} Newtons

And F_1 for 24 packets of outer masses, [$\sum m_{24}$], and a current growing radius of ¼ r_e is -

F_1 = G x [{(4x 10^{52})/24} x (4 x 10^{52})] x 24 / (0.25 x 10.9 x 10^{52})^2

F_1 = 16 x F_c

And, likewise for F_2, F_3, and F_4 -

F_2 = G x [{(4x 10^{52})/12} x (4 x 10^{52})] x 12 / (0.50 x 10.9 x 10^{52})^2

F_2 = 4 x F_c

F_3 = G x [{(4x 10^{52})/6} x (4 x 10^{52})] x 6 / (0.75 x 10.9 x 10^{52})^2

F_3 = 1.77 x F_c

F_4 = G x [{(4x 10^{52})/n} x (4 x 10^{52})] x n / (1.00 x 10.9 x 10^{52})^2

F_4 = F_c

From the above mathematical simplification the conclusion is that over time the conglomeration of masses does not affect the overall forces or energy. But, the expanding distances represented by "r" increasing do affect the overall gravitation energy by decreasing it.

Other changing parameters are how the hypothetical M changes with respect to [$\sum m_n$] over time. M decreases as [$\sum m_n$] increases due to the space surrounding the singularity being evacuated. Hypothetical values will be chosen to illustrate the trend of the gravitational energy decreasing. F_5 is chosen to show homogeneity throughout the universe. Then F_6, F_7, and F_8 are chosen to show in incremental steps what happens when the central packet of mass, M, decreases as the outer packets of mass, [$\sum m_n$], increase.

$F_5 = G \times [(4 \times 10^{52}) \times (4 \times 10^{52})] / (1.00 \times 10.9 \times 10^{52})^2$

$F_5 = F_c$

$F_6 = G \times [(5 \times 10^{52}) \times (3 \times 10^{52})] / (1.00 \times 10.9 \times 10^{52})^2$

$F_6 = 0.94 \times F_c$

$F_7 = G \times [(6 \times 10^{52}) \times (2 \times 10^{52})] / (1.00 \times 10.9 \times 10^{52})^2$

$F_7 = 0.75 \times F_c$

$F_8 = G \times [(7 \times 10^{52}) \times (1 \times 10^{52})] / (1.00 \times 10.9 \times 10^{52})^2$

$F_8 = 0.44 \times F_c =$ the approximate final reduced net forces due to the universe's central evacuation.

No matter how one slices or dices it, gravitational energy should decrease and in turn inertial energy should follow suit. But inertial energy keeps increasing due to the observed increasing acceleration rate of the universe's expansion. In order to solve this riddle cosmologists have concluded that there exists dark energy that has been added and increasing ever since the Big Bang and causing an increasing rate of acceleration. This idea, however, violates science's beloved laws of conservation and symmetry.

V. Applying the Equivalence Principle Successfully

Is there another explanation – perhaps even simpler? Why not assume that as the packets of matter expand outward in very rough spherical shells they become compressed. The term "spherical" is used loosely in that it represents a geometry that is only statistical in nature. From deep-sky observations it is known that matter exists in ligaments with very large voids. These observations only bolster the lumpy nature and asymmetry of the expanding universe. However, the thinking of a very rough three-dimensional sphere cannot be ruled-out, since all matter and its kinetic energy originated from a singularity point and moved outward into three-dimensional space.

So another thought experiment is applied to another useful simplification: expanding shells of lumpy matter becoming compressed. The compression is caused by the shells being locally attracted to each other by creation's friendly companion, gravity. In this case, the value of "r", the average distance between packets of matter is actually decreasing and **not** increasing. The original "r_n" of our previous thinking are distances taken from the singularity point. However, if all matter is moving away from the singularity, then by reason, the center of the universe wherever it resides is mostly void having little gravitational influence. The thought of a homogeneous density (less the observed large voids) throughout the universe is really not comprehensible. See the diagram of Figure 2.

The influence of gravity between and among all matter is better understood by applying the mathematics and logic of various concentric shells moving outward from a singularity point and being attracted to each other. Evidence of this shell compression is given by our observations of deep space that show the continual clustering and collision of galaxies and the forming of superclusters of galaxies. This means that the value for the overall "r" is becoming smaller thereby causing an increase in gravitational energy and its equivalent inertial energy. Hence, the acceleration rate of the expanding shells should always increase due to this reasoning.

VI. Concluding Why the Universe Expands

Using this perspective, dark energy is no longer required. The distances between the shells and packets of outer masses of m_1 to M (the most inner shell), m_2 to M, …, m_n to M; m_1 to m_2, …, m_1 to m_n ; m_2 to m_3, ..., m_2 to m_n; etc. are mostly decreasing. As "r" becomes smaller and smaller the gravitational forces become ever larger. For the equivalence principle to reign, the overall acceleration, "a", must increase in order for all the inertial forces to increase in turn. This inductive reasoning poses a serious challenge to the currently accepted dark energy concept.

In the previously hypothetical model of the universe the expected final reduced net forces due to the universe's central evacuation equals 0.44 of Fc (total net current gravitational force) determined in the previous chapter. Any evacuation of mass around the singularity point will produce a total net gravitational force that keeps getting smaller. Gravitation force is only affected by matter that is interior to a spherical surface where it is determined. Hence, the loss of gravitation force due the evacuation of the central core of the universe must be added to the gravitational side of the equivalence principle equation in order to compensate for the central void of no matter.

Computations from the Planck mission arrive at 68.3 % dark energy and 31.7 % for all matter including dark matter. So the real amount of total net current gravitation force is equal to combining the universe's central evacuation factor and the computed extra mystery energy –

$$F_{actual} = \{[\sum m_n] + M\} \times a = G \times \{[\sum m_n] \times M\} / r^2 = (F_c / 0.44)_1 + [(.683/.317)\, F_c]_2$$

$$= 2.27\, F_c + 2.15\, F_c = 4.42\, F_c$$

Examining the above values reveals that F_{actual} can only become larger than Fc if the acceleration "a" increases on one side of the equation of equivalence and average distances between all net masses represented by "r" decreases. Of course, it is assumed that all matter and/or its equivalent energy form created after the Big Bang and represented by $\{[\sum m_n] + M\}$ does neither increase nor decrease. Therefore, the solution of how "r" is affected is given by -

$$4.42\, Fc = G \times \{[\sum m_n] + M\} / (r/X)^2 \text{ or } (r/X)^2 = 1 / 4.42 \text{ where}$$

$X = \sqrt{(4.42)} = 2.1$ which provides a trend or a relative value for the overall "r" distance shrinking as the expanding layers of matter are compressed. This value of (r / 2.1) signifies by a certain amount that the distances between shells of matter have come together since the Big Bang. This compression is almost 50% due to the gravitational attraction between the shells and occurs while the shells of matter are at the same time expanding. This continuing attraction and compression of the shells along with the evacuation of the central core creates the ever increasing acceleration of the universe's overall expansion. As the shells expand they also are coming together. This vision does not exclude the localized, random, chaotic, asymmetrical clumping of matter that is readily observed. From man's viewpoint in the universe, it is almost impossible to see this general trend of all matter slowly coming together to create a thick, layered, spherical, hollow ball. However, there is strong evidence supporting this idea from the Planck Mission that performed a very detailed and complete deep space sky survey. The cosmological principle may be in jeopardy. Eliminating this principle originally proposed by Isaac Newton would definitely support the new concepts presented in this treatise.

VII. What Does Space Mission Results Reveal about a "Hollow Universe" with Galaxies Becoming Compressed on the Outer Perimeter?

So a better vision of the universe is like envisioning a growing cantaloupe or honey dew melon instead of a watermelon without any hollow center. Should observers on Earth be able to see this hollow evacuated void? The answer is probably yes, but astrophysicists need to know that this hollow void may exist and how to find it. Parallax methods can only reveal distances to 100,000 (10^5) light years (ly). Cepheid variables expand the knowledge of distances of galaxies to 10,000,000 (10^7) ly, and supernovae studies indicate distances from 1,000,000,000 (10^9) ly to 10,000,000,000 (10^{10}) ly. Redshift studies (the radio and microwave background) allow astronomers to determine distances of the very first galaxies near the time of the Big Bang that are beyond 10 billion light years ago.[i]

However, studies of the distribution of intermediate galaxies in directions 90^0 and 180^0 apart from each other have not been performed. This type of evaluation is required to find the predicted huge void of matter that surrounds the Big Bang's singularity point and the outer layers of matter that are coming together. See the diagram of Figure 3. The Hubble Deep Field (HDF) studies have been performed only at high latitudes both north and south to avoid dust and obscuring matter in the plane of the Milky Way's disk. The selected area of targets for HDF studies represents only 1/28,000,000 of the total area of the sky.[j]

No comprehensive survey of intermediate galaxy ages has been conducted since the original Hubble constant was determined. A new survey is needed to discover whether the distribution of galaxies is truly homogeneous throughout space like raisins expanding in a raised bread as the cosmological principle predicts or whether there may lurk a huge void as this paper hypothesizes. Hubble Law and the Hubble constants are based on Hubble's measurements of galaxy distances and their correlation with Vesto Slipher and Milton Humason's measurements of redshifts associated with galaxies. Hubble plotted a trend line from 46 galaxies that he studied to obtain a value for the Hubble constant.[k] Other subsequent studies improved the accuracy of the constant but for the most part all these galaxies that were studied were in one line of direction and only reached outward about 20 megaparsecs (Mpc) which is only about 0.48% of the radial distance from the Big Bang singularity to the observable edge of the universe. Certainly no conclusion can be made about the homogeneous density of the universe using this data.

"Images from the Extreme Deep Field, or XDF, were released on 26 September 2012 to a number of media agencies. Images released in the XDF show galaxies which are now believed to have formed in the first 500 million years following the Big Bang".[l] Most sky surveys focus on how far and how long ago that background microwaves and galaxies can be detected. The distribution of galaxies being homogeneous in all directions has never been confirmed. This homogeneous distribution is only assumed from the cosmological principle[m] which was planted in the minds of the scientific community by Isaac Newton. Newton during his time had no idea of the expansiveness of the known universe, but he needed a simple answer to why the stars stayed in their positions when he was developing his law of gravitation. His new principle did keep away critics about his new gravitational law. This assumption slowly became mostly dogma and really only applies to what astronomers can see from their particular vantage point at only one place in this whole universe.

VIII. Planck Space Mission Data Possibly Refutes the Cosmological Principle

The Planck space mission released in 2013[n] the most accurate and detailed map of the oldest light in the universe, revealing new information about its age, contents, and origins. The cosmic microwave background is remarkably uniform over the entire sky, but tiny variations appearing as splotches on the Planck map are the seeds from which matter grew forming stars and galaxies. Planck is the successor of NASA's Wilkinson Microwave Anisotropy Probe (WMAP) and the Cosmic Background Explorer (COBE) gathering measurements with improved sensitivity and resolution.

However, some anomalous features were observed which did not agree with the standard assumption that the sky is the same everywhere. The light patterns are asymmetrical on two halves of the sky; and a void or patch of sky was revealed that was larger than expected. "The distribution of light is random, but the amplitudes of the fluctuations are not. Amplitude is how bright they are; like the height of a wave." The fluctuations are just a little brighter than they should be on one side, and just a little dimmer on the other.[o] This affect was also confirmed by the WMAP. So is the Universe not so homogeneous on a vast scale?

The answer, which is not currently being accepted, may be that the universe does not have a uniform density of galaxies on a large scale. There may really be a center that is the location of a giant void with no matter. When observers look toward the center of the universe the light is dimmer due to the void of no galaxies and brighter in the opposite directions due to the compression of the layers of galaxies providing a denser distribution. This so-called lopsidedness of the universe could be the exact evidence for supporting a hollow universe with compressed outer layers of galaxies that causes the galaxies to accelerate their expansion rate. Of course, then dark energy is no longer required. Dark energy is just another construction of the mind to support a previous construction which was the cosmological principle by Isaac Newton. These two constructions cannot survive without the other. Perhaps they should be both abandoned. Much debate and further studies for more convincing redshift data from galaxies will be required.

Figure 1: A Universe with a Homogeneous Matter Density

A universe with a homogenous matter density is possibly erroneous because an expanding universe cannot be explained unless dark energy is added.

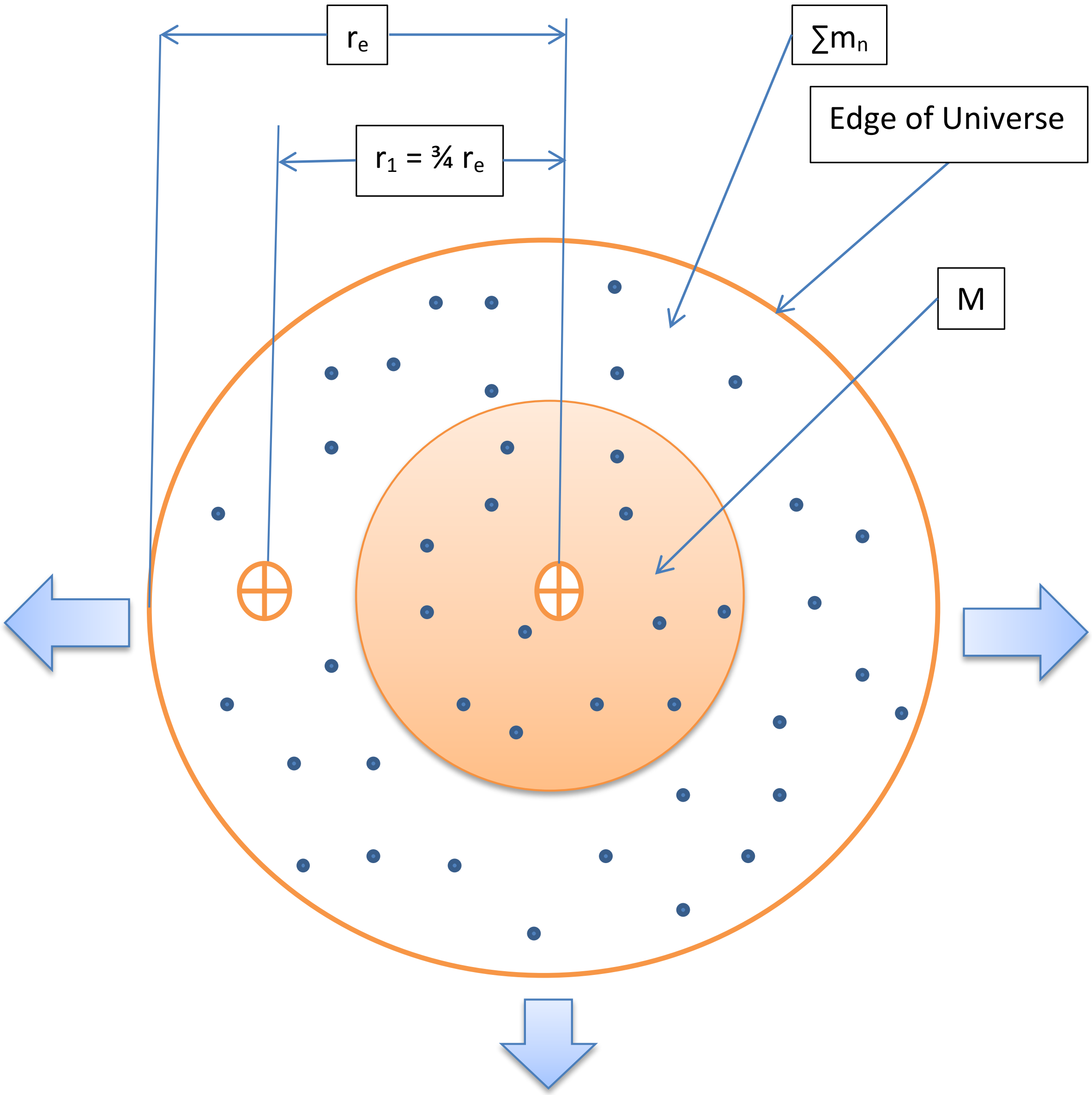
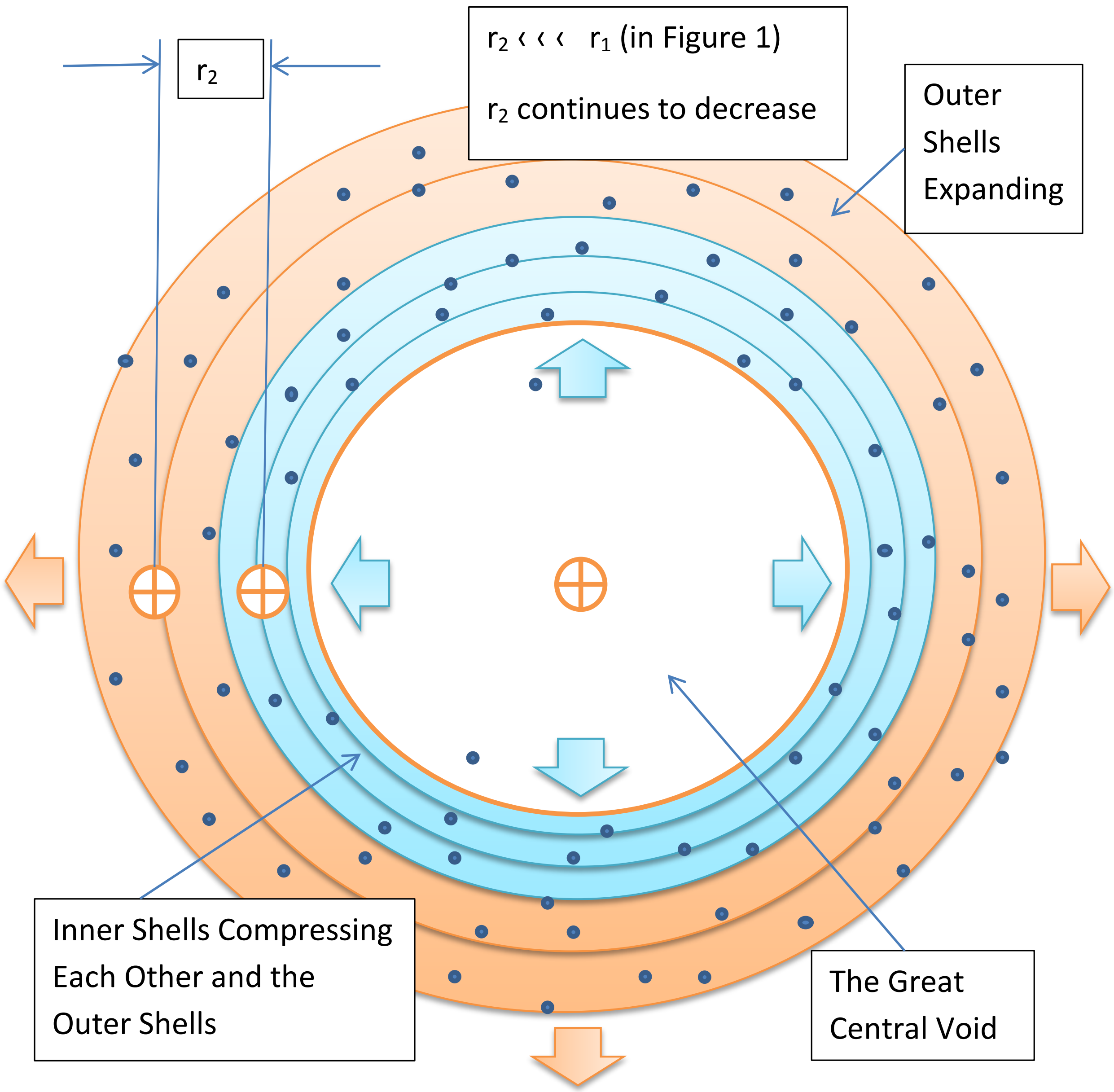


Figure 2: A Universe with Shells of Matter

A universe with shells of matter that are both expanding outward and compressing together as the central inner void increases its volume explains an accelerating expanding universe without the need for dark energy.



IX. Possible Future Space Missions and Gathering of Galaxy Redshifts

Astrophysicists have a trick of using redshift measurements of galaxies moving outward. Objects moving away are proportionately increased in wavelength which causes the optical spectrum to shift toward the red end. Cosmological redshift indicates the expansion of the universe for objects sufficiently far away by showing a corresponding rate of increase of their distance from Earth. Based on wavelength the calculation of redshift, z (a dimensionless value) is –

z = (wavelength observed – wavelength emitted) / wavelength emitted.

The highest values of z for objects in deep space are from about 5.2 to 8.6 with the values of the first Population III stars being predicted at between 20 and 100. The redshift of z = 1089 for the cosmic microwave background provides an age of 379,000 years after the Big Bang.[p] [q]

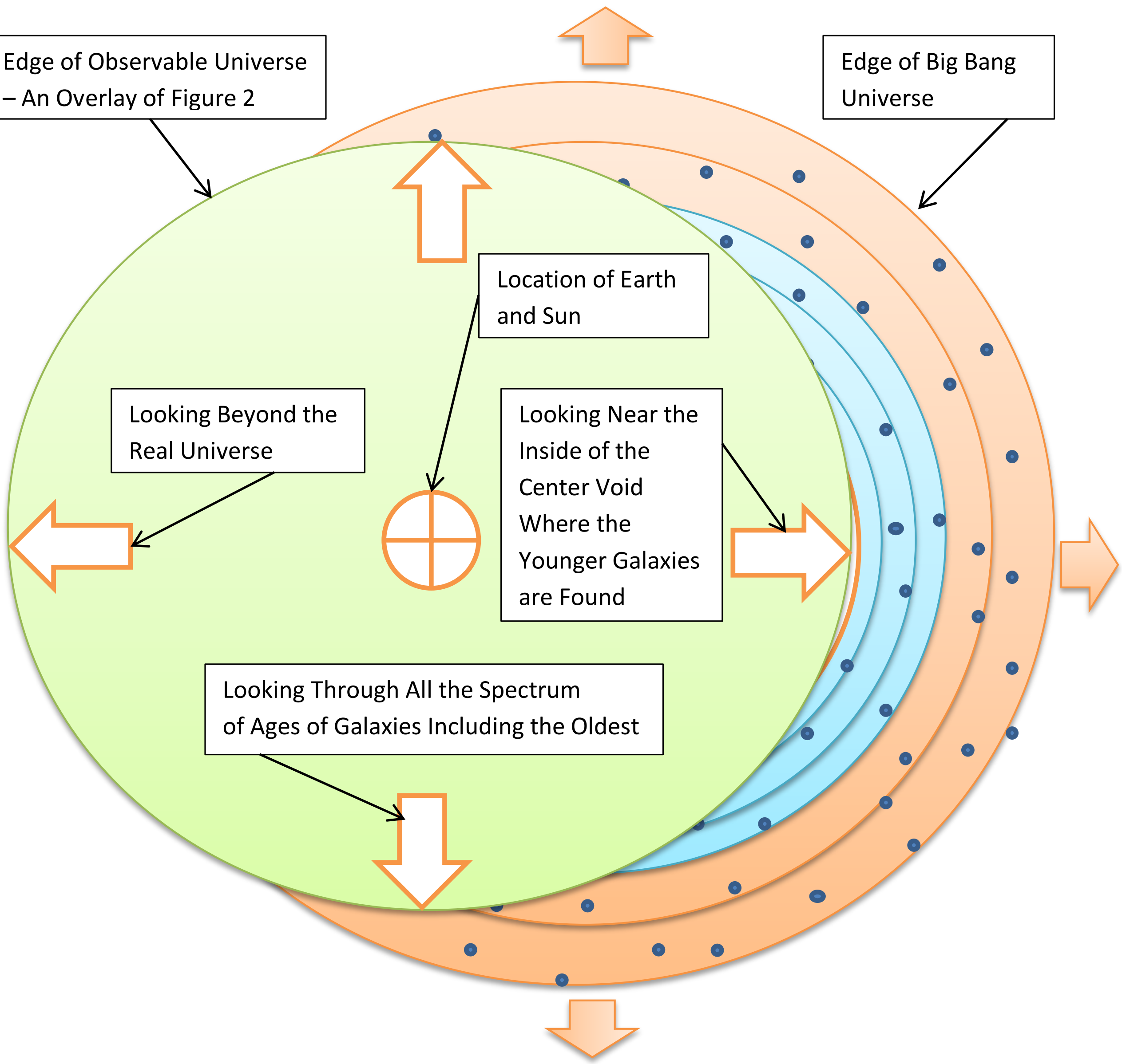
As astronomers look outward from Earth in all directions they observe the edge of the observable universe expanding in all directions. However, in certain directions the hollow central void should be detected by seeing less galaxies of an intermediate age or an age range that is totally missing. This direction is, of course, toward the central regions of the expanding universe whatever direction that may be. In the opposite, outward direction from the center the edge of the universe may be within man's observable range. In this opposite direction man may actually see the edge of the universe and be able to see nothing beyond as the envelop keeps expanding. In directions at right angles to looking directly inward toward the central singularity point or radially outward from this central point astronomers should be able to look through the thickness of shells of galaxies and possibly see the edges but at a farther distance. Also, in these directions the spectrum of all ages of galaxies should be revealed. More superclusters of galaxies, ligaments, and so-called walls of galaxies should be seen by looking through the cross-section of expanding shells at 90 degrees from the central vector direction.

A coordinated survey of galaxy ages along several lines of sight needs to be performed in search of the non-homogeneity of density. If a line of sight is found where a certain range of ages is totally missing then that line of sight is going through the void of galaxies and matter which locates the general direction from where the Big Bang originated. Then a survey should be performed in the opposite direction looking for the range of younger galaxies that should be totally missing, but the oldest galaxies are present. Then a final survey should be performed at 90 degrees to this radial line of sight from the central void to prove that the density of ages of galaxies is maximized. In other words, the ages should be closer together by looking through the cross-section of the compressed layers of galaxies. These surveys taken together would then map the density and major void of our universe in three dimensional space.

These surveys or space missions will require the full range of spectrum studies[r] such as the microwave spectrum by the Planck mission and the infrared spectrum as seen by the Spitzer mission.[s] Deep field studies between the UV and infrared range as made by the Hubble space telescope will be more difficult to utilize since objects seen in this spectrum range are much more sensitive to dust in the Milky Way disk and dusty conditions around other galaxies. The cosmic distance ladder will need to be utilized to accurately determine galaxy distances through the whole range from 1 to 100 mega parsecs (Mpc). More supernovae studies will be required for each line of sight 10 million to 1 billion light years. Redshift studies are needed to fill in data for the youngest galaxies going from 1 to 10 billion years. For the farthest galaxies redshifted toward the infrared part of the electromagnetic spectrum, a Spitzer type mission is required to capture these wavelengths of radiation.[t]

Figure 3: The Observable Universe in Relation to the Big Bang Universe

The farthest radiation signals are dependent on the speed of light (c) that reach observers on Earth. The age of the universe times (c) determines the edge of the observable universe. This distance does not coincide with the perimeter of actual universe that has been expanding outward ever since the Big Bang.



X. Conclusions

This simplified model of shell compression will hopefully be replaced by a more eloquent mathematical treatment and provide the necessary credibility to deflate the dark energy bubble and its attending cosmological principle and provide a more sensible, classical view for the clockworks of our universe. This treatise by no means attempts to discredit modern quantum physics. Quantum physics is on more firm footing since it need not incorporate dark energy. A cloud of misunderstanding caused by the recent dark energy concept should be eventually replaced by this more appropriate idea of presenting a less mystical concoction and a more congruent creation.

Of course, more redshift data of galaxies taken at different distances and at different directions in the sky will surely reveal a huge central void and our unique position in the universe. In one direction a void will be revealed with possibly the youngest galaxies being discovered beyond the void. In the opposite direction the oldest galaxies will be revealed. In directions 90 degrees to this central radial direction the compression of outer perimeter of galaxies will be discovered. See Figure 3.

Multi-universes and parallel universes cannot be discounted. Presently, there is no way of knowing or having our senses receive signals from these entities. They are only fabrications of man's mind. And, of course, this treatise gives no answers as to why and how our Big Bang occurred. This treatise does hopefully aid the cosmologists in avoiding the non-sensible error of adding energy to our given system after the Big Bang occurred and destroying long cherished principles of universal symmetry. Scientists can ill afford to be looking for something that does simply not exist.

XI. Glossary

These major concepts are abridged from Wikipedia presentations and may have added explanations to support the ideas of this treatise.

1. **Big Bang Theory**

   This theory is the prevailing cosmological model that produces the age of the universe at 13.798 $\pm$ 0.037 bya. The universe started as almost a singularity point that was extremely hot and expanded at a very fast rate. After thousands of years of cooling energy was converted to sub-atomic particles such as the proton, neutron and electron. The first atoms of hydrogen were produced upon further cooling. Hydrogen became the most abundant element with traces of helium and lithium. More cooling and expansion caused these elements to coalesce and form the first stars and galaxies by means of gravity. The furnace and pressure cooker of the stars and their supernovae further synthesized the other elements of the universe.

2. **Conservation of energy and mass**

   The total amount of energy in an isolated system remains constant over time and can neither be increased nor destroyed. However, this energy can change location or form within the system. This same reasoning applies also to mass. Since mass or energy can be transformed into the other, both mass and energy are conserved within an isolated system based on their equivalence of $E = mc^2$.

   These laws of symmetry do not apply to the concept of dark energy that is added over time to the system called the Big Bang Universe. Of course, one could imagine or assume that this energy was always available in the continuum of space vacuum that is expanding and creating energy at an accelerated rate. It remains to be determined what wins – symmetry or something from nothing.

3. **Cosmological constant**

   This arbitrary constant is used in the equations of the General Relativity Theory by Albert Einstein to explain energy density in a vacuum. The constant is thought to be positive ever since 1998 when it was discovered that the universe's expansion was accelerating. The fraction of energy density of the Universe due to this constant is also expressed in a flat universe by ΩΔ which is the ratio between the energy density and the critical density of the universe. This ratio is now estimated to be 0.692 + 0.010 per the recent results of the Planck space mission. This is also the ratio of dark energy to matter in our universe.

4. **Cosmological horizon**

   This horizon marks the boundary of that part of the universe the observer can see. Radiation emitted beyond this horizon never reaches the observer because the space in between the observer and the object is expanding more rapidly than the speed of light. Hence, no communication is possible beyond this observable universe boundary.

5. **Cosmological inflation model**

   This theory predicts the rapid exponential expansion of the early universe by a factor of at least 10^{78} in volume driven by negative-pressure vacuum energy density. The inflationary epoch lasted from 10^{-36} to 10^{-32} seconds. After that epoch the universe continued to expand at a much slower rate. This inflation explains the flat, homogeneous, isotropic parameters of the universe and also the large scale structure. This model also explains why temperature and curvature of different regions of the microwave background are so nearly equal. This model is disputed in this paper since the space around the Big Bang singularity point is considered to be largely evacuated.

6. Cosmic distance ladder

A succession of methods are used to determine close distances by direct methods such as parallax to distances within our galaxy to much farther distances of extra-galaxies. The techniques are based on various measured correlations between methods that work at close distances with methods that work at larger distances. In the ladder analogy each rung of the ladder provides information that can determine the distances at the next higher rung. Some of the more important techniques for extra-galactic distance measurements are the classical Cepheid stars, supernova's photosphere, SN type Ia light curves, globular cluster luminosity function, planetary nebula luminosity function, and overlap and scaling. Using redshift studies in the microwave and radio ranges distances can be approximated from 100 million to 13 billion light years. The Hubble Space Telescope has made measurements between 13.0 to 13.3 billion years ago with its Ultra Deep Field studies.

7. Cosmological principle

This principle is based on the assumption that the distribution of all matter in the universe is homogeneous and isotropic when viewed on a large enough scale. The forces of gravity are expected to act uniformly on this scale. No observed anomalies in this large scale are expected to occur over the entire evolution of the universe since the Big Bang. This idea was first developed by Isaac Newton to affirm his universal law of gravitation; the observed stars were sufficiently far away and far apart so as not to fall toward each other or toward the objects of the solar system that were proven to obey his universal gravitation law. Newton needed to apply this unproven idea to give credence to his famous law since the knowledge of masses and distances to and between stars were not well known during his time.

8. **General Theory of Relativity**

This geometric theory of gravitation unifies special relativity and Newton's law of gravitation by providing a description of space and time. The curvature of this spacetime is directly related to the energy and momentum of whatever matter and radiation are present. General relativity predicts gravitational time dilation, gravitational lensing, redshift of light, and gravitational time delay. However, this theory cannot presently reconcile the laws of quantum physics.

9. **Hubble constant**

This value is a proportionality between the proper distance, D, to a galaxy and its separation velocity from Earth. This is usually designated as H_0 and its units are (km/s)/Mpc or s^{-1}. The Hubble constant as measured by NASA's Wilkinson Microwave Anisotropy Probe (WMAP) was reported to be 69.32(km/s)/Mpc. Close agreement was achieved by the Planck Mission that measured H_0 = 67.80 (km/s)/Mpc.

10. **Hubble Deep Field (HDF)**

HDF is an image of a small region of space constructed from a series of observations by the Hubble Space Telescope. The first series was taken near Earth's North Pole in the constellation of Ursa Major. Later, another series of observations was taken in the southern hemisphere. These images cover only about one 24-millionth of the whole sky. The similarities of the two regions have led to the idea that the universe is homogeneous and isotropic over large scales thereby confirming the cosmological principle.

However, this paper supports the idea that the universe has a large central void with an expanding outer perimeter. This idea can only be confirmed by taking images that are taken in all six directions of a set of Cartesian coordinates. Some of these directions may not be possible to the dusty disk of the Milky Way obscuring the view. Also, a survey of the various ages of galaxies along each one of these coordinates is required to prove or disprove any large central void of galaxies. The HDF data is too meager to make conclusions about the universe's homogeneity or heterogeneity.

11. Hubble flow

The space-time volume of the universe is expanding and the motion of the astronomical objects due solely to this expansion is known as the Hubble flow.

12. Hubble Law

This name is given to a cosmological theory proven by observations that all objects in deep space or intergalactic space are found to have a Doppler shift (redshift) relative to Earth and to each other; and these distances are proportional to their distance from the Earth and all other interstellar bodies. Hubble Law, named after Edwin Hubble who first determined the Hubble constant, is an observable basis for the expanding universe and the most important basis for the Big Bang Theory.

This law is represented by the equation: $v = H_0D$, where v is the recessional velocity of a distant galaxy; D is the proper distance between Earth and that galaxy; and H_0 is the Hubble constant (km/s)/Mpc. The subscript in H_o represents the current value which is thought to be changing over time.

13. Hubble length

The Hubble length or distance is defined as c/H_0 which is the speed of light multiplied by the Hubble time. It is equivalent to 4228 million parsecs or 13.8 billion light years. The Hubble length in light years is equal to the Hubble time in years. This distance for the most distant galaxies is currently where their recession is at the speed of light.

14. Hubble time

Hubble time based on the standard cosmological time model is the reciprocal of the Hubble constant which is approximately 2.3×10^{-18} s^{-1}. Hence, $1/H_0$, is equal to 4.35×10^{17} seconds or 13.8 billion years, the suspected age of the universe.

15. Principle of Equivalence

This equivalence is a concept utilized in the physics of general relativity. Albert Einstein observed that gravitation force is no different to an observer than his experience within an accelerated frame of reference such as an elevator. In equation form the principle can be simply written as – (inertial mass) x (acceleration) = (intensity of gravitation field) x (gravitational mass) or $F = ma = G\ Mm/r^2$. This principle is applied to the entire universe in this paper.

16. Quintessence

Quintessence is a hypothetical force of dark energy or the fifth fundamental force that changes over time. This force can be either attractive or repulsive depending on the ratio of its kinetic and potential energy.

17. Special Theory of Relativity

This theory accounts for making measurements in various reference frames. All motion measurements are relative to a certain reference. There is no well- defined state of rest with a preferred reference frame. Albert Einstein added to this postulation the idea of the constant speed of light in a vacuum which applied to both the laws of mechanics and electromagnetism. The theory resulted in surprising consequences such as time dilation, length contraction, and the equivalence of mass and energy by using the formula $E = mc^2$.

18.Standard Model of Cosmology

This model explains the parameter of the Big Bang universe and is also known as the Lambda-CDM model. Its name denotes that the cosmological constant, Δ, and cold dark matter are utilized. This model predicts:

a. the structure and origin of the cosmic microwave background
b. the large scale structure in the distribution of galaxies
c. the abundance of hydrogen, helium, and lithium
d. the accelerating expansion of the universe observed in the redshift of light coming from distant galaxies and supernovae
e. the total mass-energy ratios.

19.Symmetry in Physics

Any physical system that exhibits the property of symmetry has under certain transformations features either physical or mathematical that remains unchanged.

XII. Endnotes

[a] Wikipedia, Hubble constant – 6/06/2013
[b] Wikipedia, Dark energy – 4/08/2013
[c] Science News, Planck sees slightly older universe with more matter, April 20, 2013
[d] Wikipedia, Cosmological constant -4/23/2013
[e] Wikipedia, Zero-point energy – 2/10/2013
[f] Wikipedia, Liquid helium – 4/23/2013
[g] Wikipedia, Equivalence principle – 11/07/2013
[h] Wikipedia, Observable universe – 4/23/2013
[i] Wikipedia, Cosmic distance ladder – 6/06/2013
[j] Wikipedia, Hubble Deep Field – 6/03/2013
[k] Wikipedia, Hubble Law – 6/06/2013
[l] NASA's Hubble Space Telescope Feature of 9/25/2012: Extreme Deep Field, XDF
[m] Wikipedia, Cosmological principle – 4/23/3013
[n] NASA's Planck Mission website: Planck mission results – 3/21/2013
[o] European Space Agency (ESA) Planch Mission website: "The Universe is Lopsided" – 3/21/2013
[p] Wikipedia, Redshift – 4/23/2013
[q] Astronomy Picture of the Day (APOD) – April 8, 2013: "A Redshift Lookup Table for our Universe"
[r] Wikipedia, Space Telescopes – 6/06/2013
[s] NASA's website, Spitzer Space Mission – 6/06/2013
[t] NASA's website, Spitzer Infrared Nearby Galaxies Survey (SINGS) – 6/06/2013