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Stars, Galaxies, Superuniverses, and the Urantia Book

by
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Introduction

In the past several years, since the advent of the Hubble Space Telescope (HST), there has been an explosion of astronomical information relating to our Milky Way galaxy, our Local Group of galaxies, and myriads of galaxies unknown at the time the Urantia Book was written. The HST has even allowed us a glimpse at galaxies believed to be near the edge of the universe itself. Figure 1 shows a portion of the Deep Field South image showing galaxies at distances out to 12 billion light years.

Figure 1. A portion of the Hubble Deep Field South image showing galaxies to near the edge of the universe. (NASA)

The Urantia Book contains a description of the universe which one might describe as "Urantian cosmology." This cosmological information, written prior to 1941 by celestial beings, was derived from revelation, not human astronomical science. It is therefore of interest to examine the Urantian cosmology, some 60 years later, to see how this revelation squares with current astronomical knowledge.

Much information of cosmological interest can be obtained by analysis of selected portions of the Urantia Book text. For example, the number of suns in the Master Universe, being all of material creation, is said to be equal to the number of glasses of water in the oceans of our planet. This paper describes a procedure for calculating this number given current readily-available information, arriving at a figure of 4.5 billion trillion suns. I will show that this number is in reasonable agreement with current knowledge.

Given this number and other astronomical information now available we are able to compute the average number of stars per galaxy. Given the identification of our Milky Way galaxy as the inhabitable portion of the superuniverse of Orvonton, we can estimate the number of inhabitable planets per star. It is even possible to determine, within limits, the size of the Grand Universe, our superuniverse, and our local universe of Nebadon.

After performing these calculations and comparing the results with current astronomical knowledge where possible, one finds that the Urantian cosmology is not generally inconsistent with our present knowledge of the universe. This is in spite of the fact that

the Urantia Book states that it's cosmology is not divinely inspired and may require revision in the future.

> "The cosmology of these revelations is not inspired. It is limited by our permission for the co-ordination and sorting of present-day knowledge." (UB1109:3)

Urantian Cosmology

An overview of Urantian cosmology is given on the first page of the Urantia Book.

> "Your world, Urantia, is one of many similar inhabited planets which comprise the local universe of Nebadon. This universe, together with similar creations, makes up the superuniverse of Orvonton, from whose capital, Uversa, our commission hails. Orvonton is one of the seven evolutionary superuniverses of time and space which circle the never-beginning, never-ending creation of divine perfection--the central universe of Havona. At the heart of this eternal and central universe is the stationary Isle of Paradise, the geographic center of infinity and the dwelling place of the eternal God.
>
> The seven evolving superuniverses in association with the central and divine universe, we commonly refer to as the grand universe; these are the now organized and inhabited creations. They are all a part of the master universe, which also embraces the uninhabited but mobilizing universes of outer space." (UB1:5-6)

We thus live in the grand universe, which includes the presently-inhabited portion of the much larger master universe. The grand universe is subdivided into seven superuniverses, or collections of galaxies, one for each of the seven possible Master Spirits, or personality associations of the three triune manifestations of God. The seventh Master Spirit, being the association of the Universal Father, Eternal Son, and Infinite Spirit supervises our superuniverse of Orvonton. We will show that the Milky Way galaxy lies entirely within Orvonton, and is the greatest part of the inhabited portion of Orvonton. The capital of our superuniverse is called Uversa and will be shown to be located outside the Milky Way galaxy.

> "Satania has a headquarters world called Jerusem, and it is system number twenty-four in the constellation of Norlatiadek. Your constellation, Norlatiadek, consists of one hundred local systems and has a headquarters world called Edentia. Norlatiadek is number seventy in the universe of Nebadon. The local universe of Nebadon consists of one hundred constellations and has a capital known as Salvington. " (UB182:5)

We also live in a star system called Satania, presumably named after Satan, a lieutenant and associate of Lucifer, a former ruler of Satania, who led a rebellion against God, which resulted in the isolation of our planet, Urantia, from the rest of the universe. Jerusem is said to be an architectural sphere, or artificial world, and thus is nonluminous and is not visible by telescopic means from Urantia. It is of special interest because it is on a subsatellite of a satellite of Jerusem that we are resurrected after death. This is the location of the mansion worlds mentioned by Jesus.

Our star system of Satania is one of approximately 10,000 such systems in our local universe of Nebadon. This local universe was created by a Creator Son of God, Michael, who incarnated on Urantia to live the life of one of His mortal creatures and to reveal the nature of God the Father to the inhabitants of His local universe. Michael is better known on Urantia as His mortal incarnation, Jesus of Nazareth. The Urantia Book specifically says that our local universe of Nebadon is not a physical star system, but that its capital, Salvington, is within such a system. We will show that our local universe is approximately 4000 light years in diameter.

With this brief overview of Urantian cosmology, we are now prepared to examine specific teachings of the Urantia Book and to compare them with current astronomical knowledge.

The Master Universe

Size of the Master Universe

The Urantia Book does not explicitly give a size for the master universe. It does imply that the master universe is finite and is expanding.

> "Even if the master universe eventually expands to infinity…" (UB92:6)

Curent scientific estimates of the size of the master universe are generally based on the theory of the "big bang" where the universe came into being at an instant of time about 14 billion years ago, and has expanded outwards from this point at the speed of light ever since. A good discussion of three techniques for determining this age is given at http://www.astro.ucla.edu/~wright/age.html. Under these assumptions, it is thus a sphere having a radius of about 14 billion light years.

The Urantia Book implicitly denies the big bang theory, for it implies that the master universe was already in existence 875 billion years ago. It was at this time the Andronover nebula was initiated which resulted in our local universe of Nebadon.

> "875,000,000,000 years ago the enormous Andronover nebula number 876,926 was duly initiated." (UB652:2)

Number of Stars in the Master Universe

The Urantia Book contains the following statement about the number of stars in the master universe.

> "But in the master universe there are as many suns as there are glasses of water in the oceans of your world." (UB173:0)

The volume of the oceans of Urantia can be found on the United States Geological Survey web site, www.usgs.gov/edu/waterdistribution.html, as 317 million cubic miles. Knowing this, and that one cubic mile is equivalent to 4.167×10^9 cubic meters, one finds that the volume of water on Urantia is 1.321×10^{18} m^3 or 1.321×10^{24} cm^3.

Another source states that the oceans cover 70 percent of the earth's surface and have an average depth of 2 miles. The area of the earth's surface is 4 pi times the square of the earth's radius of 6,350 km. Given this, one can calculate that the volume of this water is 1.14×10^{24} cm^3, which is in substantial agreement with the volume given by the USGS.

To compute the number of stars in the master universe we need a number for the volume of a glass of water. A small juice glass in my kitchen has a volume of 200 cm^3. A typical drinking glass that I use daily has a volume of 300 cm^3, and the volume of the largest glass I have is 500 cm^3. Thus, taking the volume to be 300 cm^3 will give results accurate to within about +/- 40%, a figure sufficient for our purposes. Given that the volume of a typical glass of water is about 300 cm^3, one can calculate that the number of glasses of water in the oceans of Urantia is about 4.4×10^{21}. Thus, according to the Urantia Book, the number of suns in the master universe must be on the order of 4.4×10^{21}. The web site, Atlas of the Universe (http://anzwers.org/free/universe/universe.html), states that there are 2.0×10^{21} stars in the visible universe.

To put this number in perspective consider that a cubic rock salt crystal 0.92 cm (0.36 inches) on an edge will contain the same number of molecules. This can be calculated given that rock salt is a cubic crystal with a lattice constant of 5.64×10^{-8} cm. We can conclude that the number of atoms in the human body is much greater than the number of stars in the universe.

The Mass of the Master Universe

Given the number of stars in the master universe it is possible to estimate its mass. Given that the sun is an average star, and the mass of the sun is 1.989×10^{33} g (grams), then the mass of all the stars in the master universe would be $4.4 \times 10^{21} * 1.989 \times 10^{33} = 9 \times 10^{54}$ g. Currently astronomers believe that more than 90% of the mass of the universe is tied up in "dark matter." Thus the mass of the universe would be about ten times the mass of all the visible stars, or about 9×10^{55} g.

Eddington, in his book, *Fundamental Theory* (1946, p 105), computes the mass of the universe from general relativistic theory as 1.98×10^{55} g which is within a factor of 4.5 of the value inferred from UB statements. Thus these estimates agree within an order of magnitude, although we have no proof that either Eddington's value or the UB value is correct. Eddington also computes the number of protons in the universe to be $3/2 * 2^{256} * 136 = 2.36 \times 10^{79}$ (p283).

Number of Galaxies in the Master Universe

The Urantia Book discusses the number of galaxies in the master universe in the following quote.

> "In the not-distant future, new telescopes will reveal to the wondering gaze of Urantian astronomers no less than 375 million new galaxies in the remote stretches of outer space." (UB130:5)

The Urantia Book is probably referring here to the Hale (Mt Palomar) telescope, which went into operation in 1948. The figure 375 million thus refers to the additional new galaxies observable when the Hale telescope was put into operation, not the number of galaxies in the master universe. Recently the Hubble Space Telescope made two deep field images, in the region of the North Pole, and another in the region of the South Pole (see Figure 1), these regions being those which could be continuously observed for long periods of time without interruption by occultation by the Earth. Exposure times of 10 days were used. From the north deep field image astronomers estimate that there are 80 billion galaxies in the universe. From the southern image they estimate that there are 125 billion galaxies in the universe. For the purposes of this paper we will assume that there are at least 100 billion galaxies in the master universe.

Number of Stars Per Galaxy

Given this number of galaxies and the total number of stars in the master universe, one can calculate that the average number of stars per galaxy is 4.4×10^{21} stars divided by 1.0×10^{11} galaxies or 4.4×10^{10} stars per galaxy (44 billion). The number of stars in our Milky Way galaxy is estimated to be around 200 to 400 billion. This is pretty good agreement with our average number since our galaxy is the second largest in our local cluster of about 30 galaxies, and thus may be considered to be an exceptionally large galaxy. There are many more small galaxies of the elliptical or globular types than there are of the spiral type such as our Milky Way. The information on the number of stars in the Milky Way was obtained from the University of Arizona at http://seds.lpl.arizona.edu/messier/more/mw.html.

Density of Stars in the Master Universe

If there are 4.4×10^{21} stars in the master universe and if the radius of the master universe is 14 billion light years, then the average density of stars in the master universe is 3.8×10^{-10} stars per cubic light year. If the stars were uniformly distributed throughout the master universe the minimum distance between stars would be about 1,400 light years. Actually, the stars cluster into globular clusters, galaxies, clusters of galaxies, and galactic superclusters where the stellar density is significantly greater than the average density, and leaving great voids in which the stellar density is much less than average. Given knowledge of the density of stars in a given region, it is possible to estimate the volume of the sphere necessary to contain a given number of stars, and from this to determine the approximate radius of this sphere. This technique will be used later to compute radii for the grand universe, our superuniverse, and our local universe.

The Grand Universe and Orvonton

Size of the Grand Universe

The size of the grand universe can be estimated from the number of stars it contains and an estimate of the average star density on that scale. The Urantia Book says there are ten trillion stars in our superuniverse (UB172:7). If we assume that all seven superuniverses are of approximately the same size, then there would be 70 trillion stars in the grand universe.

If the grand universe contains seventy trillion stars, and if these stars are in galaxies which are approximately uniformly distributed throughout the master universe, then the volume of space occupied by the grand universe will be a fraction $70 \times 10^{12} / 4.4 \times 10^{21} = 1.59 \times 10^{-8}$ of the volume of the master universe. The current estimate of the radius of the master universe is about 14 billion light years. Since the volume is proportional to the radius cubed, the radius of the grand universe would be of the order of $(1.59 \times 10^{-8})^{0.333} = 2.5 \times 10^{-3}$ times the radius of the master universe, or about 35 million light years. This assumes that the star density in the Grand Universe is the same as in the Master Universe.

There is good reason to believe that the actual star density within our local part of the universe is considerably higher than the average density throughout the master universe. This is because the stars are grouped into galaxies, clusters of galaxies, and even larger superclusters of galaxies leaving other areas with voids containing relatively few galaxies. We may estimate the average density of stars in our local group of galaxies in the following manner.

One source, the Atlas of the Universe, http://anzwers.org/free/universe/localgr.html, states that there are about 700×10^{9} stars within 5 million light years of Earth. The density of stars in this volume is thus about 1.3×10^{-9} per cubic light year, or about 3.3 times the average density of the master universe. The same source gives the density in a

sphere of about 1 billion light years as 1.19×10^{-10} per cubic light year. Thus this source estimates that the star density in our local area is about 10 times greater than that in a volume much greater than the volume of any supercluster. Given this, we must reduce our estimate of the size of the grand universe by a factor of the cube root of ten ($10^{.333} = 2.15$) to allow for the higher local density of stars. Our corrected estimate of the radius of the grand universe is then 35/2.15 = 16 million light years.

Since Havona is at the center of the grand universe, the distance from Earth to Havona would be about 16 million light years. If there are seven superuniverses distributed equally in angle about Havona, then the distance to the nearest superuniverse outside Orvonton would be about 14 million light years.

Another clue to the size of the grand universe is given in the following passage:

> "Long before the presence of life on Urantia the [Solitary] messenger now associated with me was assigned on a mission out of Uversa to the central universe--was absent from the roll calls of Orvonton for almost a million years but returned in due time with the desired information." (UB259:2)

The time given in this passage is most likely given in Uversa years, since the writers of the book seem to be quite explicit when they refer to Urantia years, calling such times either "Urantia years" or "years of Urantia time" 23 times throughout the book. Since the Solitary Messengers can travel at the rate of 4.52 million light years per Urantian year (UB267:1) and assuming the time given is in Uversa years (8.2 Urantia years, see UB174:2) the distance traveled by the Solitary Messenger would be less than 37 trillion light years. The distance to Havona would then be less than 18.5 trillion light years. This would be in good agreement with the value derived above from the number of stars in Orvonton if the Solitary Messenger had been absent only one Uversa year rather than one million years.

<u>Number of Stars in Orvonton</u>

The Urantia Book specifically gives the number of suns within Orvonton.

> “The superuniverse of Orvonton is illuminated and warmed by more than ten trillion blazing suns.” (UB172:7)

This number of suns is indicative that Orvonton is composed of more than one galaxy, since the Milky Way, the second largest galaxy within the Local Group, is currently thought to contain about 200 to 400 billion stars. It would take at least 25 Milky Way or about 110 average galaxies to contain ten trillion stars. It is thus clear that our superuniverse of Orvonton is significantly bigger than our local group of about 30 galaxies and is much bigger than the Milky Way galaxy.

The Size of Orvonton

The Urantia Book gives at least seven different clues as to the size of our superuniverse, Orvonton.

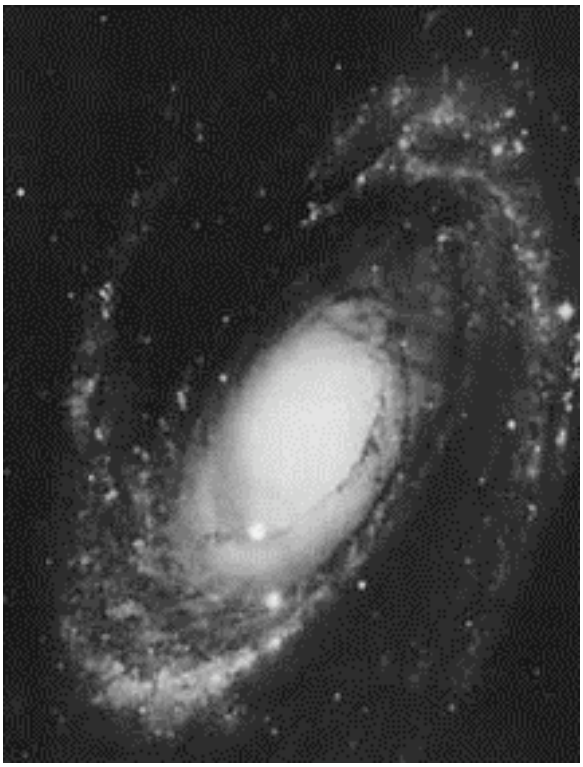

Figure 2. The galaxy M81 is just visible to the naked eye under ideal conditions. (SEDS)

"Although the unaided human eye can see only two or three nebulae outside the borders of the superuniverse of Orvonton, your telescopes literally reveal millions upon millions of these physical universes in process of formation." (UB130:4)

The galaxy M81, shown in Figure 2, is visible to the unaided eye under very good viewing conditions. This 6.9 magnitude galaxy is 12 million light years distant and is probably not within Orvonton. It is a candidate for being another of the seven superuniverses.

This passage clearly delineates the spatial extension of Orvonton, since is says that the unaided human eye can see nebulae outside Orvonton. This means that the many galaxies visible by means of the telescope are not within Orvonton. This passage continues saying

> "Most of the starry realms visually exposed to the search of your present-day telescopes are in Orvonton, but with photographic technique the larger telescopes penetrate far beyond the borders of the grand universe into the domains of outer space, where untold universes are in process of organization." (UB130:4)

This sentence says that most the stars visible by eye through large telescopes are within Orvonton. This is one of the primary distinguishing characteristics of the galaxies within the Local Group; that they contain individual stars which are visible by aid of a telescope. An implication of this sentence is that some of these starry realms are outside of Orvonton. Thus some of the Local Group galaxies are outside of Orvonton. For more information on the Local Group refer to the web page of the University of Arizona Lunar and Planetary Laboratory, http://seds.lpl.arizona.edu/messier/more/local.html.

The upper limit on the radius of the grand universe of 16 million light years also implies an upper limit on the size of our superuniverse, Orvonton. If the seven superuniverses

are spherical, equal in size, do not overlap, and are evenly distributed in a circle of radius equal to 16 million light years, then the radius of each superuniverse must be smaller than about 8 million light years. This must be considered to be an extreme upper limit to the size of Orvonton.

Another estimate of the size of Orvonton can be obtained in the same manner as our estimate of the size of the grand universe. If Orvonton contains 10 trillion stars, and if there are 4.4×10^{21} stars evenly distributed in the master universe, then a volume of space with a radius of 15.5 million light years would be required to hold this number of stars. Making the same correction for the difference between the local star density and that of the average density in the universe gives a radius of Orvonton of 15.6/2.15 = 7.2 million light years.

The statement that the Divine Counselor can reach any part of the superuniverse in less than one year implies that the radius of the superuniverse must be less than 4.5 million light years. Assuming that Urantia and Jerusem are in the relative close proximity of 2000 light years, then the radius of Orvonton must be less than 3.35 times 1.35 million light years, or 4.5 million light years.

Another limit to the size of Orvonton can be derived from a passage concerning the physical-energy circuits.

> "The power centers and physical controllers of the superuniverses assume direction and partial control of the thirty energy systems which comprise the gravita domain. The physical-energy circuits administered by the power centers of Uversa require a little over 968 million years to complete the encirclement of the superuniverse." (UB175:5)

This passage seems to indicate that the circumference of the superuniverse is 968 million light years. This would indicate that the radius of the superuniverse is 154 million light years. This value is inconsistent with our previously derived information about the size of the superuniverse. The value of 968 million years could be the sum of the travel times from the center of the superuniverse to the outer circumference, around the circumference, and back to the center, for all 30 energy systems. Assuming this, and if these circuits all travel at the velocity of light, then the radius of the superuniverse would be about 3.9 million light years. This value is consistent with our other information.

The size of Orvonton can be estimated from the passage that implies that no less than 4% of the volume of Orvonton is inhabited (UB121:5). From this, and assuming that Orvonton is roughly spherical we may infer that the ratio of the radius of Orvonton to that of the inhabited portion of Orvonton is no less than 2.92. Given that the radius of the inhabited portion of Orvonton is 250,000 light years (UB359:8), then the radius of Orvonton is not less than 730,000 light years.

Another indication of the size of Orvonton comes from the information given in the UB on the Andromeda galaxy. If Andromeda is within Orvonton as indicated by the UB, and

if the distance to Andromeda is 1 million light years, then the radius of Orvonton must be at least 500 thousand light years.

Given the above considerations, one may conclude that the radius of Orvonton is greater than 730,000 and less than 4 million light years, possibly about 3 million light years. This would include the large Andromeda and Triangulum galaxies as well as a great number of other smaller galaxies necessary to give the stated number of stars.

The Milky Way Galaxy is within Orvonton

The Urantia Book indicates that our Milky Way galaxy is within the superuniverse of Orvonton.

> "Practically all of the starry realms visible to the naked eye on Urantia belong to the seventh section of the grand universe, the superuniverse of Orvonton. The vast Milky Way starry system represents the central nucleus of Orvonton, being largely beyond the borders of your local universe. This great aggregation of suns, dark islands of space, double stars, globular clusters, star clouds, spiral and other nebulae, together with myriads of individual planets, forms a watchlike, elongated-circular grouping of about one seventh of the inhabited evolutionary universes." (UB167:3)

One-seventh of the inhabited evolutionary universes (I take this to mean local universes) may very well mean that the Milky Way contains nearly the entire inhabited portion of Orvonton, which is one-seventh of the superuniverses in the grand universe.

The idea that the Milky Way galaxy is within the superuniverse of Orvonton is made even more specific in the following passage.

> "They [the short space rays] emanate in the largest quantities from the densest plane of the superuniverse, the Milky Way, which is also the densest plane of the outer universes." (UB475:1)

This passage can also be read to imply that the other outer universes (the other six superuniverses) lie in the plane of the Milky Way galaxy. It can also be read as implying that the Milky Way galaxy is the superuniverse of Orvonton, but this interpretation is inconsistent with the statement that Orvonton contains ten trillion stars, which is much larger than the 200 to 400 billion stars in the Milky Way.

We may infer that other nebulae (galaxies) outside the Milky Way belong to Orvonton from the passage

> "some of the nebulae which Urantian astronomers regard as extragalactic are actually on the fringe of Orvonton and are traveling along with us." (UB131:0)

The Andromeda and Triangulum galaxies and the Large and Small Magellanic clouds are examples of such nebulae which are extragalactic (outside the Milky Way galaxy) but which are part of Orvonton.

The following passage indicates that there are at least seven galaxies in Orvonton.

> "Of the ten major divisions of Orvonton, eight have been roughly identified by Urantian astronomers. The other two are difficult of separate recognition because you are obliged to view these phenomena from the inside. If you could look upon the superuniverse of Orvonton from a position far-distant in space, you would immediately recognize the ten major sectors of the seventh galaxy." (UB167:8)

One can presume that they are talking about the Milky Way galaxy as the seventh galaxy in Orvonton. These ten major sectors also presumably refer to ten arms of our spiral galaxy. In one visualization of the spiral arms of the Milky Way (see http://casswww.ucsd.edu/public/tutorial/MW.html) I can count only eight arms. The Atlas of the Universe site gives the names of six arms of our galaxy: the Cygnas, Perseus, Orion, Sagittarius, Scutum-Crux, and Norma arms. At this time we cannot exclude the possibility of their being ten arms, since much of the structure of our galaxy is hidden from us by dust clouds, radio observations being the only practical way to observe behind these clouds.

Figure 3. The Small Magellanic Cloud located 210,000 light years from the center of the Milky Way lies within the inhabited portion of our superuniverse, Orvonton.

The Small and Large Magellanic Clouds are within Orvonton

Two nearby extragalactic nebula which were known before the invention of the telescope are the Large and Small Magellanic Clouds, which were noted by Magellan in 1519 during his voyages in the southern oceans. The Small Magellanic Cloud, shown in Figure 3, is at a distance of about 210,000 light years, while the Large Magellanic Cloud is only 179,000 light years away. Being at a distance of less than 250,000 light years from the center of the Milky Way puts them within the inhabited portion of Orvonton.

Uversa, the Capital of Orvonton, is not within the Milky Way

The Urantia Book gives the distance from our system capital of Jerusem to the center of the superuniverse of Orvonton. This distance corresponds to the distance to the Small Magellanic Cloud. Thus it is possible, although not likely as we will show later, that Uversa is within the SMC.

> " The Satania system of inhabited worlds is far removed from Uversa and that great sun cluster which functions as the physical or astronomic center of the seventh superuniverse. From Jerusem, the headquarters of Satania, it is over two hundred thousand light-years to the physical center of the superuniverse of Orvonton, far, far away in the dense diameter of the Milky Way. Satania is on the periphery of the local universe, and Nebadon is now well out towards the edge of Orvonton. From the outermost system of inhabited worlds to the center of the superuniverse is a trifle less than two hundred and fifty thousand light-years. " (UB359:8)

Being at a distance of 210,000 light years from the center of the Milky Way, the Small Magellanic Cloud is certainly “over two hundred thousand light-years” from Jerusem, and thus might be a candidate for the location of Uversa. The Small Magellanic Cloud does not, however, seem to be centrally located with respect to the three largest nearby galaxies, the Milky Way, Andromeda (M31), and Triangulum (M33). One must read "far, far away in the dense diameter of the Milky Way" as indicating a direction relative to Jerusem, rather than a position. This would be consistent with accepted astronomical usage of the word "in", as meaning in the same direction. Thus a planet is said to be "in" Aquarius, etc. To specifically locate the center of the superuniverse at the center of the Milky Way galaxy, one would use the words "at the center of" rather than "in."

Taking the center of the superuniverse at the center of the Milky Way galaxy would be inconsistent with current knowledge in that the disk of the Milky Way is about 120,000 light years in diameter, and that Urantia (and presumably Satania) is about 26,000 light years from the center of the galaxy. Thus the distance from Satania to the center of the superuniverse would likely be slightly less than 26,000 light years, and not over 200,000 light years as stated. We thus conclude that the center of the superuniverse of Orvonton is not within the Milky Way galaxy.

Uversa is not Near the Center of the Milky Way

A Divine Counselor of Uversa states that he required 109 days to travel from Uversa to Urantia. He also says that his velocity is less than that of a Solitary Messenger. This allows one to place a lower limit on the distance from Urantia to Uversa.

> "Trinity-origin beings possess prerogatives of transit which make them independent of transport personalities, such as seraphim. We all possess the power of moving about freely and quickly in the universe of universes.

> Excepting the Inspired Trinity Spirits, we cannot attain the almost unbelievable velocity of the Solitary Messengers, but we are able so to utilize the sum total of the transport facilities in space that we can reach any point in a superuniverse, from its headquarters [Uversa], in less than one year of Urantia time. It required 109 days of your time for me to journey from Uversa to Urantia." (UB222:6)

This passage also allows one to compute the ratio of the distance from Uversa to the outermost point of Orvonton, basically the radius of Orvonton to the distance from Uversa to Urantia. This ratio is that of one year to 109 days or 365.25/109 = 3.35. Since we know that the radius of the inhabited portion of Orvonton is greater than 250,000 light years, then the distance from Urantia to Uversa must be greater than 74,600 light years. Since the distance from Urantia to the center of the Milky Way galaxy is about 26,000 light years, one can conclude that Uversa is not near the center of the Milky Way.

Another passage of the Urantia Book supports the notion that Uversa is not located at the center of the Milky Way.

> "Uversa is favorably situated for the work of this [astronomy] colony, not only because of its central location, but also because there are no gigantic living or dead suns near at hand to disturb the energy currents." (UB338:4)

It is known that there is a black hole at the center of the Milky Way which should be even more effective at disturbing the energy currents than living or dead suns. Due to dust clouds, dark nebulae, and a very high density of stars, the center of the galaxy would be a most unfavorable location for an astronomy colony.

<u>Uversa is at the Astronomic Center of Orvonton</u>

The following passages indicate that the various components of Orvonton rotate about Uversa, and thus Uversa is the astronomic center of Orvonton.

> "The Sagittarius sector and all other sectors and divisions of Orvonton are in rotation around Uversa, … " (UB168:3)

> "6. The whirl of the ten major sectors, the so-called star drifts, about the Uversa headquarters of Orvonton." (UB168:3)

This rotation about Uversa is presumably not due to the gravitational attraction of Uversa since it is an architectural world and this would be of relatively insignificant mass.

> "10. Architectural Worlds. These are the worlds which are built according to plans and specifications for some special purpose, such as Salvington,

> the headquarters of your local universe, and Uversa, the seat of government of our superuniverse." (UB172:1)

The statement that

> "The Satania system of inhabited worlds is far removed from Uversa and that great sun cluster which functions as the physical or astronomic center of the seventh superuniverse." (UB359:8)

also supports the notion that Uversa is at the physical center of Orvonton, and that it is at a great distance from Urantia.

An Upper Limit on the Distance to Uversa

The velocity of a Solitary Messenger as given in the passage below can be shown to be equivalent to 4.52 million light years per year of Urantia time.

> "Their velocity in traversing space is variable, depending on a great variety of interfering influences, but the record shows that on the journey to fulfill this mission my associate messenger proceeded at the rate of 841,621,642,000 of your miles per second of your time." (UB261:1)

Since the speed of light is 1.862809×10^5 miles/sec, the speed of the Solitary Messenger is $8.41621642 \times 10^{11}$ miles per second divided by $1.862809 \times 10^5 = 4.518 \times 10^6$ light years/ year. This is warp 4.5 million!

Given this speed, the travel time of 109 days stated above, and the location of Jerusem within 4000 light years of Urantia implies that the distance from Urantia to Uversa must be less than 1.35 million light years

Fraction of Orvonton which is Inhabited.

The UB implies that only a small fraction, between one and four percent, of Orvonton is currently inhabited.

> "That portion of Paradise which has been designated for the use of the existing universes is occupied only from one to four per cent, while the area assigned to these activities is at least one million times that actually required for such purposes. Paradise is large enough to accommodate the activities of an almost infinite creation." (UB121:5)

This implies that the inhabited portion of each superuniverse occupies between one and four percent of the inhabitable planets of that superuniverse. Thus Orvonton contains 10 trillion stars, 40 trillion planets, 1 trillion inhabitable planets, and the inhabited portion of Orvonton contains between 10 and 40 billion inhabited planets, and must contain

between 100 and 400 billion stars. The Milky Way galaxy has been estimated to contain between 200 and 500 billion stars. Thus it appears that the Milky Way galaxy contains most of the inhabited portion of Orvonton.

The ratio of the number of stars in the mostly uninhabited master universe to that of the grand universe is $4.4 \times 10^{21}/7 \times 10^{13} = 6.3 \times 10^{7}$ (63 million). Could this be the reason that this portion of Paradise is over one million times greater than that actually required at present?

The Size of the Inhabited Portion of Orvonton

The Urantia Book gives a fairly precise indication of the size of the inhabited portion of Orvonton.

> "From the outermost system of inhabited worlds to the center of the superuniverse is a trifle less than two hundred and fifty thousand light-years." (UB359:8)

The radius of the Milky Way galaxy is about 65,000 light years. If the Milky Way contains the "central nucleus", or inhabited portion, of Orvonton, then all of the Milky Way would likely be within the inhabited portion of Orvonton as we concluded above. This also establishes that the radius of Orvonton must be significantly greater than 250,000 light years.

Andromeda not within Inhabited Portion of Orvonton

The Urantia Book explicitly denies that the Andromeda galaxy, shown in Figure 4, is within the inhabited portion of Orvonton, our superuniverse.

Figure 4. The Andromeda Galaxy is probably within the uninhabited portion of our superuniverse.

"There are not many sun-forming nebulae active in Orvonton at the present time, though Andromeda, which is outside the inhabited superuniverse, is very active." (UB170:1)

This passage implies that Andromeda is, however, within Orvonton. Notice that the UB is here making explicit the distinction between the inhabited and the uninhabited portions of the superuniverse.

The Distance to the Andromeda Galaxy

Speaking of the Andromeda galaxy (M31), the Urantia Book says

> "This far-distant nebula [Andromeda] is visible to the naked eye, and when you view it, pause to consider that the light you behold left those distant suns almost one million years ago." (UB170:1)

This contradicts current astronomical knowledge, which gives the distance to Andromeda as 2.39 +/- 0.09 million light years based on an average of 5 different types of determinations as discussed at http://www.earth.uni.edu/astro/cosmos/part6.html. This distance to Andromeda is not inferred from its red shift (Andromeda is actually blue shifted) but is obtained from a knowledge of the absolute brightness of certain Cephid variable stars which can be seen in Andromeda. The distance obtained by these methods could be in error by a factor of 2.667 (2.39/0.9) if the light we received from Andromeda were 86% absorbed by matter in the optical path, allowing only 14% to reach our telescopes. This might be due to the postulated "dark matter" surrounding our galaxy, but there is no evidence that this is the case. Such a severe light absorption would have to be exceedingly spatially uniform or its presence would be detectable as a patterning in the images obtained by our telescopes.

Upper Limit on the Distance to Andromeda

Given that Andromeda is within our superuniverse, there is an upper limit on the distance from Urantia to the Andromeda galaxy which would be consistent with other information given in the Urantia Book. This upper limit would be the distance from Urantia to Uversa plus the distance from Uversa to the edge of the superuniverse. In this limiting case Uversa would be directly between Urantia and Andromeda.

Knowing that the ratio of the distance from Uversa to the edge of the superuniverse to the distance from Uversa to Urantia is 3.35, then the maximum possible distance to the Andromeda galaxy is 4.35 (1 + 3.35) times the distance from Urantia to Uversa. Since Urantia is within the inhabited portion of Orvonton, then the distance from Urantia to Uversa is less than 250,000 light years, and so the maximum distance from Urantia to Andromeda is 4.35 x 250,000 = 1,087,500 light years.

This is consistent with the distance given in the Urantia Book as less than one million light years, but inconsistent with the current scientific value of this distance of about 2.4 million light years. In order to bring the Urantia Book cosmology into conformance with current science, the distance given in the UB from Uversa to the edge of the inhabited portion of the superuniverse would have to be scaled up by a factor of at least 2.4/1.0875 = 2.2.

Globular Clusters near the Edge of Orvonton

The Urantia Book states that

> "The globular type of star clusters predominates near the outer margins of Orvonton." (UB 170:2)

The existence and location of globular star clusters in a halo around the Milky Way was well known at the time the Urantia Book was written. A discussion of this subject can be found in *The Universe Around Us* by Sir James Jeans (1929, pp 60-62). This book also contains a description of the distribution of these globular clusters as

> "… lying on both sides of the Milky Way, its greatest diameter of about 250,000 light years lying in this plane, …"(p 62)

Given that the UB implies that the radius of the inhabited portion of Orvonton is 250,000 light years (UB359:8) and thus the radius of Orvonton itself must be significantly greater, it seems inconsistent to identify the star clusters mentioned in the UB with the globular clusters described by Jeans which have a maximum radius of 125,000 light years from the galactic center.

They may be speaking of the eleven dwarf spheroidal (or elliptical) galaxies that closely circle the Milky Way. More information on these can be found in an interesting paper by George Lake of the University of Washington. This paper can be found at the URL http://wwwhpcc.astro.washington.edu/papers/localgroup/lg.html. An image of the dwarf spheroidal galaxy Leo I, located about 830,000 light years away, can be seen at http://antwrp.gsfc.nasa.gov/apod/ap960519.html. I suspect that these dwarf galaxies are within Orvonton.

Orvonton Rotates about the Isle of Paradise and Havona

The Urantia Book states that our superuniverse of Orvonton circles the Isle of Paradise and the central universe of Havona.

> "Orvonton is one of the seven evolutionary superuniverses of time and space which circle the never-beginning, never-ending creation of divine perfection--the central universe of Havona. At the heart of this eternal and central universe is the stationary Isle of Paradise, the geographic center of infinity and the dwelling place of the eternal God." (UB1:5)

Location of Havona

The Urantia Book states that the location of Havona is in the direction of the center of the Milky Way galaxy. Of course it is not in the Milky Way at all, but is about 16 million light years distant.

> "When the angle of observation is propitious, gazing through the main body of this realm of maximum density, you are looking toward the residential universe [Havona] and the center of all things." (UB167:5)

The Period of Rotation of Orvonton about Havona

The Urantia Book gives a clue to the period of rotation of Orvonton about Havona.

> "Today, the solar system to which Urantia belongs is a few billion years past the swing around the southern curvature so that you are just now advancing beyond the southeastern bend and are moving swiftly through the long and comparatively straightaway northern path." (UB165:4)

If it took a few billion years to move from the southern curvature to just past the southeastern bend, a distance of one eighth of a complete revolution, then the period of rotation of Orvonton about Havona must be 8 times a few billion years. Assuming the word "few" indicates the number 3 gives a value of 24 billion years for the period of rotation of Orvonton about Havona. This is twice the current estimated age of the Universe and implies that Orvonton has not yet made one revolution about Havona.

The Orbital Velocity of Orvonton around Havona

The velocity of Orvonton in its orbit is the circumference of the orbit, 2 pi times the radius of the orbit, divided by the period of the orbit (24 billion years). Given that the period is 7.57×10^{17} s, and assuming a radius of 16 million light years, one finds that the velocity of Orvonton in its orbit around Havona is 1.25×10^{6} m/s or 5.6 million miles per hour.

This velocity is of the order of magnitude of the currently estimated velocity of the Local Group of 400 km/s in the direction of the Virgo galactic cluster.

The Mass of Havona and the Isle of Paradise

Knowing the period of rotation of Orvonton about Havona to be about 24 billion years, and knowing the distance from Orvonton to Havona to be about 16 million light years, we can calculate an estimate of the mass of Havona. By equating the gravitational pull of Havona necessary to balance the centrifugal force of Orvonton in its orbit about Havona, one finds the mass of Havona to be given by

$$M = R V^2/G$$

Where R is the radius of Orvonton's orbit, V is the velocity of Orvonton in its orbit, and G is the universal gravitational constant (6.673×10^{-11} m^3 kg^{-1} s^{-2}). Knowing that 1 light year is 9.46×10^{15} m, the radius of Orvonton's orbit is 1.51×10^{23} m. The velocity is 1.25×10^6 m/s as found above.

Substituting the appropriate values into the equation above gives the mass of Havona to be 3.5×10^{45} kg. Given that the mass of the sun is 1.989×10^{30} kg, this is equivalent to 1.9×10^{15} solar masses. This is also equivalent to about 900 Milky Way galaxies.

The UB says this about the mass of Havona and the Isle of Paradise:

> "Owing to the enormous encircling masses of the dark gravity bodies about the fringe of the central universe, the mass content of this central creation is far in excess of the total known mass of all seven sectors of the grand universe." (UB:129:2)

The Urantia Book states that Orvonton contains about 10^{13} solar masses. The seven sectors of the grand universe thus must contain about 7×10^{13} solar masses. Our calculated value of the mass of Havona and the Isle of Paradise is thus about 27 times that of the seven sectors of the grand universe, in agreement with the UB statement.

Possible Other Galaxies within the Grand Universe

Given that the radius of the grand universe is about 16 million light years, one can compile a list of the galaxies, or groups of galaxies, which could be possible locations of the other six superuniverses. If these superuniverses are in a circular orbit around Havona with radius of 16 million light years, we would expect to find two at a distance of 31 Mly, at +/- 0.86H (0.86 hours = 12.9 deg) galactic azimuth, two at 25 Mly distance at +/- 2.6H azimuth, and two at 14 Mly at +/- 4.3 H azimuth. This is because Havona is said to be in the direction of the center of the Milky Way galaxy (0 H galactic azimuth). Such candidates would also be found near the plane of our galaxy, that is, having small values of galactic elevation, Such a list will include

1. **NGC5128** (Centaurus A), shown in Figure 5, is located about 21 deg above the galactic plane at -3.4 H azimuth, and is 12 Mly distant. This makes it a candidate for one of the two closest superuniverses.

2. **NGC6744** shown in Figure 6 is located about 26 deg below the galactic plane at -1.8 H azimuth, and is 25 Mly distant. This is thought to be one of the most similar galaxies to the Milky Way.

Figure 5. NGC 5128, Centaurus A, is possibly one of the other inhabited superuniverses. (NOAO/AURA/NSF)

After looking through lists of the many galaxies in the vicinity of Urantia, one finds that there are at least 192 galaxies within 32 Mly, and over 1000 galaxies within 100 Mly. It becomes clear that the local universe structure is more complex than the concept of seven superuniverses revolving about Havona presented in the Urantia Book. The concept of the seven superuniverses must be considered as referring to seven inhabited regions of space, and that it must be considered that there are many other uninhabited galaxies within the grand universe, besides Andromeda, not mentioned in the Urantia Book.

Figure 6. NGC 6744 is similar to the Milky Way, and is a possible inhabited superuniverse. (NOAO/AURA/NSF)

The lack of candidate galaxies having the characteristics stated above may be due to the fact that it is difficult to observe galaxies which lie in the plane of the Milky Way, and which are on the opposite side of the Milky Way from Urantia. Recently, some radio observations have revealed galaxies which are otherwise hidden by the obscuring matter of the Milky Way. Undoubtedly there are many unknown galaxies in this region that might be suitable candidates for the location of the other superuniverses.

Our Local Universe

Size of Our Local Universe, Nebadon

Nebadon is said to have about 10 million inhabitable planets. This implies that Nebadon contains about 100 million stars, assuming that on average one star in ten has an

inhabitable planet. If the local stellar density is about one star per 240 cubic light years (there are 30 stars within a radius of 12 light years from Urantia), then the volume of space required to hold 100 million stars would be 2.4 x 10^{10} cubic light years. If this volume were approximately spherical, then the radius of this sphere would be about 1,800 light years. One might conclude that our local universe is about this size, or about 3000 to 4,000 light years in diameter. Thus is is clear that our local universe of Nebadon is not the same as our Local Group of galaxies, which is much bigger, on the order of several million light years in diameter.

The Location of Salvington

The UB makes the following statement concerning the location of Salvington, the capital of our local universe.

> "Salvington, the headquarters of Nebadon, is situated at the exact energy-mass center of the local universe. But your local universe is not a single astronomic system, though a large system does exist at its physical center." (UB359:1)

Figure 7. M6, the Butterfly Cluster is located 2000 light years from Urantia in the direction of the galactic center and is likely near Salvington.

We can also guess that Salvington, the capital of our local universe is perhaps about 2000 light years from Urantia in the direction of the center of the Milky Way, since the book says that we are on the outer fringe of Nebadon. This would be near the location of M6, the Butterfly star cluster shown in Figure 7.

It is also likely that the majority of Nebadon is within the Orion arm of the Milky Way galaxy.

Planets, Inhabited and Inhabitable

Fraction of Planets in Orvonton which are Inhabitable

The Urantia Book gives information on the fraction of planets that are inhabitable. One reads:

> "In your superuniverse not one cool planet in forty is habitable by beings of your order. And, of course, the superheated suns and the frigid outlying worlds are unfit to harbor higher life. In your solar system only three planets are at present suited to harbor life." (UB173:5)

Thus the upper limit on the fraction of planets which are inhabitable by human beings is 1 in 40 (0.025). This statement concerns our superuniverse of Orvonton, but since I assume the laws of nature are the same in all superuniverses I will assume this number is applicable to the other superuniverses as well.

The Number of Inhabitable Planets in Orvonton.

The number of inhabitable planets in Orvonton is specifically given in the UB.

> "Seven superuniverses make up the present organized grand universe, consisting of approximately seven trillion inhabitable worlds plus the architectural spheres and the one billion inhabited spheres of Havona." (UB166:8)

Given this, one can conclude that our superuniverse of Orvonton contains about one trillion inhabitable worlds. Notice that the UB is careful to distinguish between inhabitable planets and inhabited planets. We will show later that most of these one trillion inhabitable worlds are currently uninhabited.

Fraction of Stars in Orvonton Containing an Inhabitable Planet.

Given that there are one trillion inhabitable worlds in Orvonton, and 10 trillion stars in Orvonton, one must conclude that if stars had no multiple inhabitable planets, then one star in ten has an inhabitable planet. If, as is indicated in the section on the distribution of inhabited planets in Satania below, stellar systems tend to have only one inhabitable planet, then generally only one star in about ten would have any inhabitable planets.

A recent survey of 800 nearby stars using the Doppler method, has shown that about one star in twenty has at least a Jupiter-sized planet. That one star in ten has an inhabitable planet therefore seems not improbable.

Average Number of Planets per Star in Orvonton.

If there are 0.1 inhabitable planets per star, and 0.025 inhabitable planets per planet then on the average there must be 0.1/0.025 = 4 planets per star in Orvonton. This would indicate that planets are a common occurrence. This is verified by current astronomical science which, although it can detect only large planets approximately the size of Jupiter, has shown such planets to be relatively common.

Number of Inhabitable Planets in our Solar System

> "In your solar system only three planets are at present suited to harbor life." (UB173:5)

Because of the wide diversity of life forms in the Universe, many planets which we would consider uninhabitable for man, may be perfectly habitable for some of the radically-different other life forms. Our solar system having three inhabitable planets is a rare occurrence since as we show below, only 0.7% of solar systems with inhabitable planets have three.

Distribution of Inhabited Planets in Satania

The UB gives the distribution of inhabited planets in Satania among the physical systems (solar systems) containing such planets.

> "Satania is not a uniform physical system, a single astronomic unit or organization. Its 619 inhabited worlds are located in over five hundred different physical systems. Only five have more than two inhabited worlds, and of these only one has four peopled planets, while there are forty-six having two inhabited worlds." (UB359: 7)

Thus there are 511 solar systems with one, 46 with two, 4 with 3, and only 1 with 4 inhabited planets. There are thus 511 + 46 + 4 + 1 = 562 solar systems with inhabited planets in the Satania system.

Average Number of Inhabited Planets per Star in Satania

The Urantia Book gives the number of stars in our system, Satania, which allows computing the average number of inhabited planets per star.

> "There are upward of two thousand brilliant suns pouring forth light and energy in Satania, and your own sun is an average blazing orb." (UB458:1)

Since there are 619 inhabited planets and 2000 stars in Satania, then there are on the average 0.31 inhabited planets per star, or equivalently, approximately one inhabited planet for every 3 stars. Given that there are 562 solar systems with an inhabited planet, then one star out of every 3.6 in Satania has an inhabited planet.

Given that one star in ten in Orvonton has an inhabitable planet, the fact that in Satania one star in 3.6 has an inhabited planet indicates that the Satania star system is an especially favorable environment for life. Current science accepts that only certain zones within a galaxy are favorable for supporting human life.

Fraction of Satania Presently Inhabited

According to a Table given in the Urantia Book (UB167:1), a system contains about 1000 inhabitable planets, therefore the Satania system containing 619 inhabited planets makes it about 62% inhabited. This is much higher than the fraction of Orvonton that is presently inhabited (around 1 to 4%).

The Size of Satania

Given the number of stars in Satania, one can estimate its size under the assumptions that the star density in Satania is uniform and the same as our local star density (one star per 240 cubic light years). Assuming this, one finds that a sphere of radius 48.5 light years is required to contain the 2000 stars said to comprise Satania.

Urantian Cosmology which may Require Future Revision

The Urantia Book states that its cosmology is not necessarily inspired, and that it may require revision in the future. In this article to this point we have been focusing on positive correspondences between Urantian cosmology and current knowledge. In truth, there are some aspects of this cosmology which are not validated by current science and which are likely to require revision.

For instance, the Urantia Book says

> "The Uversa star students observe that the grand universe is surrounded by the ancestors of a series of starry and planetary clusters which completely encircle the present inhabited creation as concentric rings of outer universes upon universes." (UB131:1)

In the past decade there has become available on the Internet a number of 3-dimensional visualizations of the universe. Studying these visualizations, one is struck by the fact that there is no evidence of a structure that can be described as "concentric rings of outer

universes." In fact, the universe appears to consist of large superclusters of galaxies, which are distributed in a more or less random manner.

In another instance the Urantia Book describes the "space zones" beyond the grand universe as

> "Between the energy circuits of the seven superuniverses and this gigantic outer belt of force activity, there is a space zone of comparative quiet, which varies in width but averages about four hundred thousand light-years. These space zones are free from star dust--cosmic fog. Our students of these phenomena are in doubt as to the exact status of the space-forces existing in this zone of relative quiet which encircles the seven superuniverses. But about one-half million light-years beyond the periphery of the present grand universe we observe the beginnings of a zone of an unbelievable energy action which increases in volume and intensity for over twenty-five million light-years." (UB130:0)

Again, there is no evidence of spherical zones of empty space surrounding any structure which might be the grand universe. Given the relatively small size of these space zones compared to the size of the grand universe and the distances between galaxies, this statement cannot be reconciled with known universe structure.

The idealized picture of seven superuniverses circling Havona in approximately the plane of our galaxy ignores the fact that assuming this cosmology is true, the space containing these universes also contains numerous other galaxy clusters outside the plane of our galaxy. There is no evidence of any organization of nearby galaxies resulting in a preferential localization near the plane of the Milky Way galaxy.

In another apparent disagreement with current scientific thought, the Urantia Book specifically denies the reality of the expansion of the universe, that the apparent recession of galaxies is linked to their distance by means of the Hubble constant. The UB says:

> "Many influences interpose to make it appear that the recessional velocity of the external universes increases at the rate of more than one hundred miles a second for every million light-years increase in distance. By this method of reckoning, subsequent to the perfection of more powerful telescopes, it will appear that these far-distant systems are in flight from this part of the universe at the unbelievable rate of more than thirty thousand miles a second. But this apparent speed of recession is not real; it results from numerous factors of error embracing angles of observation and other time-space distortions." (UB134:3)

Current science regards this Hubble effect as real. In fact, all the current 3-dimensional representations of the universe largely rely on this effect to establish the distance to the galaxies, Andromeda being an exception. If the Hubble effect is not real, then all such current representations are invalid. At this time there is no scientific evidence that the Hubble effect is not real, and in fact, there is significant evidence that it is real.

The Urantia Book states that only a very small portion of the observable universe contains life.

> "As far as we know, no material beings on the order of humans, no angels or other spirit creatures, exist in this outer ring of nebulae, suns, and planets. This distant domain is beyond the jurisdiction and administration of the superuniverse governments." (UB131:2)

Current scientific opinion is that life formed by a chance combination of chemicals and evolved into the complex life forms known today. It would be deemed as most unlikely that life was concentrated on only a few clusters of galaxies as implied by this UB statement. Of course, we have at present no way to know if this is true or not.

One of the most serious disagreements between current astronomical science and the Urantia Book cosmology concerns the size of Orvonton, The radius of Orvonton can be inferred to be about 3.35 times between 200,000 and 250,000 light years or about 770,000 light years as indicated by UB222:6 and UB359:8. This assumes that Jerusem, the capital of our star system, Satania, is relatively near (within 50 light years) to Urantia and is thus within the Milky Way. Such a small radius would exclude both the Andromeda and Triangulum galaxies from the uninhabited portion of Orvonton and it seems impossible that there are 10 trillion stars (UB172:7) within such a small volume.

One possible explanation for this inconsistency and also for that involving the distance to the Andromeda galaxy is to postulate that the authors of the Urantia Book presented a cosmology that was scaled to fit the astronomic knowledge of the time when the book was written. The value of one million light years for the distance to Andromeda was the current astronomical knowledge during the period of 1923 to 1953. The Urantia papers were written within this time period. If the authors scaled the true distance to the Andromeda galaxy down by a factor of about 3 to prevent the disclosure of unearned knowledge, to be maximally self-consistent they may have also scaled down the other two distances which they directly give. These distances are the 200,000 light years from Uversa to Jerusem, and the 250,000 light years corresponding to the radius of the inhabited portion of Orvonton.

If this hypothesis is true, then the true distances can be found by multiplying the values given in the UB by a factor of about 3. This makes the distance to the Andromeda galaxy agree with current knowledge. It makes the distance from Jerusem to Uversa to be greater than 600,000 light years, and the radius of the inhabited portion of Orvonton to be less than 750,000 light years. The overall radius of Orvonton would then be greater than 3.35 times 600,000 or 2.0 million light years. It would be less than 750,000/0.34 or 2.2 million light years. This places both the Andromeda and Triangulum galaxies within the uninhabited portion of Orvonton. It also makes the UB statement that Orvonton contains ten trillion stars much more plausible.

Such a scaling would not be inconsistent with the statement that the Divine Counselor can reach any part in Orvonton in one Urantia year. If the distance from Uversa to the edge of Orvonton is about 2.1 million light years, then the velocity of the Divine Counselor would be 2.1/4.51 = 0.47 times that of the Solitary Messengers, or consistent with his statement that he could not attain the speed of a Solitary Messenger. Apparently a Solitary Messenger travels at about twice the speed of a Divine Counselor. Any scaling factor greater than about 6 would be inconsistent with the stated speed of the Divine Counselor.

Could it be that the revision of the Urantian cosmology which the UB authors state may be required in the future is this scaling upwards of the stated distances by a factor of 3? This is probably one of the simplest possible revisions, which could be imagined.
Another discrepancy in UB cosmology concerns the time required for a Solitary Messenger to travel to the central universe (Havona) and back. The Urantia Book states that a Solitary Messenger can travel at a speed of

> "841,621,642,000 of your miles per second of your time." (UB261:1)

Since the speed of light is 186,281 miles per second, the speed of the Solitary Messenger is 4,512,000 times the speed of light.

The Urantia Book also says the following about a Solitary Messenger:

> "Long before the presence of life on Urantia the [Solitary] messenger now associated with me was assigned on a mission out of Uversa to the central universe--was absent from the roll calls of Orvonton for almost a million years but returned in due time with the desired information." (UB259:2)

In a million Urantia years a Solitary Messenger can travel a distance of 2,256 billion light years and back. The age of the universe is thought to be only 14 billion years, so the radius of the universe is no greater than 14 billion light years. It would take a Solitary Messenger only 6,200 years to travel to the edge of the known universe and back.

There is good reason, based on the number of stars in the grand universe, to believe that the distance from Uversa to the central universe is only about 16 million light years. A Solitary Messenger can travel this distance and back in only seven Urantia years. If this distance is correct the Solitary Messenger had 999,993 years to spend in the central Universe before he had to return.

There is also good reason to believe that the speed given for the Solitary Messenger is correct. This is based on the ability of a Divine Counselor, travelling at a lesser speed, to reach any part of Orvonton in one Urantia year, and the apparent size of Orvonton based on the number of stars in Orvonton. If this is so, it appears that he could have made the trip to the central universe and back in less than one Uversa year, or 8.2 Urantia years and still have had 1.2 Urantia years to conduct his business.

Thus it appears that the statement given in UB259:2 is grossly inconsistent with the other cosmology given in the UB. Perhaps it should have read that the Solitary Messenger was gone only one (Uversa) year?

Conclusions

These results show that the major aspects of Urantia Book cosmology are, in most part, in reasonable agreement with our present cosmological understanding. The major conflicts with current astronomical knowledge can be resolved if the three absolute distances given in the book are scaled up by a factor of about 3 to make the distance to the Andromeda galaxy conform approximately to current estimates.

The reader may question why the revelators chose to present a false value for the scale of the cosmology given in the UB. I believe that this choice actually demonstrates the wisdom of the revelators. Given that the currently-accepted value of the distance to the Andromeda galaxy was 900,000 light years at the time the book was written (Jeans, op.cit. p66), the revelators were faced with several conflicting choices. At the time, the distance to the Andromeda galaxy was the only extra-galactic distance known with any belief of certainty. I believe they chose to give this distance to provide an absolute scale to the size of our superuniverse because it was the largest distance determined by Urantian science of that time. Given this, they were faced with two choices: revealing the true distance or presenting a distance in agreement with accepted knowledge. Given the fact that the Urantian science was inaccurate at the time, any statement made would inevitably be at odds with current opinion, either before or after the truth was known. Revealing the true distance would immediately create disbelief in the revelation among the science-minded audience at which the revelation is directed, and would impart unearned scientific knowledge, prohibited by the mandate of revelation, which would shortly be acquired unaided by Urantian scientists in any event. In giving the then-accepted value, they avoided any controversy during the early stages of the acceptance of the revelation. The impact of the later inconsistency with Urantian astronomy they defused by explicitly admitting that the cosmology presented was not divinely inspired and would require revision in the future. Scaling all distances down by the same factor would create the minimum possible distortion to the presented cosmology, and would allow recovery of the true distances in the future when the true distance to the Andromeda galaxy was known.

The Urantia Book expressly condones not revealing facts when it might inhibit spiritual advancement. Speaking of the seraphic recorders it says,

> "Some day they will teach you to seek truth as well as fact, to expand your soul as well as your mind. … But sometimes error is so great that its rectification by revelation would be fatal to those slowly emerging truths which are essential to its experiential overthrow. When children have their ideals, do not dislodge them; let them grow." (UB554:6)

Did the revelators decide that correcting the factual error concerning the distance to Andromeda might inhibit the spread of the spiritual truths they were trying to implant?

The apparent inconsistency in the time taken by the Solitary Messenger in his trip to the central universe and back is not convincing evidence of the inaccuracy of UB cosmology. It may be that the Solitary Messenger spent the vast majority of the time during his trip in collecting the desired information, or it may be that the value "one million" was inserted by a human editor who could not believe that such a trip would take only one year.

It appears unlikely that the other disagreement with Urantian science, that of the purposeful implantation of life in the seven superuniverses, or galaxy clusters, versus the random spontaneous self-assembly of life from inert matter, will be resolved anytime within the foreseeable future. It does seem possible to verify the presence of life in the near vicinity of our solar system, which the UB states is a relatively common occurrence. This should be encouraging to those engaged in the present SETI efforts.