

# ***The Architecture of the Universe and the Urantia Book***

by  
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## **Introduction**

*The Architecture of the Universe* (AU) is a book about the "broad features of the design of the physical world", written by W. F. G. Swann in 1934. Professor Swann was the Director of the Bartol Research Foundation (now the Bartol Research Institute, see <http://www.bartol.udel.edu/basics/history.html> for more information) of the Franklin Institute from 1927 until 1959. Originally born in England, he came to the United States in 1913, and was a professor of physics at the University of Minnesota, the University of Chicago, and Yale. Professor Swann was also an accomplished cellist and was the founder of the Swarthmore Symphony Orchestra. Professor Swann was honored in 1967 by having a crater on the backside of the Moon (52N, 112.7E, 42 km in diameter) named after him.

The Architecture of the Universe was identified by Matthew Block as a possible source for some of the scientific material in the *Urantia Book* (UB). This is based on correspondences between Swann's book and material in papers 15, 41, and 42 of the UB.

Although Swann's book may have been a human source for some of the scientific material in the Urantia Book, there is no evidence of verbatim copying of material from Swann, and in two instances, errors in Swann's material were corrected or avoided by the authors of the UB papers.

## **Correspondences**

Ten possible correspondences between these two books have been identified and are discussed below. Two of these were discussed by Martin Gardner in his book *Urantia: The Great Cult Mystery* (U:TGCM:347). The first of these concerns statements about the seven openings in the human head.

The Seven Openings of the Human Head. Both the UB and the AU make statements concerning the seven openings of the human head.

“When a renowned religious teacher reasoned that the number seven was fundamental to nature because there are seven openings in the human head, if he had known more of chemistry, he might have advocated such a belief founded on a true phenomenon of the physical world.” (UB479:6)

“There are seven windows in the head, two nostrils, two eyes, two ears, and a mouth; ... [nearly four paragraphs deleted] ... if he had known that there were chemical elements, and had predicted something about the recurrence of their properties after periods of seven, when arranged in order of their atomic weights, he might have hit upon a truth there also.” (AU3:1-4:1)

While it may be true that the concept of the UB passage was derived from Swann's work, it is also true that there is a significant difference between the two statements. In particular, the two passages are speaking of completely different people. The UB statement is about a “renowned religious teacher” while Swann's discussion concerns Francesco Sizzi, an astronomer who attacked Galileo because he taught the unorthodox view that the earth revolved around the sun, and not vice-versa. In no way was Sizzi a “renowned religious teacher.” Gardner tries to make him appear so by calling him an “eminent Roman Catholic

contemporary of Galileo,” but even Gardner can’t quite bring himself to call him a “renowned religious teacher.” This is just one example of Gardner’s intellectual dishonesty and twisting of facts in an attempt to support his preconceived opinions. As a matter of fact, the religious significance of the seven openings of the human head derives not from Sizzi, but is an ancient Indian Vedic teaching called Prana Vayu. The seven openings are known as the seven Rishis, or seven Pranas. So, in fact, the Urantia Book statement concerning a “renowned religious teacher” is most probably not referring to Sizzi at all. As an aside, Sizzi was broken on the wheel in 1617 for writing a pamphlet attacking the king of France.

Mass of electron vs tenth of ounce. The UB contains a statement concerning a proportionality between the mass of the electron and one-tenth ounce, and the size of the electron and the size of the earth:

If the mass of matter should be magnified until that of an electron equaled one tenth of an ounce, then were size to be proportionately magnified, the volume of such an electron would become as large as that of the earth. (UB477:2)

The mass of the electron is  $9.10938 \times 10^{-28}$  gram. An ounce is 28.35 grams. The magnification required to increase the electron mass to one-tenth ounce is then given by  $2.835/9.10938 \times 10^{-28} = 3.112 \times 10^{27}$ . The Institute of Physics web site at

(<http://www.iop.org/Physics/Electron/Exhibition/section1/properties.html>)

states that the size of the electron has never been measured. It is only known that its radius is less than  $10^{-18}$  m. The radius of the earth, however, is quite well known to be  $6.378 \times 10^6$  m. In order for the size of the electron to be proportionately magnified to equal the size of the earth, the electron radius must be  $6.378 \times 10^6 / 3.112 \times 10^{27} = 2.049 \times 10^{-21}$  m which is 2.049 zeptometers. Thus the *Urantia Book* implies that the electron radius is about five hundred times smaller than the currently known upper limit of its radius. The corresponding diameter of the electron is thus  $4.098 \times 10^{-19}$  cm.

The corresponding passage in AU is:

The mass of the electron is so small that if you should magnify all masses so that the electron attains a mass of one tenth of an ounce, that one tenth of an ounce would, on the same scale of magnification, become as heavy as the earth. (AU44:2)

The mass of the earth is  $5.9736 \times 10^{27}$  gm. If one magnifies one-tenth ounce (2.835 gm) by the factor of  $3.112 \times 10^{27}$  one has a mass of  $8.83 \times 10^{27}$  gm. This estimate is about 47% greater than the actual mass of the earth. In order to make this statement absolutely accurate, the reference mass must be 0.082 oz rather than 0.1 oz. One-tenth ounce is probably close enough for the purpose of this illustration.

What is most interesting about this correspondence is that the UB author, a Mighty Messenger, changed the second ratio from one concerning mass, which is easily verifiable, to one concerning the size of the electron. In doing this, the Mighty Messenger provides a way for Urantians to calculate the size of the electron, scientific information which is unknown to this day. This is an apparent violation of the mandate not to provide scientific information unknown on Urantia.

Martin Gardner, in his book *Urantia: The Great Cult Mystery*, says the following about this correspondence:

“Note that the Mighty Messenger made a mighty mistake in copying from Swann. He says the magnified electron would have a *volume* equal to that of the earth when he should have said *mass*.” (U:TGCM348:3)

Gardner makes the mistake of assuming that the Mighty Messenger intended to copy Swann exactly. If he had read the UB passage carefully he would have found that the Mighty Messenger knew exactly what he was saying. He did not make the mistake of confusing mass and volume. We know this because he explicitly refers to size as the quantity he is proportionately magnifying. He is saying that the magnification factor derived from mass, if applied to size, would make the electron have the same size as the earth. As we have shown above, the value of electron size this implies is not inconsistent with current scientific estimates of the upper limit on the size of the electron. Gardner then goes on to acknowledge that the Mighty Messenger did not copy Swann’s mistake concerning the relative size of the proton. This appears to be a case of Gardner’s belief that he can read the mind of the Mighty Messenger, for he has no factual basis on which to base his statement that a “mighty mistake” was made. In my opinion this is another example of Gardner’s intellectual dishonesty.

Volume of proton. The UB gives the following statement concerning the relationship of the size of the proton, a pin head, and the earth’s orbit.

“If the volume of a proton—eighteen hundred times as heavy as an electron—should be magnified to the size of the head of a pin, then, in comparison, a pin’s head would attain a diameter equal to that of the earth’s orbit around the sun.” (UB477:2)

The diameter of the earth’s orbit is  $2.992 \times 10^{13}$  cm (see <http://www.seds.org/nineplanets/nineplanets/earth.html>). I measured the diameter of the head of a common sewing pin as 0.068 in or 0.173 cm. The head of this pin is probably the smallest typical value; I have seen other pins with larger-diameter round heads. This pin head would have to be magnified by a factor of  $1.73 \times 10^{14}$  to equal the diameter of the earth’s orbit. Decreasing the pinhead by this factor yields the diameter of the proton as given by the *Urantia Book*,  $1.0 \times 10^{-15}$  cm.

The radius of the proton was measured by spectrographic techniques in 1996 to be  $0.861 \times 10^{-15}$  m, or  $8.61 \times 10^{-14}$  cm (see <http://www.cnrs.fr/Cnrspresse/n22a3.html> and [http://www.physlink.com/reference\\_constants.cfm](http://www.physlink.com/reference_constants.cfm)) This is not the first measurement of this diameter; a less accurate measurement was made in 1963 which gave near the same value. The measured diameter of the proton is thus  $1.722 \times 10^{13}$  cm. This measured diameter is 172 times larger than the value inferred from the UB statements.

Swann’s corresponding statement is essentially the same as the *Urantia Book* statement.

“Then, we have the proton - the fundamental unit of positive charge - a thing 1800 times as heavy as the electron, but 1800 times smaller in size, so that if you should magnify it to the size of a pin’s head, that pin’s head would, on the same scale of magnification, attain a diameter equal to the diameter of the earth’s orbit around the sun.” (AU44:3)

It accordingly is equally in disagreement with the currently accepted measurements. It is currently accepted that the electron is smaller than the proton, thus Swann’s statement that the proton is smaller than the electron is not consistent with current science. Interestingly enough, the *Urantia Book* does not make this mistake.

Size of an atom. The *Urantia Book* gives a specific value for the size of an atom while AU gives a value for the size of the hydrogen atom.

“Each atom is a trifle over 1/100,000,000<sup>th</sup> of an inch in diameter, while an electron weighs a little more than 1/2,000<sup>th</sup> of the smallest atom, hydrogen.” (UB477:1)

“It would take about 2000 protons laid side by side to make up the diameter of an electron, about thirty thousand electrons side by side to stretch the diameter of a hydrogen atom, and about a hundred million hydrogen atoms side by side to stretch one third of an inch. (AU46:2)

The diameter of the hydrogen atom is about  $8 \times 10^{-9}$  cm, or  $3.15 \times 10^{-9}$  inches. One hundred million hydrogen atoms would then occupy a distance of 0.315 inches or approximately one third inch as stated by Swann. This is about 1/317,500,000 inch. Given that the size of atoms varies according to the particular element, the *Urantia Book* value of  $10^{-8}$  inch is a reasonable round number to use in a generic sense.

An even closer correspondence to this passage is to be found in Eddington's book, *Stars and Atoms*, written in 1926. Thus it is likely that both Swann's corresponding passage and the UB passage are both derived from Eddington's work. See my previous paper entitled “Stars and Atoms and the *Urantia Book*” for further discussion of this correspondence.

Emissions of radium. One of the most interesting correspondances between AU and the UB is that concerning the emissions of radium. Both books identify the two types of emissions, called alpha and beta particles. The alpha particles are the positively charged helium nuclei, and the beta particles are negatively charged electrons. The two books use the same structure in giving these results, first giving the velocity of the positive particles, and then that of the negative particles.

“The positive particles of radium fly off into space at the rate of ten thousand miles a second, while the negative particles attain a velocity approximating that of light.” (UB477:5)

(Speaking of emanations from the radium atom) “First, we have the alpha particle, a positively charged atom of helium moving with a velocity of about 12,000 miles per second. Then we have the beta particle, which is an ordinary electron traveling with a speed comparable with that of light, ” (AU67:1)

What is most interesting is that the *Urantia Book* cites a different value of the velocity of the positive particles than Swann. Swann gives the velocity of the alpha radiation from radium as 12,000 miles per second, while the *Urantia Book* gives a value of 10,000 miles per second. The actual velocity can be easily calculated in the following manner.

The energy of the alpha radiation from Ra226, the most common isotope of radium, is found to be 4.871 MeV (million electron Volts) as given at

<http://www.dne.bnl.gov/CoN/nuc/R/Ra226.shtml>.

The mass of the alpha particle is given as 7294.299 times that of an electron at

[http://physics.nist.gov/cgi-bin/cuu/Value?malsem|search\\_for=electron-mass](http://physics.nist.gov/cgi-bin/cuu/Value?malsem|search_for=electron-mass).

Finally, one electron Volt is equivalent to an energy of  $1.602 \times 10^{-12}$  erg. From the definition of kinetic energy one has

$$E = (m v^2)/2$$

where E is the energy of the alpha particle in ergs, and m is the mass of the alpha particle in grams, and v is its velocity in cm/s. From the information given above, the energy of the alpha particle is  $4.871 \times 10^6 \text{ ev} \times 1.602 \times 10^{-12} \text{ ergs/eV} = 7.8033 \times 10^{-6} \text{ ergs}$ . The mass of the alpha particle is  $9.10938 \times 10^{-28} \text{ gram} \times 7294.299 = 6.6447 \times 10^{-24} \text{ gm}$ . Solving the energy equation above for the velocity and substituting the values we have obtained for mass and energy yields a velocity of  $1.5326 \times 10^9 \text{ cm/s}$ . Now one mile is  $5,280 \text{ ft} \times 30.48 \text{ cm/ft} = 1.6093 \times 10^5 \text{ cm}$ . Dividing our velocity in cm/sec by this number gives the velocity of the alpha emission from radium to be 9,523 miles per second.

It is thus clear that the Urantia Book value is correct when rounded to the nearest number of thousands of miles per second. The value given by Swann is approximately 20% too large. If AU was indeed a source for the statement concerning the emissions of radium given in the UB, one must thus conclude that the author of this knew the correct value for the velocity of the alpha emissions and substituted the correct value for the erroneous value given by Swann.

Use of term “grand universe.” Both books make use of the word “grand” in reference to the universe. The Urantia Book uses the term “grand universe,” while Swann uses the term “grander universe.”

“The seven evolving superuniverses in association with the central and divine universe, we commonly refer to as the grand universe; ...” (UB1:6)

“The number of stars in the in the grander universe is, possibly, about 10,000 million-million-million [ $10^{22}$ ].” (AU232:1)

Although this is a very similar usage, Swann’s use of the term is different than the Urantia Book’s usage. Swann uses the term “grander universe” to mean all material creation. This would correspond to the Urantian term “master universe.” The Urantia Book uses the term “grand universe” to refer to the seven inhabited superuniverses plus the central universe of Havona.

Number of stars in universe. Both books use the same comparison of the number of stars in the master universe with the number of glasses of water in the Earth’s oceans.

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

“In other words, there are about as many stars in the grander universe as there are glasses of water in all the oceans of the world.” (AU232:1)

This correspondence is strikingly exact. The words and word order of the phrases starting with the word “as” are exactly the same except for the Urantia Book dropping the modifier “all.” The editing results in a more elegant phrasing without sacrificing clarity.

A calculation of the number of glasses of water in the oceans of the world gives a value of about  $5 \times 10^{21}$ . This is reasonably close to values derived from current estimates of the number of galaxies obtained from Hubble telescope deep field measurements, and to current estimates of the number of stars in a galaxy. For a detailed explanation of this calculation see my paper, “Stars, Galaxies, Superuniverses, and the Urantia Book.”

Star with density one-thousandth of Earth’s atmosphere. Both books refer to a star whose density of one thousandth that of the Earth’s atmosphere.

“The massive sun of Veluntia, one of the largest in Orvonton, has a density only one one-thousandth that of Urantia’s atmosphere.” (UB460:3)

“There is Betelgeuse, the great red star of Orion. It is a gas, and a very rarefied gas at that, for its density is only about one-thousandth part of that of our atmosphere.” (AU:232:1)

Although we cannot be sure that the sun in Veluntia mentioned in the UB is the same as Betelgeuse, both are certainly “massive suns,” and both are said to have the same density. The name “Veluntia” is not given elsewhere in the UB so it offers no help in confirming this identification. Betelgeuse is in Orion, a part of the Milky Way galaxy, which is identified in the UB as being in Orvonton.

Distance to the Andromeda nebula. Both books give the distance to the Andromeda galaxy, one of the few objects outside of the Milky Way which are visible to the naked eye.

“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. This far-distant nebula 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)

“It is the great nebula of Andromeda - one of the giants of the universe, a thing so large that light, traveling at the rate of 186,000 miles per second, takes 50,000 years to cross it, but so far away that this light takes nearly a million years to reach us, so that we see that nebula not as it is today, but as it was a million years ago.” (AU232:1)

These two passages contain the same idea, that the light we see when we view Andromeda originated one million years ago. This value of the distance to Andromeda is currently viewed as incorrect. The current estimate of the distance to the Andromeda galaxy is nearly three million light years (see <http://seds.lpl.arizona.edu/messier/m/m031.html> ). The value of one million light years was believed correct by astronomers up until 1953. Thus the value given in the Urantia Book was the value known by astronomers at the time the Urantia papers were written. The diameter of this galaxy is also given incorrectly in the UB. Current science estimates its diameter at about 200,000 light years, or about twice the size of the Milky Way.

Boiling of the Earth's Oceans. Both books also discuss that the quantity of energy radiated by the sun per second is sufficient to boil the earth's oceans.

"The total heat now given out by the solar system sun each second is sufficient to boil all the water in all the oceans on Urantia in just one second of time." (UB463:6)

The corresponding statement in the AU is

"The heat sent out from the sun, if poured into the oceans of the earth, would cause them to boil in one second." (AU237:2)

The volume of the Earth's oceans is about  $1.358 \times 10^{24}$  cm<sup>3</sup>. Thus the mass of this water will be  $1.358 \times 10^{24}$  grams. The sun is emitting energy at a rate of  $3.8 \times 10^{26}$  Joules per second. The energy required to raise one gram of water 100 C is 418.4 Joules, and the energy required to boil water at 100 C is 2,259 Joules per gram. Thus the time required to raise the earth's oceans to the boiling point of water is less than  $1.358 \times 10^{24} \times 418.4 / 3.8 \times 10^{26} = 1.5$  sec. The time required to boil the water once its temperature was at the boiling point, that is, convert the liquid water to steam, would be an additional 8 seconds. This doesn't allow for the time required to melt the water in the ice caps.

If the UB statement is taken to mean that this energy is “sufficient to boil [away] all the water” then this statement is incorrect. It would take about 9.5 seconds to do this. If the UB statement is taken to mean “sufficient to [bring to] boil all the water”, as is the common dictionary definition of the word “boil,” then the UB statement is essentially correct.

## Conclusions

Ten correspondences between the *Urantia Book* and Swann’s *The Architecture of the Universe* have been identified and discussed. From these correspondences it appears that the authors of these *Urantia Papers* had knowledge of Swann’s work. There is little evidence, however of exact copying of the language of Swann’s work.

In the correspondence concerning the seven openings of the human head, the two books are obviously talking about different people. There is no evidence that the UB is talking about Francesco Sizzi as in Swann’s book. It is possible that the UB author derived the idea of the linkage between the seven openings and the modulo 7 periodicity of the periodic table from Swann’s work. Certainly there was no direct copying of text from Swann’s work.

In our second correspondence, that concerning the mass of the electron, we find that the UB author changed the correspondence from one concerning the mass of the electron to one concerning its size. In fact, the UB statement quoted in the discussion above provides a means of calculating a value of the diameter of the electron ( $4.098 \times 10^{-19}$  cm), information which is as yet unknown to current science. This value agrees with current scientific opinion that the structure of the electron, if any, is contained within a radius less than  $10^{-18}$  m. Providing this information seems inconsistent with the revelator’s mandate:

“... many of our statements regarding the physical sciences will stand in need of revision in consequence of additional scientific developments and new discoveries. These new developments we even now foresee, but we are forbidden to include such humanly undiscovered facts in the revelatory records.” (UB1109:3)

In the second correspondence concerning the size of the proton, the *Urantia Book* repeats the erroneous information given by Swann which indicates a size 172 times smaller than the currently-accepted diameter of the proton ( $1.722 \times 10^{-13}$  cm). This would be consistent with the UB mandate. Swann, however, has the erroneous idea that the size of the electron is about 2000 times that of a proton. The author of the UB paper did not repeat this mistake, indicating that the electron is actually about 400,000 times smaller than the proton.

Both books give a value of the size of an atom which is approximately correct. Both the UB passage and Swann’s passage are probably derived from Eddington’s book, *Stars and Atoms*.

The correspondence concerning the emissions of radium contains an example of the UB author correcting an error of Swann’s. Swann incorrectly gives the velocity of the positively-charged emissions from radium (alpha particles) as 12,000 miles per second. The UB author correctly gives this value as 10,000 miles per second. Technically this might also be a violation of the UB mandate. Of course, it is possible that the UB value was derived from another source.

It is possible that the term “grand universe” used in the UB had its origin in Swann’s use of the term “grander universe.” The UB uses the term in a more restrictive sense than Swann, however.

The most exact use of Swann's wording is contained in the correspondence concerning the number of stars in the universe. The UB author deleted Swann's qualifier "about," indicating a greater confidence than Swann in the accuracy of this number. Swann's estimate of the number of stars in the universe was made in 1934 when the number of galaxies known to exist in the universe was thought to be orders of magnitude less than current estimates, and when the number of stars per galaxy was also thought to be much less. He surely had no observational basis for his estimate. This estimate, however, can be shown to be in agreement with current scientific knowledge that there are about 100 billion galaxies in the universe, that our Milky Way galaxy has about 200 billion stars, and that it can be considered as an unusually large galaxy.

The correspondence concerning the large star in Veluntia is probably the weakest of this set, for there is no way to be sure that Betelgeuse is the same star, except for the fact that the given density is the same, and that both stars are in the Milky Way.

In the correspondence concerning the distance to the Andromeda galaxy, the UB gives the same value as Swann of one million light years. Both are incorrect by a factor or approximately three according to current estimates. This same incorrect value could have been obtained from other sources such as Eddington's *Stars and Atoms*.

The two passages on the boiling of the Earth's oceans can be interpreted in two different ways, one which is correct, and one which is incorrect by nearly an order of magnitude. Using the most precisely correct interpretation, the UB passage is correct.

In conclusion, it appears that these correspondences are strong evidence that the UB authors had prior knowledge of Swann's work and incorporated some of his discussions into their work. I see no evidence that the UB authors introduced deviations from Swann's work which might be considered errors in view of present scientific knowledge. On the contrary, the UB authors avoided including information from Swann's work which today would be considered erroneous: that the electron is bigger than the proton, and that the alpha particles emitted from radium travel at 12,000 miles per second. The UB and Swann's statements concerning the size of the proton are in substantial disagreement with current knowledge. However, this knowledge was not available at the time the UB was written and thus the UB author was merely repeating Swann's mistake in accordance with the mandate not to reveal information not already known. The information concerning the Andromeda galaxy is also incorrect, and also falls into this category.

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