COSMIC REFLECTIONS

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THIRD PLANET NEWS

It's ready! The first edition of The Science Content of The Urantia Book is available from:
The Brotherhood of Man Library
PO Box 1355
Mason City, IA 50401

The booklet is a collection of articles relating human science to the scientific concepts in The Urantia Book. Most of the writing was done by Dr. Ken Glasziou, but there are several articles by Frank Wright, Dr. Matt Neibaur and Dick Bain. The booklets are free, but I'm sure BMOL would appreciate a small donation for postage.

It appears that Cosmic Reflections-and its editor-will have a new home, since I'm in the job market. I intend to keep CR going after I re-settle.

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Big Bang, Big Blunder?

They're chipping away at the Big Bang theory again. The gang of five iconoclasts-Chip Arp, Jayant Narlikar, Geoffry Burbridge, Fred Hoyle, and Chandra Wickramasinge-met in 1990 to see how many holes they could punch in the theory. You may remember Fred Hoyle. He was one of the major proponents of the steady state universe theory in the 1950's and 60's. The theory stated that the universe was continually growing due to the appearance of new mass in space. This concept was left in the dust by the Big Bang theory. Another of the five, Chip Arp, has been annoying the Big Bang believers by pointing out what appear to be some astronomical anomalies that bring into question some of the assumptions supporting the Big Bang theory. Rocking the establishment boat is a good way to lose funding and to find yourself treading water, as Mr. Arp once discovered. Fortunately for science and the world, there are people willing to pay the price to further the cause of truth.

In a recent article(1), Narlikar listed the evidence for and against the Big Bang theory. The "for" evidence is as follows:

1. Alexander Friedman used Einstein's equations to predict that the universe is expanding. In the 1920's, Edwin Hubble noticed

that the fqrther a galaxy is from us, the greater is its redshift. He concluded that the farther away from us a galaxy is, the faster it is receding away from us. Therefore, the universe appears to be expanding. If this expansion is run backwards it would appear to converge to a point, hence it appears to the astronomers that the universe started as a point of infinite mass that exploded out in every direction, the Big Bang.

2. In the mid-1940's, Gearge Gamow and several others predicted that there should be a uniform field of microwave radiation throughout the universe that is a remnant of the Big Bang. This field was found in 1965 by Arna Penzias and Robert Wilson and has been explored in detail recently by the COBE satellite.

3. Scientists have determined that a number of elements in certain amounts should have been left over from the Big Bang. Astronomers' spectroscopic studies of the light from stars and galaxies have confirmed the existence of these elements and their amounts.

With such strong confirmation, you would suppose the theory is impregnable, carved in stone. Fortunately, there always seem to be people such as Chip Arp and his four colleagues who refuse to put on wool suits and join the flock. Scientific theories aren't validated by observation alone; the critics of a theory are its final validators-or its destroyers.

Chip Arp and his colleagues have been investigating the following anomalies:

1. Quasars, discovered in 1963, have redshifts that indicate they are very distant, but several appear to be linked to galaxies that have much smaller redshifts. This would seem to show that these galaxies are much closer to us than the quasars they are linked to! Arp speculates that part of the quasar's redshift may be due to something other than their speed away from us. If true, this would invalidate redshift as a reliable indicator of distance or of the speed of recession of a distant galaxy. No calculation could be made regarding the age of the universe unless the percentage of redshift due solely to the galaxy's speed away from us were known. If it turned out that only part, or none, of the redshift were due to the speed of recession, the Big Bang theory would be in jeopardy.

2. The cosmic microwave background has been measured very accurately by the COBE satellite. It was expected that the radiation would show small variations that would indicate the early formation of galaxies. No such variation has yet been found. Astronomers are having a difficult time explaining how galaxies could have formed from a uniform Big Bang. After all, if the material from the Big Bang were all expanding outward uniformly, why would it suddenly begin to clump together?

3. In a recent article(2), Chip Arp pointed out another problem

with the redshift concept which could also cast doubts on the Big Bang theory. A certain type of galaxy, as judged by the redshift criteria, appears to be larger in size the further away it is. This seems to fly in the face of our common sense, especially since it doesn't seem to apply to other galactic types. If however, part of a galaxy's redshift is due to causes other than the speed it is flying away from us, it may not be any larger than the same type galaxies closer to us. Once again, as in the case of the quasar problem already mentioned, if redshift is not a reliable tool to determine a galaxy's speed of recession, the Big Bang theory is standing on quicksand.

There are a few other problems worth noting. By checking the elements and their amounts in the globular clusters of stars around the Milky Way galaxy, astronomers have decided that these clusters are about 15 billion years old. Depending on the value of Hubble's constant, astronomers place the age of the universe at from 10 to 20 billion years. Most astronomers compromise and accept an age of 15 billion years. By accepting that age, the astronomers are saying that the Milky Way's globular clusters formed at the time of the Big Bang. I wonder how many astronomers are comfortable with this conclusion? Since they can't figure out how galaxies formed anyhow, perhaps globular clusters popping into existence just after the Big Bang isn't a problem for them.

Another recent Big Bang related hypothesis may be in trouble. Because there isn't enough visible matter to explain the clumping together of material to form galaxies, some astronomers have theorized a large amount of "dark matter" associated with each galaxy. All sorts of exotic particles have been proposed to account for this dark matter. One of the most recent is the "crypton," which is described as a loop composed of a so-called cosmic string. Cosmic strings are threads of infinitely dense pre-matter supposedly left over from the Big Bang. You must admit that the particle is well named; it certainly sounds cryptic to me.

The dark matter hypothesis has fallen on hard times recently. The latest galactic surveys to determine the topology of the universe show that structures exist on a scale too large to be explained by the dark matter hypothesis. The Big Bang universe isn't old enough for the influence of dark matter to have congregated the galaxies into such large structures.

Some students of <u>The Urantia Book</u> have asked if the book supports the Big Bang theory. No. The book portrays a creation process that was not only sequential and evolutionary but also one that took much longer than the cosmologists' Big Bang universe. The earliest event recorded in the book occured 987 billion years ago.(Pg. 651) Notice on page 651 that it relates that there were astronomers in nearby universes watching this area <u>800 billion years ago</u>! This could mean that these adjacent local universes are over a trillion years old. The entire superuniverse could be ten trillion years or more old. The rest of the superuniverses could be even older for Orvonton is spoken of as, "..tardy in development..." (376B). It may be that the superuniverses are more than 5000 times older than human cosmologists believe.

It is evident that the contruction of the local universes is an orderly, sequential process. Note the sequence of events on page 651 and 652. First, an associate force organizer notes a region ripe for materialization. Next, someone applies for a building permit. Finally, the discoverer of the ripe area is appointed to start materialization. The force organizer moves into the area and starts the energy whirl that will become the Andronover nebula. When the developer is done, the contractors (Creator Son and Creative Spirit) move in to start construction. The rest is evolutionary history. And the associate force organizer goes off looking for another area that is prime for development. The UNDER CONSTRUCTION and PARDON THE INCONVENIENCE signs are still up in Orvonton. Big Bang believers, beware cosmic potholes!

1. Jayant Narlikar, "What if the Big Bang Didn"t Happen?," New Scientist, March 2, 1991.
2. Halton C. Arp, "The Myth of Overgrown Spirals," Sky and Telescope, April, 1991

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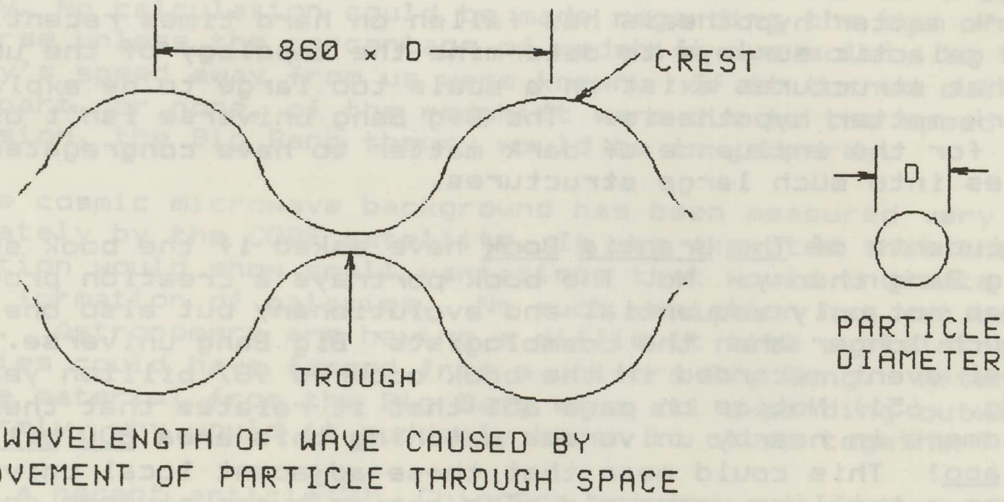
A NEW JOURNAL

Congratulations to Dr. Meredith Sprunger and the other editors of the premiere issue of Spiritual Fellowship Journal. This new journal is oriented to members of the clergy who are students of The Urantia Book. Subscriptions are $5.00, U.S., $7.00 overseas. Address: 4109 Plaza Dr., Fort Wayne, IN 46806.

ILLUSTRATION OF WAVELENGTH VS PARTICLE DIAMETER
(See following article.)



WAVELENGTH OF WAVE CAUSED BY
MOVEMENT OF PARTICLE THROUGH SPACE

The Number 860 in *The Urantia Book*

L. Dan Massey, Jr.

The quantity of energy taken in or given out when electronic or other positions are shifted is always a "quantum" or some multiple thereof, but the vibratory or wavelike behavior of such units of energy is wholly determined by the dimensions of the material structures concerned. Such wavelike energy ripples are 860 times the diameters of the ultimatons, electrons, atoms, or other units thus performing. The never-ending confusion attending the observation of the wave mechanics of quantum behavior is due to the superimposition of energy waves: Two crests can combine to make a double-height crest, while a crest and a trough may combine, thus producing mutual cancellation.—The Urantia Book (p. 474:4)

Many readers of *The Urantia Book* have noted the peculiar number 860 in this passage, and wondered about its significance. The purpose of this paper is to present some information from physics which should help explain the origin and assess the accuracy of this statement.

Late in the 19th century physicists believed that they possessed, in James C. Maxwell's electromagnetic theory, a mathematical formalism for describing electric, magnetic, and optical phenomena that achieved the clarity and systematic accuracy which characterized Newton's laws of motion in describing mechanical things. A number of workers sought to achieve a unification of Maxwell's electromagnetic theory with the well-established (but not so well understood) theories of thermodynamics. A complete mathematical description was sought for the way in which the atoms and molecules of gases interacted with light and other presumed forms of electromagnetic radiation.

The best efforts of many physicists failed to develop a mathematical understanding of the radiation of heat as wave energy. Finally, in 1900, Max Planck proposed that, in all dynamic systems, the property called *action* can exist only in specific amounts. The smallest increment of action is called the *quantum of action*. Planck showed that, under this additional assumption, the models previously developed for heat radiation corresponded to the results of experiments. The quantum of action is today called *Planck's constant*, and is represented in physics formulas by the letter *h*.

The physical property called action is directly related to energy. That is, knowing the action (quantum number) of a system tells how much energy the system has—or at least the minimum it can have. Light consists of a continual stream of particles, called *photons*. Each photon, in its travel through space, is accompanied by a wavelike disturbance. The *wavelength* of the light is simply the physical distance between two successive crests or troughs of the wave, and is represented by the Greek letter λ. The light wave not only varies from one place to another in space, but also oscillates as a function of time when observed at a fixed place in space. The rate of oscillation of the light wave is called its *frequency*, and is represented by the Greek letter ν. The wavelength and frequency of light are related by the simple relationship:

$$c = \lambda\nu \qquad (1)$$

Where c is the velocity of the light wave. Now, the energy of a single photon is also related to the frequency, according to the equally simple relationship:

$$E = h\nu \qquad (2)$$

Where E is the photon energy. We can rearrange these two formulae to find the wavelength of the photon as a function of its energy. First, from equation (1) we have:

$$\lambda = \frac{c}{\nu} \qquad (3)$$

From equation (2) we have:

$$\nu = \frac{E}{h} \qquad (4)$$

Substituting equation (4) into equation (3) gives:

$$\lambda = \frac{hc}{E} \qquad (5)$$

Which is the desired relationship.

As physicists came to examine the color (frequency) makeup of light, they discovered that many light sources produced light that, when passed through a spectroscope or prism, displayed bright lines at specific wavelengths against a relatively dark background. Measurement and analysis of these *line spectra* disclosed a systematic pattern of wavelengths, which many theoreticians sought to explain. The French theorist Louis DeBroglie suggested that the orbits of the outer electrons in the radiating atoms might be constrained to certain specific energy levels related to the action (or angular momentum) of the electron. Eventually this idea was elaborated by Neils Bohr, who proposed a fairly detailed model of the hydrogen atom (which has only a single electron).

In Bohr's model the angular momentum of the electron must be an exact multiple of Planck's constant. This assumption leads to assigning orbital energies to the electron according to the formula:

$$E_n = \frac{Rh}{n^2} \qquad (6)$$

Where n can be any integer from one to infinity and, for simplicity, we have used R to abbreviate the quantity known as Rydberg's number, the exact form of which is:

$$R = \frac{2\pi^2 me^4}{h^3} \qquad (7)$$

Where m is the mass of the electron and e is the electrostatic charge of the electron (and proton).

According to Bohr's theory, the energy, E_n, is the *ionization energy* of the atom. That is, the energy required to completely expel the electron from the orbit having exactly n units of action. This is also the energy released when an electron is captured into an orbit with n units of action. The number n is called the *principal quantum number* of the electron and corresponds, in chemistry, to the *electron shell number* of the electron. We can substitute equation (5) into equation (6) to obtain the wavelength of the light associated with an electron in orbit number n. First rewrite equation (5) in a form specific to the *nth* orbit:

$$\lambda_n = \frac{hc}{E_n} \qquad (8)$$

Making the indicated substitution into equation (6) gives:

$$\lambda_n = \frac{hcn^2}{Rh} = \frac{cn^2}{R} \qquad (9)$$

We now have a formula for the wavelength of the radiation as a function of the quantum number *n*.

To complete our analysis of the number 860 mentioned in *The Urantia Book*, we need to get a similar expression for the diameter of the orbit numbered *n*. In Bohr's model of the hydrogen atom, the radius of the *n*th orbit is:

$$r_n = \frac{e^2 n^2}{2Rh} \qquad (10)$$

Therefore, the diameter of the *n*th orbit is:

$$d_n = \frac{e^2 n^2}{Rh} \qquad (11)$$

Since the diameter must be twice the radius. When we calculate the ratio of the wavelength, λ_n, to the diameter, d_n, by dividing equation (9) by equation (11), we obtain the result:

$$\frac{\lambda_n}{d_n} = \frac{cn^2 Rh}{Re^2 n^2} = \frac{hc}{e^2} \qquad (12)$$

If the correct numerical values are inserted into equation (12) we obtain:

$$\frac{\lambda_n}{d_n} = 861.023 \qquad (13)$$

Which is in substantial agreement with the value of 860 given the *The Urantia Book*.

The number 860 is closely related to another "magical" number in physics, the *fine structure constant*, usually designated as α. The value of α is given by the formula:

$$\alpha = \frac{hc}{2\pi e^2} = 137.03608245 \qquad (14)$$

This number has fascinated physicists in the twentieth century because it is very close to the integer 137 in value. Arthur S. Eddington believed that the correct value of the number really was exactly 137! While more accurate measurements have established the value very precisely, this has not precluded numerological speculation. For example, the French physicist Armand Wyler has noted that:

$$\alpha = \left(\frac{9}{8\pi}\right)\left(\frac{\pi^5}{2^4 5!}\right)^{1/4} \qquad (15)$$

This latter relationship is exact to the current limit of measurement, which is 0.0001%. So what is the fine structure constant? Simply, it is the ratio of the time it takes an electron to orbit its nucleus to the time it takes light to cross the diameter of the orbit.

When 137 is multiplied by 2π, the result is approximately 860. The number 860 therefore has a similar relationship to the Bohr model of the atom. There is an account of the fine structure constant and the interest of early spectroscopists in the numbers 137 and 860 in the classic work *Atomic Physics*, by Max Born. The exposition of this and certain other relationships is remarkably similar to that in *The Urantia Book*, which is doubly interesting since Born's book was originally published in 1935.

LIFESIGNS IN THE STARS

In the Summer/Fall 1990 issue of Cosmic Reflections, I speculated that the triple star system Alpha Centauri might be home to Anova, the oldest inhabited planet in our system. In the April, 1991 issue of Astronomy an article appeared with the title, "Does Alpha Centauri Have Intelligent Life?" The author, Ken Crosswell, offers some good reasons to support the idea that any planets around the stars of Alpha Centauri might be good places for life to develop.

Alpha Centauri is a triple star system whose three members are known as Alpha Centauri A,B, and C. Alpha Centauri C is also known as Proxima Centauri because it is closer (4.22 light years) to our sun than any other star. The Astronomy article lists the five following criteria for stars that might have earth-like planets:

1. The star should be in what is known as the main sequence, i.e. the star generates energy by fusing hydrogen to helium.

2. The star should be the right spectral type. Some stars burn energy too quickly, and would be gone before intelligent life had a chance to develop. Other stars, such as red dwarfs, burn their fuel too slowly, and don't give enough heat and light to sustain life. Type G and some type A and K stars burn fuel at the proper rate. Our sun is a type G star.

3. The star must be stable is its rate of burning fuel. Too great an increase or decrease in output would fry or freeze the life on planets around such a highly variable star. The Urantia Book points out that our star was variable in its youth, so variability may be only a temporary problem.

4. In order for life to be present now, the star must be at least four billion years old. This assumes that it requires four billion years for the planet to become suitable for the development of life.

5. The candidate star must have the elements of life, e.g. carbon, nitrogen, oxygen and iron.

Our sun and Alpha Centauri A pass all of the tests. Alpha Centauri B does well on all of the tests but number 2. It is cooler than a type G star, but it may still be in the range of output that would allow life to exist on a planet in orbit around it. Proxima Centauri fails all of the tests.

Because Alpha Centauri is a system of three gravitationally bound stars, you might ask if a planet could have a stable orbit around one of the stars. The answer is yes, provided that the orbit of the planet is no larger than the orbit of Mars around our sun. Since our sun has four inner planets within the orbit of Mars

(Mercury, Venus, Earth and Mars), Alpha Centauri A and B could each have up to four planets.

Another possible problem is the variation of light and heat on a planet warmed by three suns. Proxima Centauri isn't a problem, because it is quite far from Alpha Centauri A and B. According to the earlier referenced article in Astronomy, the distance between A and B varies by a factor of 3.5 to 1 over an 80 year period, but the energy received by a planet in orbit around either A or B would vary by no more than 3% over the period. This is less than the variation in energy the earth receives as its distance from the sun varies from season to season.

You might suppose since there are two good stellar candidates for life supporting planets so close to us that such stars must be fairly common. This is not the case. Ken Crosswell says that only 4% or less of the stars in our galaxy are type G. Also, the planets of some type A and K stars may be able to support the sort of life found here on earth, but these would probably contribute only another 1% or so. Still, if the superuniverse of Orvonton has 10 trillion stars, then it has about 500 billion stars that could have earth like planets. This compares favorably with the one trillion inhabited planets that The Urantia Book says Orvonton will have when completed.

Our region of space does not seem to have quite its quota of suitable stars. Out of the 100 nearest suns, only three, Urantia, Alpha Centauri A and B meet the five criteria mentioned previously. Of course, the criteria listed in the Astronomy article regarding the type of suns that may have habitable planets may be too restrictive. We are informed that the Life Carriers can and do adapt life to a wide range of environments, so there well may be life on planets orbiting some of the 97 other stars.

Anova isn't the only planet that is a candidate to be in orbit around Alpha Centauri A or B. Another possibility is the planet described in Paper 72, "Government on a Neighboring Planet." A third and even more likely candidate is the close by planet of nonbreathers mentioned on page 564.

Our astronomers are trying to determine if there are planetary systems around nearby stars. But even if they determine that there are, we can only confirm the presence of life by a visit there or by hearing some radio communications from them. Radio waves could make the trip in about 4.5 years, but so far we haven't heard any signals from nearby stars. At the speeds that our spacecraft can presently attain, a trip to Alpha Centauri would take at least 30,000 years! I don't know about you, but I think I'll wait for the radio signals to appear.

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THE INDIA CONNECTION

In the 1991 winter/spring issue of <u>Cosmic Reflections</u>, in an article entitled "Human Orgins," I mentioned that it would be interesting if someone would "scratch around in the hills of northern India."-I was informed by Dan Massey that someone has been scratching around there.

In 1977 and 1978, David Pillbeam excavated in the Swalick hills of northern India. He found the skull of a hominid known as Ramapithecus. According to an anthropology textbook(1), Ramapithecus is a member of a related and widespread group of Miocene homonids known as ramapithecines that lived from 15 to 8 million years ago. According to the textbook, "Since they are like homonids in some ways, and like contemporary great apes in others, ramapithecines are plausible ancestors for all of us."

1. Kottack, Conrad Phillip, <u>Anthropology, The Exploration of Human Diversity</u>, Random House, New York, 1982.

The AW SHUCKS! Department

The eagle-eyed Dr. Meredith Sprunger wins an all expense paid trip to Plum Tree, Indiana for noting that B.F. Skinner was a psychologist (behaviorist) rather than a biologist as I had alleged in the last CR. Aw c'mon Doc,-give me a break. It's been a long time since PSY101!

LAST RITES

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