

ASTRONOMY IN THE URANTIA BOOK

Parts of the Urantia Book Papers will be correlated in this study
of astronomy—— PAPERS 12; 15; 29; 32; 41; 57; 58; 104.

167: #3 READ: "The Superuniverse of Orvonton" -through the SECOND paragraph on page 168
ONLY—— then follow these instructions:

CONCERNING THE FIRST PARAGRAPH on page 168: they refer to the rotational center of our
minor sector of Ensa——that is, the gravity center around which our minor sector is
revolving——the enormous dense star cloud ——a "subgalactic system"——a "minor
sector"——named "SAGITTARIOUS".

Our scientists have long since called this heavenly system "the Milky Way"— and
named the constellation "Sagittarius".

This tremendous sector, —the subgalaxy system——the "star cloud" called "Sagittarius"
(around which the other 99 minor sectors revolve) —functions as the rotational
gravity center IN the major sector of Splandon

Sagittarius is referred to as a "subgalactic system" ——meaning just beneath, or
very close to being, —a Galaxy, perhaps less than a million stars.

Our star cloud of Nebadon and its associated creations, is one of the 100 local
universes that comprise our minor sector of ENSA, and is, of course, revolving around
the powerful spinning sector center of Sagittarius, and together all 100 sectors are
revolving about Splandon—the major sector.

Our question is then, what is the name of the constellation that our scientists
have mis-named?

CONCERNING THE SECOND PARAGRAPH on page 168: there are THREE references made that should
be explained so that we understand this paragraph. They are——

1. "——the onetime Andronover nebula".(In line 2)
2. "——this near collision changed Andronover——" (In lines 5,6)
3. "——the two-way procession of the suns——" (In line 7)

Following references will explain the above—— (brief excerpts included for ref.)

655:3-5 (Andronover is no more. This final nuclear remnant still burns a reddish glow
(Gives forth - moderate light and heat to its 165 worlds).
(1) (Total number of suns: 1,013,628. Ours was 56th from last).
line 2 (Our sun was a variable sun in its youth).

655: #5 "The Origin Of Monmatia".
(Angona was a dark giant of space, solid, highly charged, possessing tremendous
(2) gravity pull. Over period of 500,000 years tongues of gas were shot out of
lines 5,6 (sun, finally experiencing partial disruption. Volumes of matter were disgorged
(which subsequently evolved into the TWELVE planets of our solar system. Angona
(caused this disgorgement and also nearly collided with Andronover and changed
(it into a somewhat globular aggregation.) (Our sun was experiencing 3½ day
(convulsion cycles. See 459:3)

(3) "——but did not destroy the two-way procession of the suns——".
line 7 (This refers to the tertiary stage of growth of a nebula. After it assumes a
(spiral form and becomes clearly visible to astronomers of distant universes
(systems and subsystems are thrown off from both sides of the mother nucleus
(whirling through space in the midst of the gaseous cloud of the nebula—whirl
(being held securely within the gravity grasp of the mother wheel.)

References for these four stages will be presented later in this paper and you can
study them in detail, but for the present——here is a brief summary of the four stages

of growth of nebulae which explains the two-way procession of the suns:—

1. PRIMARY nebular stage: a gigantic gaseous, circular, rapidly whirling mass, -lil a flattened spheroid.
2. SECONDARY stage: the spiral; gas streams forth from both sides of the mother nucleus.
3. TERTIARY stage: is that of the first sun dispersion (systems and subsystems).
4. QUARTAN stage: the second and last sun dispersion—enormous suns on individual circuits, (—and this marked the birth of OUR sun from Andronover)

Now re-read paragraphs 1 and 2 on page 168 and note these meanings. Then continue reading the description of the SEVEN MULTIPLE revolutionary movements of the universes and note that again they refer to Sagittarius (in no.4) as a sector.

169:#4 NEBULAE—THE ANCESTORS OF UNIVERSES.

Paradise Force Organizers are nebulae originators. In outer space there are TEN different forms of nebulae. Some larger nebulae give origin to 100 million suns. (Andromeda is our neighbor. It is popularly studied by our scientists because it resembles our Milky Way, about which it provides information. It is flat, very bright at the center and surrounded by two spiraling ARMS which appear to have origin in the center.)

Andromeda is the only very active nebula in Orvonton at present. It is OUTSIDE the inhabited superuniverse. The light we see left those suns a million years ago.

Our Milky Way is composed of vast numbers of spiral and other nebulae. Our Milky Way should be regarded as INDIVIDUAL aggregations of matter—the same as other separate nebulae in regions external to the Milky Way.

170:#5 THE ORIGIN OF SPACE BODIES.

Concentric Contraction Rings; Whirled Stars; Gravity-explosion Planets; Centrifugal Planetary Daughters; Gravity-deficient Spheres; Contractual Stars; Cumulative Spheres; Burned-out Suns; Collisional Spheres; Architectural Worlds.

172:#6 THE SPHERES OF SPACE.

Suns; Dark islands; Minor space bodies (comets, meteors); Planets; Architectural spheres.

174:#7 THE ARCHITECTURAL SPHERES.

Headquarters worlds partake of the grandeur of Paradise:—Jerusem; Edentia; Salvington; Uminor the third; Umajor the fifth; Uversa.

(See numbers of hdqtrs, p.182:6,7)

Please read about astronomy in the outer spaces, - generally recognized as—

130:#2 THE DOMAINS OF THE UNQUALIFIED ABSOLUTE.

Some of the nebulae which Urantian astronomers regard as extragalactic are actually on the fringe of Orvonton and are traveling along with us.

The space regions extending beyond the outer borders of the seven superuniverses are generally recognized as constituting the domains of the Unqualified Absolute. Throughout Orvonton it is believed that a new type of creation is in process, and these universes will become the scene of the future activities of the assembling Corps of the Finality.

329:#5 THE MASTER FORCE ORGANIZERS.

They are nebulae creators, the living instigators of the energy cyclones of space and the early organizers and directionizers of these gigantic manifestations.

357:#1 PHYSICAL EMERGENCE OF UNIVERSES

Since there will be, upon completion, one hundred thousand local universes in the superuniverse, —the energy charge of a local universe is approximately one-one-hundred-thousandth of the force "endowment" of its superuniverse. The only physical limitation upon the developmental expansion of the Nebadon universe consists in the "quantitative" charge of space-potency HELD CAPTIVE by the gravity control the associated powers and personalities of the combined universe mechanism.

(They put the temporary "squeeze" on our energy limits because of the rebellion—to retard its growth. Remember the 'technical' end of the rebellion was effected (only 2000 years ago, —after 200,000 years of infectious spreading. The energy (limit is in our system of Satania only, —as far as we know.)

458:#3 OUR STARRY ASSOCIATES

There are over two thousand suns pouring forth light AND ENERGY in Satania. Our sun is an AVERAGE blazing orb. Of the 30 suns nearest ours, only THREE are brighter.

The Universe Power Directors initiate the 'specialized' currents of ENERGY which play BETWEEN the stars and their systems. These "solar furnaces" and the dark giant of space, serve the power centers and physical controllers as "way stations" for concentrating and directionizing energy circuits. Most of the suns average one million miles in diameter. Ours is slightly less.

The largest star in the universe—the stellar cloud ANTARES is 450 times the diameter of our sun and sixty million times its volume.

The "respiratory heaves" of our sun have lengthened from $3\frac{1}{2}$ days to the present 11 year 'sunspot cycles'.

459:#4 SUN DENSITY

Our sun now exists about halfway between the most dense and the most diffuse stars (About $1\frac{1}{2}$ times the density of water.) It is GASEOUS.

Gaseous, —liquid, —and solid states—are matters of atomic-molecular relationships. DENSITY is a relationship of space and mass.

Density varies directly with the 'quantity of mass—in space'. It varies INVERSE with the amount of 'space in mass'—the space between the central cores of matter and the particles which whirl around these centers—as well as the space WITHIN the material particles.

460:#5 SOLAR RADIATION

That the suns of space are not very dense is proved by the steady streams of escaping light energies. Light can be explosive. LIGHT IS REAL.

Energy, whether light or in other forms, traverse space in a STRAIGHT and UNBROKEN line—or procession—except—as they are acted on by superior forces, or as they obey the 'linear gravity' pull in material mass —and the CIRCULAR-GRAVITY presence of the Isle of Paradise.

461:#6 CALCIUM THE WANDERER

Calcium is the chief element of the matter permeation of space throughout Orvonton and the most expert solar-prison escaper. It rides the sunbeams of space. Stone is the basic building material for planets and spheres of space. The stone atom is the most prevalent. The SODIUM atom also rides the light beams for varied distances.

Spectral analysis show only sun surface compositions—such as IRON. But iron is NOT the chief element in the sun. The temperature of the sun's surface is 6000 degrees—which is favorable to the REGISTRY of the IRON spectrum. Much of the solar calcium is now in the outer crust of the sun. Our sun lost tremendous amounts of calcium in the Angona ordeal and the formation of the solar system.

463:#7 SOURCES OF SOLAR ENERGY

Surface temperature of our sun is almost 6000 degrees (F) but rapidly increases as the interior is penetrated, —to about 35,000,000 degrees in the central regions.

There is enormous energy expenditure, the sources of which are:—annihilation of

atoms—then electrons; -transmutation of elements; -accumulation and transmission of space energies; -space matter and meteors diving into the blazing suns; -solar contraction; -gravity action at high temperatures—radiative energies; -recaptive light and other matter drawn back into the sun after having left it.

The internal temperature of the suns remains the same regardless of the fall of external temperature; it is the electronic boiling point, -all atoms are broken up in their electronic and other ancestral components— but the suns ARE NOT ABLE TO DEGRADE THE ULTIMATONS.

464:#8 SOLAR-ENERGY REACTIONS

In those suns which are ENCIRCLED in the space-energy channels, —solar energy is liberated by nuclear-reaction chains. Carbon (an energy catalyst) converts hydrogen into helium. Reduction of hydrogen content increases the luminosity of a sun.

When hydrogen is exhausted and gravity contraction ensues, there is danger of collapse. About fifty years ago this happened to the giant nova of the great nebula in ANDROMEDA. This happened in forty minutes of Urantia time. The matter continues to exist as extensive clouds of nebular gases. This explains the origin of many irregular nebulae—such as the CRAB nebula —about nine hundred years ago.

465:#9 SUN STABILITY

A sun's life becomes stable after the maximum of internal temperature is reached and the subatomic energies begin to be released. Sun stability is wholly dependent on equilibrium between GRAVITY-HEAT CONTENTION—(tremendous pressures counterbalanced high temperatures).

The interior gas elasticity of the suns upholds the overlying layers of varied materials, —and when GRAVITY and HEAT are in equilibrium, -the weight of the outer materials EXACTLY EQUALS the temperature of the underlying and interior gases.

Our sun is NOW passing out of its SIX BILLIONTH YEAR.

465:#10 ORIGIN OF INHABITED WORLDS

Some variable stars— in or near the state of maximum pulsation ARE IN PROCESS of giving origin to systems. During severe convulsive eruptions—columns of matter are thrown off and go into orbit by the gravity control of their sun. Many systems are formed like our own.

When our sun was in a state of mighty pulsation the massive Angona system swung in near approach. The surface of the sun began to erupt streams—continuous sheets of matter. Finally a vast pinnacle of matter was disgorged, became permanently detached and subsequently evolved into TWELVE planets.

Sometimes WHOLE planets, even $\frac{1}{4}$ or $\frac{1}{3}$ of a sun is drawn off. The MAJOR extrusions form cloud-bound types of worlds—much like Jupiter and Saturn.

651: Intro.

& #1 ORIGIN OF URANTIA —THE ANDRONOVER NEBULA

#2
#3
#4

Urantia is of origin in our sun. The nebula ANDRONOVER was created by Force Organizers and duly initiated. The birth of our sun occurred in the second cycle of sun dispersion—56th from the last. Andronover passed through the normal four stages of growth—: the primary (circular, gaseous, flat whirling mass)—the secondary (spiral)—the tertiary (contraction; first sun dispersion—systems etc.) and QUARTAN—(second and last sun dispersion—giant suns).

655:#5 ORIGIN OF MONMATIA—THE URANTIA SOLAR SYSTEM

Our sun was a variable star—(varying in brightness.) It captured some of the space material of the visiting Angona system, detaching THREE of the major planets of this system, —which injected new directional forces into OUR system,— retrograde motion.

657:#6 THE SOLAR SYSTEM STAGE — THE PLANET FORMING ERA

Subsequent to the birth of the solar system— a period of "diminishing solar disgorgement" ensued. For 500,000 years the sun continued to pour forth diminishing

volumes of matter into surrounding space. But during these early times of erratic orbits—when these meteors made a near approach to the sun, they were recaptured.

Planets nearest the sun were first to have their revolutions slowed down by tidal friction—which acts as a brake on their axial revolution—until it finally ceases, leaving one hemisphere always turned toward the sun—as illustrated by Mercury—and—the moon.

RE; space tidal frictions—: space is non-responsive to gravity, but it ACTS as an equilibrant on gravity. Without the SPACE CUSHION, explosive action would jerk surrounding space bodies. Space exerts an antigravity influence upon physical gravity; it can neutralize gravity action—even though it cannot delay it.(125;NL) (Also see 133;#4;3-5)

When our moon approaches 11,000 miles of the earth, earth's gravity will cause it to explode into small particles which may assemble about the world as rings of matter (much like those of Saturn) or be drawn into the earth as meteors.

665:#2 THE URANTIA ATMOSPHERE

Besides light, —vast solar energies pour in upon Urantia embracing wave lengths ranging both above and below the recognition range of human vision.

The earth's atmosphere is all but opaque to much of the solar radiation at the extreme ultra-violet end of the spectrum. Most of these short wave lengths are absorbed by a layer of OZONE...10 miles above the surface of the earth—and extends spaceward about 10 miles—(10 miles in depth).

The lower 5 or 6 miles of earth's atmosphere is the TROPOSPHERE—the regions of winds and air currents.

Next above this the inner ionosphere; —and next above is the stratosphere. One half of all our atmosphere is found in the first three miles. The HEIGHT of our atmosphere is about 400 miles.

666:#3 SPACIAL ENVIRONMENT

Astronomic dust clusters characterize many regions throughout remote space. In early times of universe materialization, space regions are interspersed with hydrogen clouds. Dust clusters are built up in these hydrogen clouds then the atoms are broken up. Atom disruption also occurs at the nucleus of large hydrogen masses.

This atom building, and atom disruption gives origin to flood tides of SHORT-SPACE RAYS —of radiant energy—which the sun disperses. Together with these many radiations—is another space energy unknown on Urantia.

These vast hydrogen clouds are as COSMIC CHEMICAL LABORATORIES. —harboring all phases of EVOLVING energy and metamorphosing matter.

668:#5 THE CONTINENTAL DRIFT

The earth's core became as dense and rigid as steel—being subjected to pressure of almost 25,000 tons to the square inch, and owing to the enormous gravity pressure it was, and still is— very hot in the deep interior.

Internally the earth's temperature is slightly above the surface temperature of the sun. The outer 1000 miles of the earth's mass is composed of different kinds of rock. Underneath are the denser and heavier metallic elements. Early in preatmospheric ages—the earth was so nearly fluid in its molten and highly heated state— (being a part of the sun—where it came from) that the heavier metals sank deep into the interior. Those near the surface are the exudate of ancient volcanoes, later lava flows, and the more recent meteoric deposits.

The lava layers of the earth's crust, when cooled, form granite. Sea bottoms are more dense than land masses. This is what keeps continents ABOVE water. Sea bottoms are of lava heavier than the granite of land masses.

APPENDIX

Following are a few arbitrarily chosen definitions of names and expressions commonly used in the field of astronomy which are helpful to beginners in the study of celestial bodies:

ASTRONOMY is the science of the position, motion, constitution, history and destiny of celestial bodies. It is the nature of this scientific investigation—that its work is never done. New discoveries are constantly opening up and immense labors remain to be performed.

BINARY STARS are two close stars held together by a gravitational force and revolving like a dumbbell about a common gravity center. (The center is closer to the more massive star.)

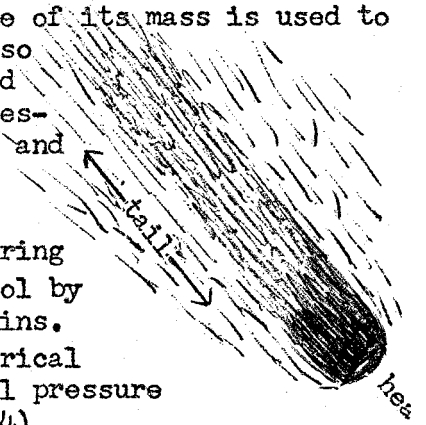
CEPHEID: a star, the brightness of which varies periodically. The periods range from several hours to 50 days. There are THREE kinds: Cepheid I stars are about 1.5 magnitude brighter than Cepheids II. The variation periods range from 1.5 to 40 days. The third type—called RR Lyrae variables—are cepheids of very short period—29 hours or less.

COMET: (a) consists of a head, usually globular, (called Coma)—a nebulous mass surrounding the nucleus of a comet.

(b) the nucleus is small but much brighter than the rest of the head.

(c) it has a tail that has the appearance of streaming from the Coma.

It appears as a large illuminated moonlike disk, visible in daylight, moving about the sun in an elongated ellipse. Each time a comet passes the sun, some of its mass is used to form its tail which dissipates like smoke into space. It may also split into two or more parts. After several score, or a hundred perihelion passages, the comet exhausts its volatile and incandescent material,—becoming a swarm of meteoroids—roaming in space and supplying the earth intermittently with meteoric showers.



From the Urantia Book: Many comets are unestablished wild offspring of the solar mother wheels, being gradually brought under control by the central governing sun. Comets also have numerous other origins.

A comet's tail points AWAY from the sun—because of the electrical reaction of its highly expanded gases, and because of the actual pressure of LIGHT—and other energies emanating from the sun. (173:4)

This phenomenon constitutes one of the positive PROOFS of the reality of light and its associated energies. It demonstrates that LIGHT HAS WEIGHT, —light is a real substance.

(Halley's comet that passed near Urantia in 1910 will again appear in 1985).

CONJUNCTION: an apparent 'line-up' of the sun, earth, —and a planet. (Inferior conjunction is when the planet is BETWEEN the earth and the sun).

CONSTELLATION: a group of stars—originally called "fixed stars"—a division of the stellar heavens, a group of stars apparently close together. Actually, the stars of a constellation may be great distances apart and moving in different directions—one from the other. MODERN ASTRONOMY RECOGNIZES 88 such groups (constellations).

DOPPLER EFFECT: the effect is a change in frequency of light due to relative motion between the observer and the source of light. The spectrum of an approaching source of light has all its wave lengths shortened.

EQUATOR: an imaginary great circle on the earth's surface—everywhere equally distant from the two poles dividing the earth's surface into Northern and Southern Hemispheres. It is also known as the "celestial equator", so called because at the points where it intercepts the Ecliptic it equalizes the whole world in light and darkness.

ECLIPTIC: —the great circle on the earth (or any celestial sphere) which is the apparent path described by the sun around the earth, —or as seen from the sun. It is shown on a terrestrial globe as a great circle making an angle of about $23^{\circ} 27'$ with the earth's

equator, —used for solving astronomical problems.

EQUINOX: one of the two points of intersection between the ecliptic and the celestial equator. When the sun is at one of these two points every year—(on or about March 21st—the vernal equinox—and September 23rd—autumnal equinox) the length of day and night are equal everywhere on earth.

EVENING STAR: this is NOT a star—it is a planet; especially Mercury, or Venus, when seen in the western sky just after sunset.

MORNING STAR: this is a planet, NOT a star, —Mercury, when seen in the eastern sky just before sunrise.

GALAXIES: a large community of stars in space. Galaxies contain billions of stars. Many are shaped in the form of a spiral. Sometimes they are referred to as "island universes"—meaning it is interspersed with islands of stars; and sometimes they are said to be "Extragalactic Nebulae"—in spite of the fact that they are galaxies of stars—and NOT nebulae.

Note: the Urantia book tells us that galaxies are individual groups—composed of VAST numbers of spiral and other nebulae. "Our Milky Way should be regarded as individual aggregations of matter—the same as other separate nebulae—in regions external to the Milky Way. (170:2,3)

Classification of Galaxies:

- (1) Irregular: these galaxies have no simple geometric form or clear design. Typical of these are the Magellanic Clouds.
- (2) Elliptical: they take on the shape of flattened disks. No spiral arms are discernible. About 25% of all galaxies are in this group.
- (3) Spirals: typical of these are the Milky Way and Andromeda:
 - a. Normal spirals—the two arms begin spiraling upon coming out of the CORE of the galaxy.
 - b. Barred spirals: the two arms extend straight out and begin to spiral at the end of the extension.
- (4) The Local Group of Galaxies: these include the galaxies that are closer than two million light years, of which there are thirteen —in addition to our galaxy and the two Magellanic Clouds. The sixteen galaxies that form the "LOCAL GROUP" are only a minute fraction of all existing island universes.

GREATNESS OF THE 200" TELESCOPE —at Palomar Observatory near San Diego: its powers are enormous. With its aid, one can see a candlelight at a distance of 10,000 miles. It penetrates TWICE as far into space (a distance of 2000 million light years) —as the 100' telescope at Mt. Wilson.

LIGHT YEAR: is a unit of distance, not of time. It is the distance that light travels in one year—approximately 6 trillion miles.

MAGELLANIC CLOUDS:

Large: the galaxy nearest our own is the LARGE Magellanic Cloud—less than 150,000 light years away—visible to the unaided eye—in the constellation "Dorado". It is irregular elliptic shaped. It contains almost 1500 Cepheid variables, —and the Great Looped Nebula—called 30 Doradus—which is the largest known gaseous nebula—much larger than Orion.

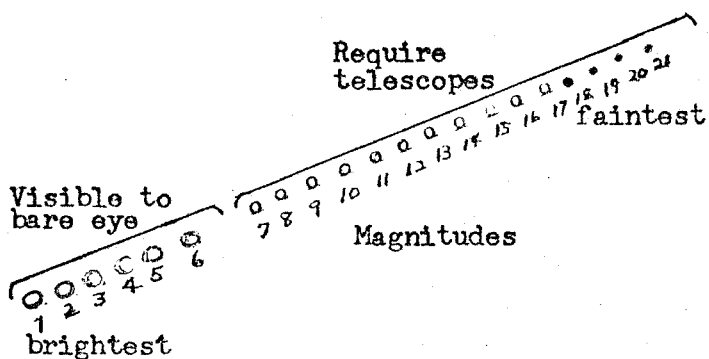
The Large Magellanic Cloud is NOT a cloud, and is NOT a nebula. IT IS A GALAXY—a large island consisting of light emitting stars, globular star clusters, diffuse nebulae and all other entities found in our own galaxy.

SMALL Magellanic Cloud is slightly farther distance than the Large Cloud; is visible to the naked eye, in the constellation of TUCANA. It is about half the size of the Large Magellanic Cloud.

Both the Large and the Small Clouds are often regarded as satellites of our galaxy, the Milky Way.

MAGNITUDE: classification of stars according to their brightness. Star brightness is measured in steps, called magnitudes. Maximum magnitude (brightest stars) are designated by small numbers, and dimming to the faintest at approximately 21.0

Some stars are actually bright but appear faint because of their great distance.



Calculations are based on the psychophysical law formulated by FECHNER in 1859—for determining the relation between apparent magnitude and apparent brightness. The German astronomer ARGELANDER (1799-1871) and associates prepared a great star catalog by using this method.

The bare eye can see stars as faint as the 6th magnitude.

NEBULAE:

A DIFFUSE nebula is a cloud consisting of a mixture of dust and gases. The light by which it is seen is due to a star in its center or in its immediate neighborhood.

A PLANETARY nebula is a slowly expanding shell of gas expelled from a hot dying star. The star causes the nebula to shine by FLOURESCENSE. Planetary nebula will last only about 30,000 years before they dissapate into space and become invisible. (They are not related to planets but resemble a planet in shape).

A SPIRAL nebula is a galaxy of stars (NOT a nebula) -in the form of a spiral.

NOVA: is a star that suddenly increases greatly in brightness. The star quite suddenly sheds its whole surface, which forms an ever-expanding shell surrounding the star. The major part of the increase in brightness is due to the large surface exposed by that shell.

Later the ejected material becomes too rarified and ceases to shine. Little is known of the pre-nova stage of these exploding stars.

PERIHELION: is that point of the orbit of a planet, or comet, which is nearest to the sun. (opposed to aphelion—the most distant point from the sun).

PROMINENCE: when the height of a disturbance exceeds 15,000 miles above the surface of the chromosphere, -it is called a PROMINENCE. These often occur in the regions of sunspots and may persist for several days to several months. They are described as thin sheets of orange colored flame—standing on edge—resembling a feathery structure; at other times —gigantic trees, -moving at a colossal speed.

Prominences can reach heights of half a million miles and more; they have exceeded the diameter of the sun approximately by a million miles.

RADIO ASTRONOMY: the branch of astronomy that deals with the electromagnetic waves emitted by various celestial bodies as well as the theory of their emission.

RADIO TELESCOPE: an instrument used for examination of celestial objects by means of the radio waves emitted by these objects.

WHITE DWARFS: are stars of extremely low luminosity, not due to lack of mass. They compare well in this respect with the mass of our sun. Their faint luminosity is due to their small size (ie; volume). Stars with fair-size mass (—ie; amounts) —and small volume—(size) —have high values of DENSITY. (A tablespoon of matter of a white dwarf would weigh tons.)

This brings us face to face with the theories related to us in the Urantia Book —on sun density (459; #4) (pg. 3 in this paper) RE: "atomic molecular relationships" and "density" (Also RE: "white dwarfs" 464; #81.2)

ZODIAC: a belt in the sky containing 12 constellations. The sun, moon, and planets appear travel within that belt. The ecliptic divides it in two.

NOTE: start reading NO.1 at bottom of page; read upward as numbered.

Charged particles from sunspots coming in. Ionizing influence on outer layer produces auroral displays.

(8. Interstellar space does not have the temperature of absolute zero. Temperature in such a rarified atmosphere is not comparable with heat reckoning at the surface of the earth. (666:3) The atmosphere of Urantia thins out increasingly until a about 3000 miles it shades off into space matter, gravity-pounding energy currents, power circuits, ultimatic activities, and organizing electric energies. (473:4)

IONOSPHERES

(7. It is this intense heat that ionizes the oxygen. (666:3) And so we have another ionosphere, —the OUTER ionosphere—which there are two levels., caused by two different sources

Intense heat ionizes oxygen. Level of auroral displays. 1200°

Sunspot craters are like enormous magnets. These magnetic fields hurl CHARGED particles from these sunspot craters through space to the earth's OUTER atmosphere—where their ionizing influence produces spectacular auroral displays. The greatest auroral phenomena is when sunspots are at their height and are more equatorially situated.

SUPER-STRATOSPHERE

The compass needle daily turns slightly eastward as the sun rises, and slightly westward as the sun sets. //During sun cycles this variation of the compass is twice as great due to increased ionization of the upper atmosphere which is produced by sunlight. //It is the presence of the TWO different levels of electrified conducting regions—(ionospheres in the superstratosphere originating from two sources: the intense temperature; and the sunspot magnetic craters drawing charged particles out of the photosphere, hurling them out through space to the earth's outer atmosphere)—that accounts for long distance transmissions of your long and short-wave radiobroadcasts. Broadcasting is sometimes disturbed by storms raging in the realms of these OUTER ionospheres. (666:5,6,7).

1000°
500°
300°
100°
70°

(6. At a height of 45 to 50 miles the temperature begins to increase. It increases until it is at the level of the auroral displays. The HEIGHT of the earth's atmosphere is indicated by the height of the auroral streamers which is about 400 MILES ABOVE the surface. At the level of auroral displays the temperature reaches 1200° F.

STRATOSPHERE

Realm of constant temperature 70° below zero F.

(5. Ascending from the surface of the earth the temperature steadily falls for 6 or 8 miles—until it reaches 70° below zero F. where it remains constant in the realm of the stratosphere

OZONE LAYER

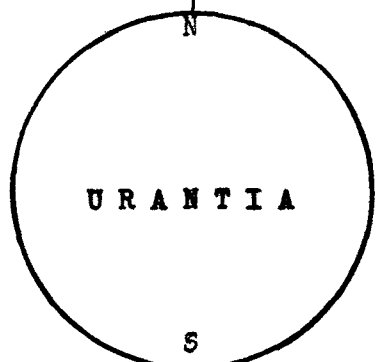
(4. Most of the extreme ultra-violet short-wave lengths are absorbed by a layer of OZONE which exists throughout a layer of about ten miles above the surface of the earth—and extends spaceward for 10 miles. This thin layer protects us from the dangerous and destructive ultra-violet radiations present in sunlight. (665:#2:2)

INNER IONOSPHERE

(3. The INNER IONOSPHERE is a layer of negatively and positively charged atoms which lies just above the troposphere. It acts as a mirror reflecting radio waves back to the earth—and around the globe. //When there is over-production of ions—(positively charged electrons)—the radio waves are NOT reflected back to earth, but are absorbed by the IONOSPHERE.

TROPOSPHERE

(2. The troposphere is the region of wind and air currents which provide weather phenomena. (666:3)
(1. One half (1/2) of all the earth's atmosphere is found in the first 3 miles. (666:3)



Georgia Gec
468 22nd St
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1976

SUN OBSERVATIONS

1. SUN SPOTS: dark and semi-dark areas that appear on the sun, -from 20,000 miles across to times the surface of the earth, -that last from about four days to 100 days. Each spot is center of a magnetic field. They resemble tornadoes. Astronomers call them "respiratory heaves". They appear every $11\frac{1}{2}$ years. If several, they are referred to as "sunspot groups".
2. UMBERA: sunspots consist of TWO gigantic portions that differ in darkness. The central portion is the umbra, -the darker portion. → dark
PENUMBERA: surrounds the umbra. It is the semi-portion. Their diameters are hundreds of thousands of miles.
3. PHOTOSPHERE: the sphere of light; the luminous envelope of the sun in which sunlight has origin.
4. SOLAR ATMOSPHERE : three layers.....
 - (1) CARONA; the upper-most (outermost) visible to the naked eye during a total eclipse. Resembles a pearly-gray halo of intricate design, vastly larger than the two layers beneath it., - $\frac{1}{2}$ million miles thick. At sunspot MAXIMUM few rays protrude. At sunspot MINIMUM: is elongated and circular. Enormous streamers radiate.
 - (2) CHROMOSPHERE; the middle layer. About 6000 miles thick. This is the COLOR sphere--a bright orange color.
 - (3) REVERSING LAYER; the lower (inner) layer; 1000 miles thick. Materially affects the quality of light given off by the photosphere, -it removes some of the components. It lies immediately above the photosphere.
5. PROMINENCES; when heights of disturbances of gaseous material on the sun exceeds 15,000 miles above the chromosphere, it is called a "prominence". They often occur in the regions of sunspots -and persist from several days to a few months. Described as thin sheets of orange-colored flame standing on edge, at times resembling a feathery structure; -at other times a gigantic tree. They have formidable dimensions, average 40,000 miles, -and cross sections of 10,000 times 1 million miles.
6. SOLAR FLARES; extremely bright clouds which appear from time to time ABOVE the chromosphere differing from the great prominences in brilliance, size, and duration. They are the brightest spots on the sun; they develop and disappear rapidly--reaching intense brightness in 10 or 15 minutes, and fade within several hours.
7. FACULAE; it is believed that faculae are clouds of solar matter that are thrown up by the sun and stay above the surface for brief periods of time.
8. GRANULATIONS; The photosphere is not uniformly bright, but "speckled" or marked by granules with diameters hundreds of miles long. They are NOT fixed, but are changing constantly in position and structure. GRANULES probably cover the whole area of the photosphere.

The surface of the sun is NOT static., motions in the photosphere resemble waves in the ocean DURING A HURRICANE. The granules are believed to be crests of waves moving about continuously in the photosphere. /It is likely that granulations, sunspots and faculae--are caused by swirling, chaotic currents of gas.
9. IONOSPHERE; a region of electrically charged (ionized) air beginning about 25 miles above the surface of the earth by means of which radio waves are transmitted to great distances. It includes several LAYERS (D,E,F1,F2 layers) that vary in height and ionization with the season and time of day. These air particles in the ionosphere are maintained (ionized) by the ultraviolet rays from the sun (and to a less extent by charged particles from the sun). Our IONOSPHERE acts as a mirror reflecting radio waves back to earth--all around the globe.
- 10 SPECTRUM: a series of images formed when a beam of radiant energy is subjected to dispersion and then brought to focus --so that the component waves are arranged in the order of their wave lengths.
- 11 SPECTROHELIOGRAM; (introduced by George Ellery Hale, 1890) an instrument used for observing the sun's disk. (Helio=means the sun). Astronomers can obtain the distribution of any element on the disk of the sun--such as hydrogen, oxygen, calcium, or other elements on the solar surface facing the earth.
11. FLUORESCENCE: the property of emitting radiation as a result of, and only during the absorption of radiation from some other source
- 12 DIAMETER OF SUN: slightly less than one million miles. / The average distance of the earth from the sun is 93 million miles; --less in January than in July by 3 million miles.

= HOW OUR PLANET INCREASES IN MASS =

- THE IMPORTANCE OF COMETS -

METEOROIDS; FLYING GRAVEL PILES; SWARMS; STREAMS; METEORIC SHOWERS.

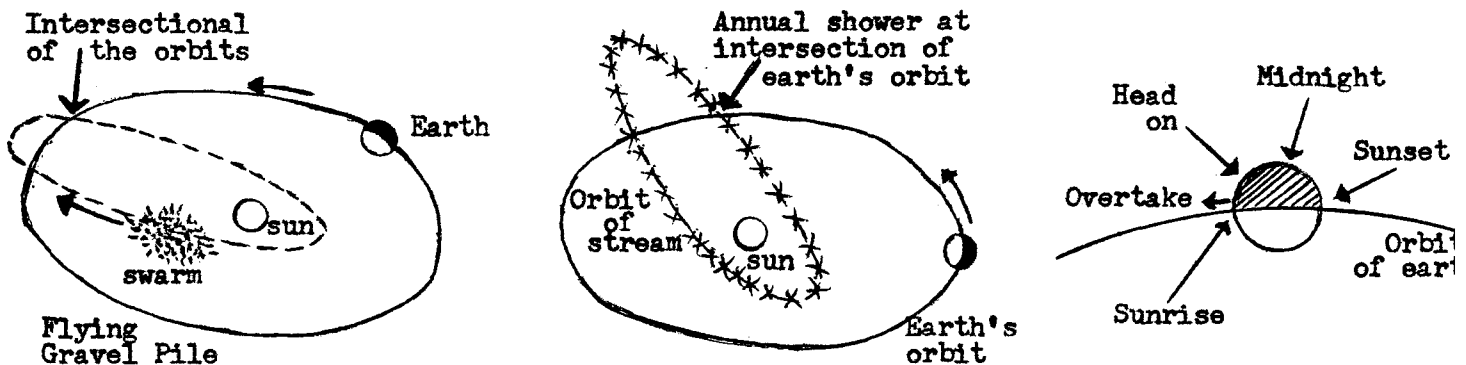
Meteoroids are tiny solid objects, the size of sand particles, traversing through space mostly along orbits formerly occupied by COMETS.

It is believed that many of these meteoroids are the remnants of comets that have lost a great deal of their mass on successive passages near the sun (perihelion), the gravitational attraction of the remaining mass being too weak to keep the particles together. Soon after the "demise" of the comet, the particles form a closely packed group, —well described as a "FLYING GRAVEL PILE"; —such a group is known as a "SWARM". With time there is a great deal of scattering—both along the elliptical orbit—and sideways. An elongated pile of such particles, is known as a "STREAM".

The earth, moving along its orbit, is continuously colliding with some of these scattered solid particles, the vast majority of which do not survive the clash. Upon entering the earth's atmosphere at a fairly great speed (200 miles per sec.), they are incinerated by the white heat produced by the compression of the air in front of the object, —and by the friction between the air and the sides of the meteoroid. Meteoroids first appear at heights of 60 to 90 miles; most vanish at heights of 30 to 50 miles. (see U.B. 563:#3;2,3)

The light phenomenon which results from the entry into the earth's atmosphere of the meteoroid is called "meteor" or "shooting star". Shooting stars are extremely common; the number of those visible each day is approximately 20 million; the number of fainter meteors that can be observed only with the aid of a telescope is thought to be between 5 and 10 billion.

The dust resulting from the incineration settles slowly towards the earth, INCREASING THE MASS of our planet annually by hundreds of tons. (see U.B. ref. 658;2,3)



Occasionally a large meteoroid collides with the earth's atmosphere and survives the tremendous heat engendered in its passage. Such a meteoroid is called a "METEORITE". Many are on exhibit in museums, —several feet in EACH dimension. On June 30, 1908 a gigantic meteorite fell in Tungusta (northern) Siberia with immense damage to forestland. It weighed 40,000 tons. Another gigantic meteorite left its imprint in the desert of N.E. Arizona near Canyon Diablo. The crater formed by the impact is 4000 ft. across surrounded by a rim which stands 140 ft. above the surface. The bottom of the crater is nearly 600 feet below the rim. Geological estimates indicate that this one occurred thirty or forty thousand years ago. Also on March 31, 1965 a "fire bomb" fell in the snow in Revelstoke, British Columbia, Canada.

Twice as many meteors can be seen in the hours between midnight and sunrise than before midnight, because the observer is on the front side of the earth as it moves along its orbit, he can see BOTH—meteors that are "overtaken" by the earth, —and those that are met "head-on".

Enormous increase of meteors occurs when the earth goes through a "SWARM" or a "STREAM". A large number of visible meteors is called a "METEORIC SHOWER". Meteoric showers are much more dramatic when the earth goes through a swarm (flying gravel pile) than through a stream. In a meteoric shower, due to a swarm, BOTH the earth and the swarm must be at the point of intersection AT THE SAME TIME.

(The above was taken from "Astronomy Made Simple" by M.H.Degan; Science Dept.; State Univ. N.C. Georgia Geoch