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ASTRONOMY-The Seventh of the Liberal Arts and Sciences.

W.M.,— This is the first occasion on which I have had the honour and privilege of reading a paper to the Lodge of Research of Hawke's Bay, and I trust that my humble effort may be successful in bringing to you all something of interest.

I approach this subject—not as an astronomer—merely an "astrophile"—an interested beginner-let us say an E.A.—humbly seeing and enjoying, in varying and progressive degrees, according to my abilities, the wondrous works of T.G.A.O.T.U. I am indebted to several of our V. Wor., Wor. and Brethren for access to books and for valuable assistance. Time does not permit of following in detail the various points that could be dealt with. Much information has been obtained from a book by John Fellows, M.A.—"The Mysteries of F.M. dealing with the Customs of the Ancient Egyptians and their identity with the Order of F,M."

When Man attained sufficient intelligence to speculate as to his own nature and that of the Earth on which he lived, he must have been impressed profoundly by the nightly pageant of the starry heavens, the intense sparkling brilliance of Sirius and Vega, the more massive and steady luminosity of Jupiter and Venus, the glowing red of Antares and the strange grouping of the brighter stars, and must have spent a good deal of time endeavouring to decipher the meaning of the vast panorama of lights which are scattered round us in all directions in space.

Brethren are familiar with the words Liberal Arts and Sciences: the initiate, early in his introduction to F.M., is made familiar with the terms. In the charge after initiation there is given him a last general recommendation, in which he is exhorted to dedicate himself to such pursuits in life as will enable him to become an ornament to the Masonic Society: with this the hope is expressed that he will more especially study such of the Liberal Arts and Sciences as may lie within the compass of his attainments—the seventh of those Liberal Arts is ASTRONOMY.

In F.M., astronomy is defined as that Divine Art by which we are taught to read the Wisdom, Strength and Beauty of the Almighty Creator in the sacred pages of the Celestial Hemisphere. When the Candidate learns the questions and answers before raising, he finds that the peculiar objects of research in the Second Degree are the hidden mysteries of Nature and Science.

The Chaldean shepherd had a far better knowledge of the stars and their movements than the modern educated dweller in the brightly lighted town: the religion, legends and, perhaps, some of the early history of the ancient Chaldeans can be traced in the, names which they gave to the groups of stars which were familiar to them. The natural association of religious ideas with the heavenly bodies led to the building of temples with a definite astronomical significance, which we can trace in the Temple of the Sun at Luxor, at Stonehenge and in many other buildings of antiquity.

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By imitating the ancient Chaldean, a patient observer may discover for himself the apparent ponderous movements of the heavens: as the days, weeks, months and years roll by, the vault of heaven will reveal the regularity of its slow but mighty revolutions and cycles; modern observers use the telescope to enable them the better to reveal and comprehend scientific truths.

When the ancients observed the vault of heaven, to them the stars were nothing but a distant background of points of light. This background enabled them to fix their bearings in space, to pick out neighbouring stars and planets by their movements against it.

When we consider the stellar universe with its scintillating jewels of light, we cannot help but experience something of the majesty that pervades all Creation. Sight is a noble sense, in some ways approaching the Divine: without it we should be unconscious entirely of all but our most immediate surroundings: sight discloses to us the existence of an universe of marvellous grandeur and of in-conceivable intensity: it is no wonder that radiation of Light is taken as a symbol of every kind of physical, mental and moral enlightenment.

After the Candidate has taken his S.O., he expresses a desire for L. "... and God said `Let there be Light, and there was Light.' " Light emanates from the Sun, the G. of G. In our L's the symbol is the B1 Star. Truly the Sun is the natural symbol of the Great A. Light is God's greatest gift to Man. The greatest luminary in Nature is the Sun, created by the Almighty A. From earliest times the Sun has been an object of reverence and worship; it brings to the earth light and heat, for to its rays all living things owe their daily existence: the Sun was known to the ancient Egyptians as Osiris, and to the Greeks as Apollo.

In the F.C. degree you are recommended to study the Liberals Arts and Sciences, which tend so effectively to polish and adorn the mind, and you are expected to make the Liberal Arts and Sciences your future study, that you may the better be enabled to discharge your duty as a F.M. and estimate the wondrous works of theAlmighty Creator.

The seven subjects of the Liberal Arts and Sciences by no means exhaust the fields of knowledge now open to man, but time once was when they did. Knowledge of the TRIVIUM—as Grammar Rhetoric and . Logic were then denominated—have furnished him with the key to all languages: and that of the QUADRIVIUM— Arithmetic, Geometry, Music and Astronomy—have opened to him the secret laws of Nature. The term Trivium means three ways or paths, and Quadrivium, the four ways or paths of know-ledge. Hence, with the greatest propriety, it is said that we are taught in the FC degree to explore the paths of Heavenly Science.

The science of astronomy as known and understood by the Greeks as early as the 6th century, and by the Egyptians and Hebrews in the 2nd and 3rd centuries B.C. differed greatly from the science of astronomy today.

ASTRONOMY—the "science of the'stars"—as we know it today, is concerned not merely with the stars, but with all the celestial bodies which together comprise the known physical universe. It deals with planets and their satellites, with comets and meteors, with stars and interstellar material, with star clusters, the system of the Milky Way and other systems which lie far beyond the Milky Way.

Astronomy is the most comprehensive, and regarded as the oldest of all the sciences. People of ancient times were attentive watchers of the skies: as we are today, they were attracted by the splendour and mystery of the celestial scenery.

Vast spaces intervene between the stars: if the size of our sun were represented by one of the periods; on this page, the sun's nearest neighbour among the stars, the double star Alpha Centauri, the outer Pointer of the Southern Cross, would be shown on this scale as two small dots 10 miles away. The actual distance exceeds four light years: that is to say, a ray of light whose speed is 186,000 miles per second, spends some 42 years on its journey from that star to the sun: this is a fair sample of the spacing of the stars around us. The components of Alpha Centauri are both yellow—one-eighth brighter than our sun and one-third larger.

The ancients possessed no telescopes and knew little of the heavens as we know them today: nevertheless, they did read the heavens in a manner that gave them much light upon Eternal Truths. They had no textbooks and the only way by which they could impart knowledge to others was by Signs and Symbols: thus they divided the heavens into the twelve Signs of the Zodiac, and to each Sign they attributed a Principle: these twelve Principles, they believed, were inherent in human nature in varying degrees—of which more later.

In opening our L's, our ritual directs that "... as the Sun rises in the E. to open and enlighten the day, so the W.M. is placed in the E. (symbolising the Sun) to open the L. and to employ and instruct the B. in F.M." The J.W. is placed in the S. to mark the Sun at its meridian; the S.W. is placed in the W. to close the L. because the Sun sets in the west to close the day. Later, the C. discovers the sun and moon to be two of the Lesser Lights.

The G.A.O.T.U. created the Sun and the Moon; the Almighty Arch. was also pleased to be pangle the ethereal concave of Heaven with a multitude of stars, that Man might meditate thereon and justly admire His Majesty and Glory. The three Lesser Lights are the S.M. and the Master of the L.: the Sun to rule the day, the Moon to govern the night and the M. of the L. should, with equal regularity, rule and govern the L. A lodge has three Symbolic Lights—situated in the E.W. and S. There is not one in the N. because K.S'sT. was situated so far north of the ecliptic that the sun, even at meridian, did not dart his rays into the northernmost parts thereof.

In the explanation of the T.B. of the 1 deg. the Magi or Philosophers of Antient Egypt communicated with one another by Signs and Symbols, and we find in our ceremonies and teachings much mention of the Sun. They saw, especially in the place of their religious ceremonies, a circle, or the figure of the Sun. Today, astronomy teaches us that our sun, by its brilliance and size, is the most prominent object in the heavens, as it is our nearest star; the stars we see on a clear night are all suns, many of them very large in size; astronomy also teaches us that, of these, our sun is a yellow star and a fair average of the general run of stars—it is 864,000 miles in diameter, 93 million miles distant from us and a ray of light takes 82 minutes to reach us.

Our L's. are situated due E. and W., because the Sun, the G. of G., rises in the E. and sets in the W. In the 1 deg. T.B. we are taught that "the Heavens He has stretched forth as a canopy—the Earth he has planted as a foot-stool: He crowns His Temple with stars as with a diadem: the Sun and Moon are messengers of His Will: the covering of a F.M.'s L. is a celestial canopy of divers colours—even the Heavens. With reference to the sun's rising and setting there seems to be so much involved that I have no definite ideas: it would seem that a great deal of caution is necessary to obviate any erroneous ideas. No doubt the E-W orientation of a L. follows on the later Egyptian temples (as witness the Pyramids) but the method of opening and closing retains a memory of the Temples of the Solar Solstice, of which probably K.S'sT. was one. These temples were so oriented that at the moment of the rising of the sun on the summer solstice (or mid-summer morn) light travelled through a long avenue of pillars to illuminate the Altar of the Holy of Holies for some two minutes only.

The Ethereal Mansion is veiled from mortal eyes by the starry firmament, emblematically depicted by seven stars. The seven stars alluded to may refer to the Pleiades group (or the Seven Sisters) which held an important place

in antient ceremonies, quite apart from the antient mysticism concerning the number seven. It is believed that one of the passages of the Great Pyramid—leading from the King's Chamber—pointed to the culmination of this Pleiades group; an opposite passage pointed to the then Pole Star.

Then again, seven stars were listed by the Antient Hebrews as follows: the Sun, Jupiter, Mercury, Venus, the Moon, Saturn (they classed the moon as a star). They thought that the Sun revolved round the Earth and that the Earth was the centre of the Universe. Today we know that the planets revolve around the Sun, Mercury, Venus, Earth, then Mars, Jupiter and Saturn, and that the Moon is a satellite of Earth. The seven planets were considered as seven spirits or influences which emanated from the Throne of God. Thus they mapped out the Heavens very much as we know them today and they used the Heavens as a text-book to tell their people the principles of Life and Being.

Some philosophers considered these seven planets in another light: they included them as the first seven of nine concentric orbs, which will be mentioned a little later. Until the Middle Ages it had been generally, although not universally, supposed that the earth formed the centre of this colony of objects, and indeed, of the whole universe. It was believed that the sun, moon and planets were attached to a transparent sphere which revolved round the central earth at a greater distance and so formed a background to them all.

The early Greek students of the stars, looking out hour after hour, and night after night, at the wheeling vault overhead, classified the brightest stars into groups or constellations. It is easy to discover lines of stars and letters of the alphabet, such as U V W, in the sky: the ancient observers, helped by a vivid imagination, saw such objects as a plough, a bull, a scorpion, a chair, etc.: in this way the stars were divided into "constellations," or groups of associated stars.

PTOLEMY—of Alexandria—a Greek astronomer and geographer — was the founder of plane and spherical trigonometry and of the Ptolemaic system of astronomy. This system assumed that the earth was spherical, but stationary, at the centre of the heavens, with planets and the sun revolving round it. It is astonishing to men of today to be told that this theory of the earth being a sphere enjoyed little disputed acceptance for 1400 years. The doctrine of the sphere was well known to the Antients: spheres are surmounted on the pillars, one a celestial, the other a terrestialsphere: the terrestial sphere showed the antient belief in a spherical earth, not a flat earth as was believed in mediaeval times. You will notice on the L. of R. summonses that there is a sphere surmounting each pillar.

On the convex surface of the celestial sphere is represented the face of the Heavens and the planetary revolutions: the principal use was to depict the situation of the fixed stars and to illustrate and explain the phenomena arising from the annual revolution of the earth round the sun and the diurnal rotation of the earth upon its own axis. On the other hand, some old students believed the earth was a "rectangular cube" in space, with man's habitation on the top thereof. This may be significant in connection with the form of the L. in the 1 deg. T.B.; there your "attention is called to the form of the L., which is a parallelopipedon—or oblong block."

Most of us are aware that the Antients gave prominence to the study of the stars: but we shall not understand their attitude to this subject unless we can ascertain what those Magi or Philosophers of olden times thought, believed and taught, in regard to the heavenly bodies. These philosophers described this planet earth as beingthe centre of nine con-centric orbs: the first seven were as stated—the Sun, Jupiter, Mercury, Mars, Venus, the Moon and Saturn; the eighth, the Sun, which moved daily from east to west, and the ninth, all other stars seen in the heavens and which also encompasses the whole. That which encompasses the whole—the wheel-shaped star system bounded by the Milky Way—we today know it as the Galactic System. The sages of old divided that which encompasses the whole, i.e., the universe, they divided it into twelve parts and to each part they gave a name, after the name of the figure perceived in it, reflected by the stars directly beneath: i.e., those twelve constellations named by the Antients and by those same names known to us today. These twelve constellations narked off divisions eastwards from the Vernal Equinox and were called the Zodiac, which contains, at all times, the Sun and Moon and the principal planets, with the exception of Venus and Pluto. The twelve symbolical names, signifying the twelve portions of the heavens and the year, regulated the beginnings of sowing, mowing, harvesting and other works of mankind.

These twelve constellations, or "Signs of the Zodiac' are:

ARIES	the RAM
TAURUS	the BULL
GEMINI	the TWINS
CANCER	the CRAB
LEO	the LION
VIRGO	the VIRGIN
LIBRA	the SCALES
SCORPIO	the SCORPION
SAGITARIUS	the BOWMAN or ARCHER
CAPRICORN	the GOAT
AQUARIUS	the WATER-CARRIER

PISCES the FISHES

With meagre knowledge and instruments these antient astronomers regarded the Sun and Moon as planets: even so, the comparative positions of the then known planets were fairly well judged: also these Signs of the Zodiac were known to the astrologers of antiquity, a fact confirmed by antient records of Egypt and India: they considered the visible heavenly bodies to be representatives of reflections of heavenly beings, which controlled the destinies of Earth, subject to the Great Over-Ruling Power or Gt.A., while of them the Zodiacal signs and the Sun wielded the greatest influence, and this comprised the pseudo-science of astrology.

Definition of Astrology—the pseudo-science which held that the destinies of nations and individuals were revealed by the stars: it was the hand maiden of astronomy, although today astronomers count it for little or nothing.

Astronomy-the science and study of the stars.

As the year progressed, the Sun appeared to occupy a certain Sign (or constellation, as we now say) during each of the twelve months. Thus, at one period of time, the Sun would be in the constellation of Cancer the Crab in January, Leo the Lion in February, Virgo the Virgin, in March, etc. But, each year saw a slight change. The Sun entered each constellation a little later— ever so little later— until at last a year would came when the Sun would be in Cancer the Crab in February (not January), in Leo the Lion in March (not February), and so on. The old astronomers—Hipparchus, the greatest of them all—must have been very keen observers, in that they discovered this phenomenon—known to us today as the Precession of the Equinoxes. These ancient observers estimated it would take 2000 years for the Sun "to pass through" one constellation (or Sign or House of the Zodiac): today's astronomers have estimated the time to be 2149 years, so that the old sages were not far out in their calculations.

The Precession of the Equinoxes—the annual occurrence of the Vernal Equinox—corresponding to Spring in the N. Hemisphere and Autumn in the S. Hemisphere—varies a small amount each year: the variation is approx. 1 degree—nearly the apparent width of two full moons—in about 71 years, so that, each year, at the same instant, the Sun crosses the Celestial Equator at a slightly different point. Before the Sun again crosses at that particular point and completes the cycle, 25,800 years will elapse.

The astrologers of Antient Egypt, without the assistance of the accurate instruments of modern observers of the Heavens, had measured the obliquity of the ecliptic, had explained the solar and lunar eclipses, and at a very early date were in possession of a knowledge of the previously mentioned Precession of the equinoxes: all this knowledge was in the possession of the priest-astrologers, who acquired, selfishly, a predominant power by silence outside their Order, even on these purely scientific matters. They had an insatiable desire to know everything which could be known, and to give a rational explanation of all they saw in the Heavens: though some of their astronomical theories were founded on insufficient data, and often were extravagant, several of their thinkers had glimmerings of ideas that were not crystallised for 2000 years: they observed and sifted facts which had been handed down from Chaldean and Egyptian observers, and endeavoured to fit them all into one consistent scheme.

The Zodiacal Sign occupied by the Sun in the month of March always has had considerable influence on religious observances. As a result of the precession of the equinoxes, there was a time when the Sun was in the constellation of 'Taurus—the Bull—in March: so that, for some 2000 years, the Bull was considered the most sacred animal: after a lapse of some 2000 years the Sun occupied a position in the constellation Aries the Ram, and the sheep became the sacred animal. Now this would appear to be an antient landmark in F.M., in that the skin of a lamb is used for the Badge or Apron of the M.M.

It is interesting to note that on opening a tomb of one of the Kings of Ur of the Chaldees, Sir Leonard Woolley director of an expedition to Mesopotamia in 1926-1927—excavated two gold statues of a ram—these statues depicted a ram caught in a thicket: this tomb was dated about 3500 B.C.

Referring once again to the 1 degree T.B. "... the Sun—the G. of G.—rises in the East and sets in the West." It will be noticed that the Sun dominates F.M. to a great extent and our L's. are oriented to mark its rising and setting. Most units of our planetry system revolve in a clock-wise direction—e.g., the sun revolves on its axis

once in nearly 28 days—the moon circles the earth once in 28 days— the moon revolves on its axis once in 28 days—each in a clockwise direction. The movements of Brethren while in the L. should, and do, simulate the sun's apparent movement round the earth, from E. by S. to W. and back by N. to E. — i.e., in a clockwise direction. W.M., I should like to point out to the Brethren that in the S. Hemisphere the course of the sun is from E. northwards to the W. and not by way of S. As sun worship originated in mystical Egypt, in the N. Hemisphere, where learning also originated and from whence it spread, naturally to the Egyptian priests and philosophers of Greece, the sun would make its daily journey from E. to W. by way of S., and to them, this would be in a clockwise direction. The Brethren perambulate the L in a clockwise direction, as stated, and only the D.C. is privileged to break this rule in order to facilitate the carrying out of his many duties, and even he, if loyal to his tradition, will not unnecessarily exercise this privilege. Perambulation round the L. should stimulate the Sun's apparent movement in another respect besides direction. It is the custom in L.s' to make rt.-angle turns at each corner: now, the movements of the heavenly bodies are NEVER RECTANGULAR: they may be circular, elliptical, or spiral, BUT—never, never rectangular.

The explanation of the 1 degree T.B. teaches us that our L's. are supported by three great P \ldots 's—they are called W.S. and B., are emblematic of Divine Attributes, and, further, represent S.K. of I., H.K. of T., and H.A.

The Sun by his Light is the emblem of Divine Wisdom —represented by K.S.

by his Heat the emblem of Divine Strength. —represented by H.K. of T.

and by his Creative Power the emblem of Divine Beauty-represented by H.A.

Our Sun, the great symbol of the Almighty Power we call the Creator or T.G.A.O.T.U., daily dispenses light and lustre and is all important to our health and well-being here on earth: nevertheless, to an observer in the far distance of space, our sun would appear just another point of light, another of the myriad stars which beautify the night sky.

In the 2 degree the S. of P. took its rise when spake Joshua—"Sun, stand thou still upon Gibeon and thou, moon, in the valley of Ajalon." And the sun stood still and the moon stayed, until the people had avenged themselves upon their enemies. So the sun stood still in the midst of Heaven and hasted not to go down about a whole day: and there was no day like that before it or after it, that the Lord hearkened unto the voice of man. This amazing occurrence is recorded in the V.S.L.—Joshua, chap. 10, verses 12, 13, 14. Recently W. Bro. C. F. Thomas read an interesting paper including an account of "Joshua's Long Day."

(Note.—At this point E.A.'s and F.C.'s retired temporarily).

In the charge after raising we "lift our eyes to that bright morning star, whose rising brings peace and tranquility to the faithful and obedient of the human race." To-day there is no one who can say definitely what appeared as a Sign to the Three Wise Men. There are many interesting theories, covering a wide range of possibilities. Among these, there is a suggestion that it may have been a supernova that appeared in the night sky and gradually increased in brilliancy until eventually it outshone every star in the heavens.

Again, it has been suggested that the Sign was not a star, but a most unusual configuration of the planets Mars, Jupiter and Saturn, forming a triangle. We are told that the Magi were thoroughly familiar with the stars and constellations and that they were familiar with the planets as evening and morning "stars": the bright planet Venus, at certain times of the year, is well-known as a "bright morning star": the early Greeks considered the planet Venus to be two different heavenly bodies; but Pythagoras, of whom we know so little and of whom we should like to know more, pointed out that, in reality, Venus was but one planet. Venus at times may be so bright that it may be seen in full daylight in a clear sky. John Fellows informs us that Pythagoras was raised to the sub- deg. of M.M.

The brightest star in the night sky—Sirius—could have been this "bright morning star." A festival was held, in Egypt, on the rising of Sirius—which about 4000 years ago appeared in the morning sky about mid-June. The rising of Sirius heralded the flooding of the River Nile—the commencement of the Egyptian

Agricultural year and was all important to the Egyptians in that the flooding of the Nile brought life and fertility to the Nile Valley.

Just before the inundation, residents retired to higher ground, and the rising of this bright star just before daybreak was noted as a mark for which everyone kept a watchful eye: the star became a warning of flood danger, whereupon the Antient Egyptians called this star Thaaut— the Dog, also Anubis—the barker or the monitor. The Hebrews called it Sihor, the Greeks, Seiros: and in Latin it was called Sirius. Today we call it Sirius—the Dog-star.

John Fellows considers the P. within a C. as follows:—the point in the centre represents the Supreme Being: the circle indicates the annual circuit of the Sun: the parallel lines mark out the solstices within which that circuit is limited. The MM., by subjecting himself to due bounds, in imitation of that glorious luminary, will not wander from the path of Duty

Truly, astronomy may be included as one of the Liberal Arts and Sciences, and a further Masonic definition is the Contemplation and measurement of the Sun, Moon and Heavenly Bodies: it is that science which inspires the contemplative mind to soar aloft and read in the Heavens, the Wisdom, Strength and Beauty of the Great Creator. How nobly eloquent of the DEITY is the celestial hemisphere, spangled with the most magnificent heralds of His Infinite Glory.

In conclusion, allow me to thank you, W.M. and B., for your patient and courteous hearing; may I express the hope that what I have had the honour and privilege of bringing before you, has arrested your attention and awakened an interest in the subject, and that it may stimulate many thoughts of the Wondrous Works of T.G.A.O.T.U.

May the stars and planets long continue to draw man's eyes and thoughts to the sky, thus revealing a boundless and. inexhaustible source of intellectual pleasure, and teach us to bend with humility and resignation to the will of the Almighty Creator.

S.M.I.B.

(Note-Calculations and figures given in this paper are approximate.)

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