ASTRONOMY - MASONIC ASTRONOMERS AND EXPLORERS

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Note: The names of known Masons are shown bold. Quotes are in italics

Introduction

In all three degrees of craft Masonry there are references to the importance of the study of the seven liberal arts and sciences. We are taught to make a daily advancement in our Masonic knowledge and, to assist us to do so, the seven liberal arts and sciences are defined as Grammar, Rhetoric, Logic, Arithmetic, Geometry, Music and Astronomy.

This paper on astronomy focuses on the relevance of this science in our lives and in our Freemasonry today. It is illustrated by reference to famous Masonic astronomers and explorers. Thus the paper is not only intended to assist us in furthering our knowledge and understanding of the world around us but also to understand how some very famous Masons contributed to the way we live today. We are also interested in the extent to which Freemasonry interested them and stimulated their lives.

Since time immemorial astronomy has been fundamental in helping us to find our location and direction. It provided the basis for telling the time and the period of the year. The sun was worshipped as the giver of life and today we recognise that its light is still an essential basis for photosynthesis in plant life. The moon helps us determine the tides for fishing and marine safety. The stars provided the symbolism for the mysticism of astrology and are today still being studies for evidence of life and our earliest beginnings.

The sun, the moon and the stars have constant reference in our Masonic rituals today. How relevant are these references today? How should we look to these symbols for current meaning and guidance?

History

The history of astronomy has three main areas of focus -The motion of the sun, moon, planets and stars, their physical characteristics, and the size and structure of the whole universe.

The Motions of the Sun, Moon and the Planets

The earliest civilizations studied the motions of the sun and planets in order to determine the calendar and when to plant or harvest crops, the season usually being accompanied by the earliest religious festivals and feasts.

The basic celestial movement patterns are that the Sun moves westward in the course of a day, and the stars and the visible planets did the same at night. However, the sun moved higher in the heavens and rose and set in different places at different times (seasons) so that it was not a reliable means of telling the direction of east or west. Similarly, the path of the sun moved eastward about one degree a day against the background of the stars, until in the course of a year it had completely traversed 360 degrees.

The planets also moved within 8 degrees of the Sun's apparent annual path (the ecliptic), but at times they made puzzling reversals in the sky. By comparison, the Moon moved across the ecliptic in about 27 1/3 days and went through several phases. The earliest civilizations did not realize that these observations were due, in part, to the motion of the Earth itself.

Stonehenge

The earliest evidence of a scientific interest in astronomy is found in sites like Stonehenge in England. As early as 3,000 BC, the collection of massive stones at Stonehenge functioned as an ancient observatory, where priests followed the annual motion of the Sun each morning along the horizon in order to determine the beginning of the seasons. By about 2,500 BC, Stonehenge may have been used to predict eclipses of the Moon.

The Egyptians

It is claimed that the ability to predict eclipses and thus strengthen the religious festivals was known to the Egyptians in 1,500 BC so that Moses' 9th plague (that of darkness) at the time of the Egyptian Captivity under Ramses II has been explained as an eclipse. However, among the Egyptians the systematic study of celestial motions was believed to be limited to the connection of the flooding of the Nile with the first visible rising of the star Sirius and they dids not progress much further than this. Similarly, the ancient Chinese did not systematically attempt to determine celestial motions.

The Babylonians

Astronomy reached its first great heights among the Babylonians. This occurred during the period up to that of King Nebuchadnezzar, the famous builder of the hanging gardens and temples of Babylon and who ordered Solomon's temple to be destroyed and then through the reigns of the Persian Kings Cyrus the Great and Darius who permitted Zerrabubel to lead the Jewish exodus from the Babylonian captivity and to rebuild the temple at Jerusalem in about 500 BC.

The Babylonians developed a calendar based on the motion of the Sun and the phases of the Moon and then developed means to predict the precise time the new crescent Moon first became visible thus defining the new lunar month. The Babylonians were able to predict this event within an accuracy of a few minutes of time by compiling precise observational tables that revealed smaller variations in the velocity of the Sun and of the Moon than ever before measured. These variations were analysed by noting how the variations regularly fluctuated with time. In the same way they predicted lunar and solar eclipses.

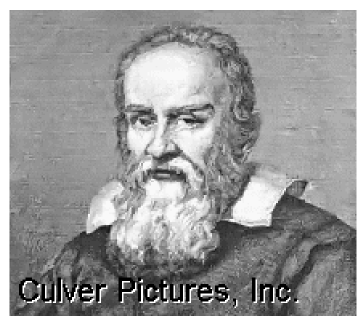
The Greeks

The Greeks, in about 400-350 BC, used a geometrical approach to explain the same celestial motions. It was assumed that each planet is attached to one of a group of connected concentric spheres centered on the Earth, and that each planet rotates on differently oriented axes to produce the observed motion. This explanatory method was not upset until Kepler replaced the circle with the ellipse in 1609.

The Greek Apollonius of Perga, in about 200 BC, noted that the annual motion of the Sun can be approximated by a circle with the Earth slightly off-center, or eccentric, thus accounting for the observed variation in speed over a year. Similarly, the Moon traced an eccentric circle in a period of 27 1/3 days. Ptolemy, in about 100 AD (just after the third Temple at Jerusalem, built by King Herod, was destroyed) compiled all the knowledge of Greek astronomy and developed the final lunar and planetary theories based on the Greek 'circles'. Ptolemy was able to predict the place of the Moon within 10 feet of arc in the sky and these predictions were in good agreement with the accuracy of observations made with the instruments used at that time.

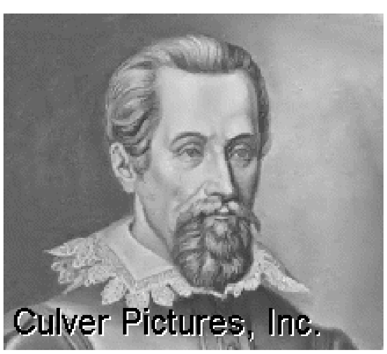
Copernicus's held that the earth rotates daily on its axis and revolves yearly around the sun. He argued, furthermore, that the planets also circle the sun, and that the earth precesses on its axis (wobbles like a top) as it rotates. It accounted for the daily and yearly motion of the sun and stars, and it neatly explained the apparent retrograde motion of Mars, Jupiter, and Saturn and the fact that Mercury and Venus never move more than a certain distance from the sun.

But the price of accepting the concept of a moving earth was too high for most 16th-century readers who understood Copernicus's claims. In addition, Copernicus's calculations of astronomical positions were not more accurate than those of his predecessors. As a result, many ignored or rejected his work.



Galileo Galilei's main contributions were, in astronomy, the use of the telescope in observation and the discovery of sunspots, lunar mountains and valleys, the four largest satellites of Jupiter, and the phases of Venus. He invented a method of using the location of the moons of Venus for determining longitude.

In physics, he discovered the laws of falling bodies and the motions of projectiles. Galileo is remembered principally for his stand for scientific thought against the restrictions of authority. He was tried and imprisoned by the inquisition in 1633. Despite this persecution, some Jesuit philosophers remained secret followers of Copernicus and, by the late 17th century, most major thinkers in England, France, the Netherlands, and Denmark were Copernicans.



The German astronomer Johannes Kepler demonstrated the validity of Copernicus theory, directly associating the Sun with the physical cause of planetary motions. At issue for Kepler was a mere 8 feet discrepancy between theory and observation for the position of the planet Mars.

This degree of accuracy would have delighted Ptolemy or Copernicus, but it was unacceptable in light of the observations of the Danish astronomer Tycho Brahe with a variety of newly constructed instruments accurate to within 1 to 4 feet.

One of these was a twelve foot astrolabe. This new scale of accuracy revolutionized astronomy when Kepler announced that Mars and the other planets must move in elliptical orbits, readily predictable by the laws of planetary motion that he proceeded to expound. Only by using an ellipse could the predictions compare with the latest, most accurate observations.

Kepler's laws and the Copernican theory reached their ultimate verification with the enunciation by **Sir Isaac Newton** of the laws of universal gravitation in 1687. In these laws, the Sun was assigned as the physical cause of planetary motion. During the 18th century, the implications of gravitational astronomy were recognized and analyzed by able mathematicians, notably Jean d'Alembert, Alexis Clairaut, Leonhard Euler, **Joseph Lagrange**, and **Pierre Laplace**. The science of Celestial Mechanics was born and the goal of accurate prediction was finally realized.

Movement of the stars

During all of this discussion the stars had been regarded as fixed. While working on his catalogue of 850 stars, however, Hipparchus had already recognized the phenomenon known as the Precession of the Equinoxes, an apparent slight change in the positions of stars over a period of hundreds of years caused by a wobble in the Earth's motion. In the 18th century, Edmond Halley determined that the stars had their own motion that was detectable even over a period of a few years.

The Physical nature of the Celestial Bodies

The stars had also been regarded as being mere points of light. But Galileo published the results of his observations with a new telescope that the Moon was a mountainous body not unlike the face of the Earth. Galileo's further discovery of the moons of Jupiter and the phases of Venus was more evidence that the planets had Earth-like characteristics.

With the invention of Spectroscopy in the 1860s a powerful new tool was given to the astronomer. The ability to determine the chemical composition of planetary atmospheres and even of the stars now became possible. The means were at hand to determine the temperature, composition, age, and structure of the Sun and to compare this data with that of the other stars, which were now for the first time proved to be other suns. This led to a discussion on the internal constitution and evolution of stars and fueled the controversy over the possible existence of extra-terrestial life not only in our solar system, but throughout a universe of other possible solar systems.

The Structure of the Universe

Observations of stellar parallax (apparent change in the direction of a star) when measured from opposite sides of the Earth's orbit, demonstrated the necessity of acknowledging the enormous size of the universe. In 1750 the English theologian and astronomer **Thomas Wright** sought to explain the brilliantly luminous band of the Milky Way as a collection of stars that extended further in the direction of the band than in other directions. With improved instrumentation Friedrich Bessel, Wilhelm Struve, and Thomas Henderson (1798-1844) in 1838 succeeded in measuring the first stellar distances. An annual parallactic shift of.31 inches in the position of the star 61 Cygni implied a distance equivalent to 590,000 times that of the Earth from the Sun.

A major task of 19th-century astronomers was the compilation of Astronomical Catalogue and Atlases containing the precise magnitudes, positions, and motions of stars. The work of Friedrich Argelander, David Gill, and J. C. Kapteyn is especially notable in this regard. Building on the astronomical catalogs of **James Bradley**, G. F. Arthur von Auwers (1838-1915), and Lewis Boss (1846-1912) exploiting the new field of statistical astronomy, applied statistical methods of distance determination to find an ellipsoidal shape for the system of stars. In 1904 Kapteyn found that the stars streamed in two directions. Only in 1927 did J. H. Oort, working on the basis of the studies of Bertil Lindblad, determine that Kapteyn's observational data could be accounted for if the galaxy were assumed to be rotating. In a cosmological shift comparable to the Copernican revolution four centuries before, the Earth's solar system was found to lie not at the center of the Galaxy but, rather, many thousands of light-years from the Galaxy's center.

Other Galaxies

The question of whether or not the Galaxy constituted the entirety of the universe was settled when E. P. Hubble demonstrated that Andromeda and many other nebulae are far outside the Milky Way. Thus the universe was found to consist of a large number of galaxies, spread like islands through infinite space.

Such was the progress of astronomy from the time of the Babylonian observations of planetary motions to within a few degrees' accuracy, to the Greek determinations of positions within a few minutes of arc, to the 19th-century measurements of parallax and proper motions in fractions of a second of arc. The concern of astronomers evolved from the determination of apparent motions to the observation of planetary surfaces and ultimately to the measurement of the motions of the stars and galaxies.

Working tools of the navigator

Astrolabe

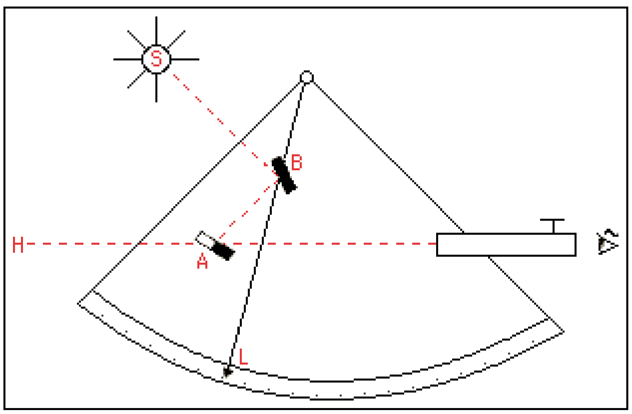
The astrolabe was one of the first instruments used for measuring the positions of heavenly bodies. It consists of a circle or section of a circle, marked off in degrees, with a movable arm pivoted at the center of the circle. When the zero point on the circle has been oriented with the horizon, the altitude or azimuth of any celestial object can be measured by sighting along the arm. Until the astrolabe was superseded by the sextant during the 18th century, it was the principal instrument used by navigators.

Sextant

The Sextant was an optical instrument used for the measurement of angular distance between any two objects. The chief use of the sextant is in navigation: The sextant enables a navigator to measure the angular elevation of the sun and other celestial bodies, and from this information the navigator's latitude and longitude can be determined.

The operation of the sextant depends upon superimposition of the images of the two objects whose distance is being measured. This is achieved by means of an optical system consisting of a telescope and two mirrors, one fixed and one movable.

In the diagram shown below, the telescope T is mounted in a fixed position on the body of the instrument, pointing toward the mirror A. The top half of this mirror is transparent, and the bottom half is silvered. A second mirror, mirror B, is angled above mirror A. An observer looking through the telescope toward the horizon H sees the horizon through the unsilvered portion of mirror A and at the same time sees the image of the star or the sun S on the silvered portion of mirror A, as re-reflected from mirror B above. By moving B by manipulating the lever L, the image of the star is brought into coincidence with the image of the horizon. The angular distance between the star and the horizon can then be read on a scale, which is engraved on the body of the sextant. This scale is an arc of one-sixth of a circle, or 60 degrees. Each degree on the scale of the sextant is equivalent to two degrees of angular distance between the objects actually observed because the light from S reflects off two mirrors.



A friend of mine was the navigator on "G-for-George" the Lancaster bomber which was flown from Britain to Australia during World War 2. Bob Neilson, later well-known as Commissioner of Transport in New South Wales, used a sextant to take star shots at night as his primary navigation instrument across the Pacific.

Magnetic Compass

The magnetic compass is an old Chinese invention, probably first made in China during the Qin dynasty (221-206 B.C.). Someone noticed that lodestones (a mineral composed of an iron oxide) aligns itself in a north-south direction, leading to the first compasses. Magnetized needles used as direction pointers (instead of original spoon-shaped lodestones) appeared in the 8th century AD, again in China, and between 850 and 1050 they seem to have become common as navigational devices on ships. The first person recorded to have used the compass as a navigational aid was Zheng He (1371-1435), from the Yunnan province in China, who made seven ocean voyages between 1405 and 1433.

The Star Charts

Measuring longitude by the Lunar distance method led to the accumulation of Star Charts, which detailed the detailed position of stars throughout the year. Royal Astronomer **Revd James Bradley**, after 10 years work accumulating star charting material of inestimable value to astronomy, was awarded the Copley Medal, the Royal Societies highest award.

Chronometers

The chronometer replaced the Lunar distance method of detecting longitude by providing a very accurate time from a home port. Measuring the apex of the sun's daily transit to measure noon, then comparing this with the time at the home port, enabled a simple calculation for the current longitude.

The first successful chronometer was constructed in 1761 by English horologist John Harrison and Captain Cook carried a copy of his H-4 on his second voyage.

Geodetic Surveying

\The accuracy of the chronometer and the construction of the star charts were essential building blocks for accurately measuring one's position on earth. In my University days, to locate your position on earth, you spent some time setting a chronometer against the radio 'beeps' announcing the time - the beginning of the last beep being the target time on which the chronometer was calibrated. You then set up a theodolite, equipped with an angled eyepiece, and noted accurately the horizontal and vertical settings and the time when a known star passed across the cross-hairs. This observation was carried out at least three times on three different stars. Then, looking up the star charts to find where those stars were in relation to Greenwich, meant that we could calculate our position on earth to within about 20 feet by calculating our latitude and longitude. The calculations took several hours using 7-figure log tables.

Global Positioning on Earth

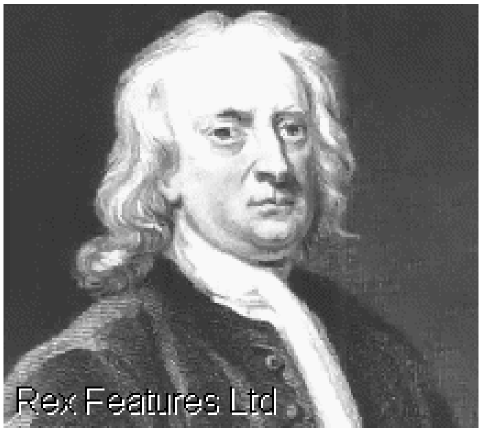
Today we use Global Positioning Systems, which almost instantaneously provides our position with similar accuracy based on readings from man-made satellites and with which almost everyone is familiar.

Famous Freemason-astronomers

At University, when I had to struggle with the mathematics of **Newton**ian mathematics, Euler functions, **Laplace** transforms, **Lagrange** multipliers, Fourier series and Bessel functions, it might have been more interesting if we had been told more about the problems that these brilliant men were trying to solve. I also probably would have been more interested if I knew some of the most difficult ones were Freemasons. In addition to those whose career is summarized below, many Masonic astronomers were elected members of the Royal Society. They included:-

- **George Bishop** of St Albans Lodge,
- **Revd James Bradley** of St George and Cornerstone Lodge,
- **Revd Fearon Fallows** of Cambridge New Lodge,
- **James Glaisher** of Brittanic Lodge,
- **Benjamin Gould** of St Andrews Lodge in Boston,
- **John Machin** of Lodge # 18, and
- **George Parker** of Lodge # 29.

In many cases they were prompted and inspired by anomalies they observed, either in a logical or philosophical sense or in their actual observations. The philosophical anomalies required more rigorous mathematics.



Sir Isaac Newton, the culminating figure in the scientific revolution of the 17th century, was born on Jan. 4, 1643 in Woolsthorpe, England. Perhaps the greatest scientific genius of all time, **Newton** made fundamental contributions to every major area of scientific and mathematical concern to his generation.

He is generally credited with having joined Freemasonry but the details of his initiation are not known.

Even though instruction at Cambridge was still dominated by the philosophy of Aristotle, some freedom of study was permitted in the student's third year. **Newton** immersed himself in the new mechanical philosophy of Descartes, Gassendi, and Boyle; in the new algebra and analytical geometry of Vieta, Descartes, and Wallis; and in the mechanics and Copernican astronomy of Galileo. At this stage **Newton** showed no great talent. His scientific genius emerged suddenly when the plague closed the University in the summer of 1665 and he had to return to Lincolnshire. There, within 18 months he began revolutionary advances in mathematics, optics, physics, and astronomy.

During the plague years **Newton** laid the foundation for elementary differential and integral Calculus. His crucial insight was that the integration of a function (or finding the area under its curve) is merely the inverse procedure to differentiating it (or finding the slope of the curve at any point). Taking differentiation as the basic operation, **Newton** produced simple analytical methods that unified a host of disparate techniques previously developed on a piecemeal basis to deal with such problems as finding areas, tangents, the lengths of curves, and their maxima and minima. Isaac Barrow, a Fellow of Trinity College and Professor of Mathematics in the University, was so impressed by **Newton**'s achievement that when he resigned his chair in 1669, he recommended that the 27-year-old Newton take his place.

He discovered that white light was a mixture of different colours of the spectrum but **Newton'**s greatest achievement was his work in physics and the theory of universal gravitation. The story that he discovered universal gravitation in 1666 while watching an apple fall from a tree in his garden is a myth. **Newton**'s great insight of 1666 was to imagine that the Earth's gravity extended to the Moon, counterbalancing its centrifugal force. From his law of centrifugal force and Kepler's third law of planetary motion, **Newton** deduced that the centrifugal (and hence centripetal) force of the Moon or of any planet must decrease as the inverse square of its distance from the center of its motion.

In 1684 the young astronomer Edmond Halley persuaded **Newton** to compose a full-length treatment of his new physics and its application to astronomy. After 18 months of sustained effort, Newton published (1687) The Mathematical Principles of Natural Philosophy), or

Principia, as it is universally known. By common consent the Principia is the greatest scientific book ever written.

With the publication of the Principia, Newton was recognized as the leading natural philosopher of the age, but his creative career was effectively over. **Newton** died in London on Mar. 31, 1727, having single-handedly completed the scientific revolution and moulded much of the content and the image of modern science.

Joseph de LALANDE (1732-1807) was a French astronomer widely known for his improvement of Halley's astronomical tables and for his popular books on astronomy. He published the first significant catalogue of stars listing nearly 50,000.

He became involved in many astronomical controversies and took an active part in scientific and literary organisations. In 1769 he instituted the Lodge Des Sciences and was a founder of Lodge Les Neuf Soeurs at Paris.

The Frenchman **Pierre de Laplace** (1749-1827) is best known for his nebular hypothesis of the origin of the solar system, which viewed the solar system as originating from the contracting and cooling of a large, flattened, and slowly rotating cloud of incandescent gas.

He also provided a stronger mathematical basis for Newtonian thinking and his 5-volume '*Treatise on Celestial Mechanics*' was the culmination of over a century of work devoted to the mathematical explanation, on the basis of gravitational theory, of the motions of the bodies of the solar system. He held Grand rank in the Grand Orient of France

The German-born American physicist **Albert Michelson** (1852-1931), recipient of the 1907 Nobel Prize for physics, performed historic experiments in the 1880s that attempted to measure the motion of the Earth through space with a delicate Interferometer. Their negative result was one of the factors that led to the replacement of Newtonian concepts of time and space by Einstein's Relativity theory.

Michelson defined the international metre in terms of a standard wavelength, greatly refined the value for the velocity of light, and invented the modern interferometer, the chevron diffraction grating, and numerous instruments for the U.S. Navy, such as the range finder. He was initiated in Washington Lodge No.21, New York City, in 1874.

The British physicist **Sir Edward APPLETON**, (1892-1965), won the 1947 Nobel Prize for physics for his discovery that the upper layer of the ionosphere, called the 'Appleton layer', reflects radio waves. This established the potential for long distance radio communications and laid the basic foundation for much of our current television, radio, mobile telephone and satellite communications systems.

Appleton served as a professor of physics at King's College, University of London, taught at Cambridge University, and helped in the development of radar and the atomic bomb. He was initiated in 1922 in Isaac Newton Lodge in Cambridge and was knighted in 1941.

Masonic Explorers of Australia

Many were motivated by the challenge of geographical exploration. Both Britain and France were colonising. They were seeking new sources for wealth and trade and had seen the successes of Holland and Spain. Britain was also looking for colonies to reduce pressure on the prison system at home.

The **Comte de La Perouse** was probably the first French Freemason to explore Australian waters in the French Naval Vessel 'L'Astrolab' which reached Botany Bay in 1788 but was wrecked soon after. Chevalier d' Entrecasteaux was assigned in 1791 to lead the search for him but was unsuccessful. **Baudin** went seeking him and was charged by the French Government with mapping Australia's Southern coastline. His meeting with **Matthew Flinders** at Encounter Bay in South Australian waters led to the first Masonic meeting in Australia for which a record exists today.

Matthew Flinders was one of the most successful navigators and cartographers of his age. In a career that spanned just over twenty years, he sailed with Captain William Bligh, circumnavigated Australia and encouraged the use of that name for the continent.

He was one of the first to use the new accurate chronometers and had two with him on his voyage with Hunter. By this time the sextant was in common use and Flinders charts were all compiled with the use of these instruments.

Flinders, after his arrival back in England, had spent some years preparing his navigation charts of Australian waters some of which were until recently still in use. He had almost completed his work when a French paper was published explaining how the difference between True and Magnetic North could be computed. Flinders had spent many hours compensating for ship's magnetism and its effect on the compass but he now had to recalculate all of his charts to allow for this variation. I stand in absolute awe of his courage, perseverance and mathematical skills.

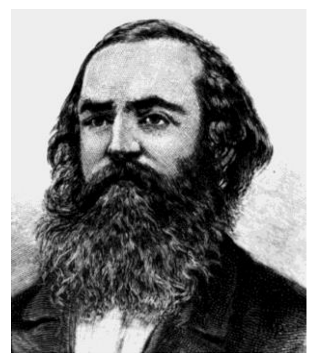
Lieutenant John Oxley RN was appointed Surveyor-General of NSW in 1811 and with **George Evans**, botanist, traced the Lachlan, Maccquarie, Hastings and Clarence or Tweed rivers.

Was once engaged to **John MacArthur's** daughter Elizabeth but denied being associated with **MacArthur** in the Bligh rebellion.

Hamilton Hume was the first Australian born explorer.

Along with Hovell in 1824, Hume was part of an expedition that first took an overland route from Sydney to Port Phillip near the site of present day Melbourne. Hume and Hovell each received grants of 1,200 acres (4.9 km^2) of land as a reward for this exploration.

Along with Sturt in 1828, he was part of an expedition of the first Europeans to discover the Darling River.



John McDougall Stuart was a Scottish surveyor and explorer who explored much of South Australia including the Flinders Ranges and as far west as Streaky Bay.

Stuart's greatest achievement was the south-north crossing of the continent and back in 1861-62 reaching the Indian Ocean on 24 July 1862.

Freemasons in space

Australian aviation pioneers **Sir Charles Kingsford Smith** and **Lawrence Hargraves** were both Freemasons and would have wondered as I have, when flying and aircraft, what it would be like to break free of Newton's laws and have the power to soar to the moon. Indeed, who has not wondered, when looking at the moon or the planets, what it would be like to be there?

Neil Armstrong commanded the Apollo 11 space mission and, with **Edwin Aldrin**, the pilot of the lunar module 'Eagle', landed on the moon and became the first person to walk on its surface on July 20th 1969. **'Buzz' Aldrin** followed him and they set up basic science experiments and collected samples of the Moon's surface to return to earth.

One wonders what Galileo or **Newton** or **Laplace** would have thought and what pride they might have felt in their contribution to that voyage of discovery. What would **Appleton** have thought of the live TV coverage we saw of that event.

In addition to his achievements as an astronaut, **Aldrin's** doctoral thesis on orbital mechanics and rendezvous laid the foundation for flight techniques that made the lunar landing possible.

Aldrin was an US Air Force officer, who flew in the Korean War. He earned a doctorate of science in astronautics from the Massachusetts Institute of Technology in 1963 and later that year became an astronaut. He was initiated in Montclair Lodge No. 144 New Jersey.

Their way to the moon was paved by other Masonic Astronauts. **Glenn, Cooper and Grissom** were among the first seven chosen as astronauts in 1959.

* **John GLENN** was, in 1962, the first American to orbit the Earth. Glenn became a Marine Corps pilot in 1943 and flew in combat in World War II and the Korean War. In 1957 he became the first man to fly faster than sound from New York to Los Angeles, covering the distance in 3 hours, 23 minutes. He is a member of Concord Lodge No. 688 at Concord, Ohio.

Glenn was elected to the U.S. Senate in 1974 as a Democrat from Ohio. He won re-election in 1980 and 1986. A moderate, he made an unsuccessful bid for the 1984 Democratic presidential nomination. He won Senate re-election again in 1992 and 1998.

Leroy Cooper Jr., a member of Carbondale Lodge No. 82, Colorado, was the fourth American to orbit the Earth. He joined the US Air Force in 1949, completed a degree in aeronautical engineering and was chosen as one of America's first seven astronauts. He flew several record-breaking flights before retiring to become a vice-president for research and development of Walt Disney Productions.

His fellow Astronaut-pioneer and Brother Mason **Virgil Grissom** was the second American in space but died in the first fatal U.S. space-program accident. His career illustrates the risks these space pioneers undertook as he had previously been involved in the suborbital flight into space aboard Liberty Bell 7 (1961) during recovery of which the hatch accidentally blew off, causing the craft to sink. **Grissom** jumped overboard and nearly drowned. He was a member of Mitchell Lodge No. 228, in Indiana.

Aldrin was not the only Freemason to walk on the moon. **James Irwin** piloted the Apollo 15 mission which made the fourth landing on the moon and **Irwin** was the eighth man to walk on its surface, spending nearly 3 days there with David Scott. **Irwin's** autobiography *'To Rule the Night'* was published in 1973 and he died in 1991

Conclusions

The science of astronomy teaches us to find our place on earth, to ascertain with precision the direction we are to take and to navigate our passage along the correct path. There have been vast improvements in our understanding of the movements of the stellar system and in the working tools of the navigator - from the astrolabe to the Global Positioning System - which have enabled man to navigate to places so far from our homes that they fill us with wonder.

Let us not lose that sense of wonder at God's creation as we go about our daily lives.