

Development of Astronomy.

Graduating Thesis of

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Astronomy is both a new and an old science. It is old in the sense that it has been studied in ages gone by, by the oldest nations that ever existed, as the Chaldeans, Romans, Egyptians, and many others, without regard as to the correctness of the beliefs and theories of those times; though to them it was satisfactory, just as much so, as we believe our theory of today is true.

It is a new science in the sense that we discard the beliefs of the ancients and cling to the present belief or theory, which has been adopted at a comparatively recent date. But in a study of the development of this subject we must take into consideration the ancient Astronomy and see how it is related to modern Astronomy and how modern Astronomy grew out of it.

Astronomy originated under three different heads, each having a separate origin, but all depending upon each other and forming one science.

The first kind that originated is "Observational" or "Practical" Astronomy. It

relates to the facts of all astronomical phenomena, without regard to the cause of them, and was first practiced and studied by the early Chaldeans and Chinese.

The second is called "Theoretical" or "Gravitational" Astronomy. It deals with the cause of all phenomena with a view of finding the why and wherefore of it. Sir Issac Newton was the first and probably the greatest worker in this line of the science.

The third is "Physical and Descriptive Astronomy." It depends wholly upon the telescope and other astronomical instruments for its value. It is the most recent form of the science and seeks to know what the heavenly bodies are, what their structure is, how they are related, etc. Galileo was the originator of it, but Herschell was the first to give it prominence which the whole progress of science has served to confirm and render more exclusive. Most of the progress of Astronomy in recent years has been in this line.

The early beginnings of Astronomy is of some interest and will be given in a somewhat condensed form, for nearly all are only the revelations of certain persons who claimed to be able to communicate with a Divine Being. The dates have been disputed, as to who the first Astronomers were, but they will be given in the order given by the best authorities.

The first people that originated or made a study of it were the Acadians who were a tribe of the Babylonians. We have nothing with which to judge their work, except a few astronomical words which they adopted and which remain in the languages today. Later the Semetic Babylonians took up the work and made some advancement in it and most of the credit is therefore given to them. As an evidence of their work we have a work called, "The Observations of Bell" which is supposed to have been written about 1700 B.C. and was compiled for a Babylonian King. It is not written but only the impressions

made upon stone remain.

The Egyptians it is claimed by some were the originators of Astronomy, but there is no record of it and we therefore consider it not true. They however made some valuable observations and believed in a solar system which they originated, but which was very crude.

Their place for observations being situated so as to make it one of the best in the world, helped them in their work. One good authority says that their sphinxes, rams, and ornaments of various kinds, had a plain astronomical significance and that each represented a sign of the zodiac or something related to the heavenly bodies.

Chinese Astronomy is founded entirely upon its own basis. With them it was a governmental matter and strict laws were enforced on the state astronomers. Their work like all other ancient work in this line was very crude. But they made some good observations of the North Star and found that it did not change its position. They also recorded

the first of a series of eclipses at a very early date.

The Jews made observations of the motions of the stars and by it calculated the length of a year very accurately. This is sufficient proof that they some progress in it and had a good knowledge of it in certain lines. Their dates, however, are beyond question, untrue. They claim to have made observations many hundred years before any other people but it is not shown by any record.

Among all the nations except the Chinese where it was political and the Greeks where it was speculative, Astronomy has been intimately mixed and associated with religious ideas. The two sciences, Astronomy and Theology have risen together. The people believed that all phenomena of the stars etc, were the result of the action of a divine or higher being.

Thus, as they were all worshippers of some Being and advanced in this line, they also studied Astronomy as related to the action of the stars, with a view to understand them and know more about

the beings that they worshipped. In this way Astronomy advanced slowly, very slowly, for many hundred years, with only now and then a man appearing who made Astronomy his work, and who stands out so much brighter than his fellow men. Such men do not appear untill one or two hundred years B.C. except a few minor ones who are not worthy of mention. We wish to take up next, a short sketch of the work of the most important of the men who were heroes of their time on this subject.

Among the greatest and most widely known of the astronomers of his time was Hipparchus who was called the "Father of Astronomy." He lived on the island of Rhodes in the Mediterranean Sea about 150 B.C. He determined the length of a year to within four minutes of its true length. He found that the distance from the earth to the sun varies throughout the year. He made the first catalogue of the stars, fixing their position for over a thousand of them, although he did not have them wholly

right and his system of the sun and planets was also wrong.

Ptolemy lived at Alexandria in Egypt about 150 A.D. He collected the work of other astronomers and combining it with his own works wrote one great work called, "Almagest" which was the only authority over the whole world for fourteen-hundred years. His solar system differed but little from other systems of his time and was in brief as follows: the earth is the center of the universe: the earth is a sphere, all the other heavenly bodies revolve about the earth once every twenty-four hours. This theory was the accepted theory everywhere until the 16th century.

Thus for fourteen-hundred years, very little was done for the advancement of this important science. The Ptolemaic system was thought to be true just as much as we believe that the Copernican system is correct. The standstill or rather the small advancement was due partly to the fact that no instruments yet existed at that time. But at the end of

~~Here~~ this time, one bright star shines out like Jupiter in its brightest, and astonished the world with his theory. Indeed he was first thought to be insane by the people and his views were denounced both by the people and by the Church. This man was Copernicus who was born in Prussia in 1473 and died in 1543. He was dissatisfied with the geocentric theory and set to work to disprove it. The result was that he soon set forth his own theory which is the accepted theory to this date. He wrote a book called, "The Revolution of the Heavenly Bodies" in which he set forth his theory and tried to prove it. He finished it in 1530 but owing to the great opposition that it met, it was not published until 1543, the year in which he died. Thus the beginning of Modern Astronomy dates from about 1543.

Bruno was the next person to uphold the Copernican Theory and lived a little later than Copernicus. He undertook to explain the theory and was the first person to teach it in Europe. He

was finally burned alive for upholding this theory.

Galileo was the next Astronomer in chronological order and was also one of the greatest Philosophers the world has ever produced, besides being the greatest Astronomer of his time. He was born in 1564 and died in 1642. He proved the Copernican Theory and was the first man to use the telescope in Astronomy. He invented one that magnified thirty-two times and with it discovered the moons of Jupiter. His teachings were condemned by the Church and in his later life he was cast into prison for his beliefs, and died there.

Kepler at the beginning of the 17th century introduced three laws by which the motions of all the planets and their satellites is interpreted. He spent almost a lifetime on them but finally proved them. They are as follows: I The planets move in ellipses with the sun in one focus. II The radius vector of each planet sweeps over equal areas in equal times. III The squares of the times

of revolutions of two planets are proportional to the cubes of their distances from the sun. It was the general opinion that the sun was exactly in the center of the orbits, but by partly figuring and partly guessing at it he found that they were ellipses and proved it later.

These laws were confirmed and brought forward by Sir Isaac Newton who was born in England in 1642 and died in 1727. This is only a minor part of his work in Astronomy, for he is credited by the discovery of the law of gravitation. The story is familiar to all, how he saw the apple fall and wondered if the same force was not attracting the moon to the earth and if so why it did not fall upon the earth. The law of the centrifugal force of a rotating or revolving body was discovered about this time and the two laws put together explained why the planets keep the same relation to each other and to the sun. He was probably the greatest scientist the world has ever known and his great work "Principia" is said to be one

of the greatest productions of the human intellect. So important is his work that the first half of the eighteenth century is characterized in Astronomy by his work.

In 1738 another Astronomer was born, William Herschell, by name. He early devoted himself to the work and in 1773 hired a small telescope, and after that his life work was set, which was to obtain a "knowledge of the construction of the heavens." In his work he discovered two-thousand-five-hundred nebulae, eight-hundred and six double stars, passed the whole firmament in review several times and discovered the planet Uranus. This is not all his work but simply a generalized statement of it.

Such statements is all that we can make of the son of William Herschell, born in 1792 and Sir John Herschell by name, so extensive was his work. He made some valuable observations ⁱⁿ the same fields that his father worked, i.e., in the northern heavens. Here he discovered many new stars and nebulae

and the work so inspired him that in 1820 he completed an eighteen inch speculum which was to be the chief instrument for his future work. He soon sought new fields for work and taking his family and his instruments, he embarked for Cape Town and landed there in 1824. His intentions were to survey the southern heavens as his father had the northern. His work there is beyond calculation in value to Modern Astronomy. Among his principal observations were one-hundred ninety one of the principle stars which he arranged in tabular form; he described seventeen-hundred and eight nebulae of which over three-hundred were new and discovered in all two thousand one hundred and two stars and gave careful measurements for them. He returned in 1838 to England bringing with him all his work, which was soon published and comprises some of the best work done in Modern Astronomy.

The present theory of planetary evolution, or the "Nebular Hypothesis" first made its appearance in 1796 and was

presented by a French Astronomer named La Place. The theory has been subject to much ridicule but has stood its ground so far. Many other theories have been, and are being advanced but they fail to hold their ground and are lost.

The present century is characterized by its inventions. Among these and holding an important place are the inventions used in Astronomy. Telescopes, Helimeters, Reflectors and scores of other instruments of immense size, value, and magnifying power have been the cause to the a great extent of the vast amount of work in this science in this century. We predict that progress will continue and we will be enabled to tell even if the other planets are inhabited and if so, what state of civilization they are in and probably we will be enabled to establish a system of communication with the people of other worlds.