

A CELESTIAL SPHERE IN A NATURAL HISTORY MUSEUM.

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The Chicago Academy of Sciences has appreciated the increasing interest in astronomy and the difficulty which every one meets in trying to become familiar with even the brighter stars, and more commonly known constellations. Various plans for promoting this study were considered by the Academy. The flat star charts are confusing to the untrained observer, and the globes, on the outside of which stars are sometimes represented, are unsatisfactory.

Through the use of the Celestial Sphere, now in the Academy Museum, it is possible to become familiar with all the constellations that are ever visible in the latitude of Chicago. Few people have had the opportunity of seeing all of these constellations for on a given evening it is possible to see but a few of them and the apparent motion is so slow that it would take hours and hours of careful watching to see all of those visible on a single perfectly clear night.

The stars of the first, second, third, fourth and a selected number of those of the fifth magnitude visible from the altitude of Chicago are represented in the Sphere, and the total number is 692. In addition to the fixed stars, four planets, Venus, Mars, Jupiter and Saturn are represented as well as the Sun and Moon. The celestial equator is clearly marked in the interior of the sphere, and the ecliptic, or apparent yearly path of the Sun among the stars, is also shown.

Many of the mathematical conceptions necessary for the study of descriptive astronomy and which often discourage the beginner, are made with this sphere, perfectly simple. There is now no reason why any one, including the younger school children, can not become familiar with the chief constellations their apparent movement, the brighter stars and the real and apparent movements of the Sun, Moon and planets.

Many of the fundamental ideas in mathematical geog-

raphy necessary in elementary education are also easily demonstrated with the sphere.

The sphere now in the Academy building was invented by Wallace W. Atwood, Secretary of the Society and Director of the Museum. It was constructed, installed and presented to the Academy by Mr. La Verne W. Noyes, President of the Board of Trustees, in order to broaden and to promote the educational and scientific work of the Academy.

The Construction

The material used in constructing the sphere is very light galvanized sheet-iron, 1-64 of an inch thick, which has been pressed to the proper curvature and soldered to the equatorial ring and to a much smaller ring about the entrance to the sphere. The separate sheets lap sufficiently to be soldered upon one another. The platform and horizon table are of wood and rest upon a very strong steel frame.

The diameter of the sphere is fifteen feet. The weight, exclusive of the platform, is a little more than 500 pounds. This weight is carried by a tube $2\frac{1}{2}$ inch tube attached to the outside of the sphere along the line of the equator and resting upon three wheels as shown in the cross section view. The two lower wheels carry the greater portion of the weight but the third and upper wheel, above the door, resists a certain thrust due to the inclined position of the sphere. The stationary platform within the sphere is supported in part by steel trusses resting upon the frame work of the museum balcony, and in part by two upright pillars which rest upon the great I beam of the mainfloor of the Museum. This platform carries a circular horizon table, below which the sphere is obscured from view, and above which there is a complete hemisphere on which the stars are represented.

The observer in this sphere is located on the surface of the Earth at North Latitude 41 degrees 50 minutes. Celestial spheres constructed for localities having other latitudes north or south would be placed at other angles and certain other constellations would be represented.* Thus a celestial sphere constructed for Buenos Aires, to represent the southern heavens, would be so placed that the observer would enter from the north polar region and see the southern constellations, not visible at Chicago, observe the courses of Sun and Moon north of him but fail to see any of the constellations about the north pole of the heavens as seen from the latitude of Chicago.

Attached to the steel structure supporting the sphere is a small electric motor, which propels the two lower wheels supporting the sphere and their rotation causes the sphere to rotate.

The electric power for rotating the sphere and the light for illuminating the interior are controlled from within the sphere. The electric current necessary for representing the Sun is received at the north pole at a rotary contact, and carried by an insulated wire to the ecliptic, about which there is a wire on the inside of the sphere.

The Fixed Stars

The stars are represented by tiny perforations in the sphere. Different sized perforations have been made to represent stars of different magnitudes. The size and location of each star in the sphere has been determined with great care by using an instrument especially constructed for this purpose, so that the sphere is an accurate miniature representation of the heavens.

The Planets

The shifting positions of the planets Jupiter, Saturn, Mars and Venus among the constellations have been provided for by a number of openings made to represent the different positions of each of these planets at different times of the year. The openings not in use are very readily covered.

The Sun and Moon

The Sun is represented by a small electric light which may be moved from place to place along the ecliptic and thus be kept in its appropriate place among the stars. The Moon will be represented by a series of small discs cut to represent discs may be moved from point to point along the orbit of the Moon and thus represent that body in its appropriate position in the heavens.

Each star in the sphere has been numbered and a series of star tables have been prepared so that it is perfectly simple for one to identify a particular star observed in the sphere or to locate a given star or constellation.

This apparatus should prove to be of great practical value in educational work. The public and private school children should make frequent visits to the sphere and the students in Astronomy in the neighboring Universities will find it well worth their time to arrange excursions with their instructors to the Academy to make use of this apparatus in their studies.