

# THE OBSERVATORY,

## A MONTHLY REVIEW OF ASTRONOMY.

No. 231.

SEPTEMBER.

1895.

### *Some Astronomical Records in ancient Chinese Books\*.*

ASTRONOMY is one of the most ancient, as it is one of the most interesting of the Sciences. It dates its birth from the beginning of the human race. All was new to primeval man. Nature, unclothed as yet in scientific names or formulæ, was to him living and real. To his young fresh intellect, what an interesting field for speculation lay in the blue vault with its countless luminaries, its varied and brilliant constellations as they revolved in everlasting harmony around him. He gazed with admiration on the glorious orb of day, as he ran his daily course, and heard the hissing of the waters, as he plunged into the western seas. On clear starlight nights, he fancied he heard the far off "music of the spheres," a melody too elevated to be heard by mortal ears.

Notwithstanding all these flights of imagination, when history opens, no small progress had already been made in astronomy. In China, the stars had been already named, the seasons determined by means of culminating stars, and a fair approximation made to the length of the year. The zodiac had been divided into 28 constellations and the places of the Sun and Moon determined by their position among the stars. As regards the Sun, at least, this implies no small skill in the art of observing, as the stars are not visible in the daytime. While the Chinese showed such an aptitude for observation, they displayed a remarkable deficiency in the power of generalization and in drawing the legitimate deductions from the data collected. Thus, while the Chinese determined the equinoxes and solstices by means of culminating stars and so determined the position of the Sun,—though they must have perceived that his position at these epochs was slowly changing—yet it was the fourth century after Christ ere they

\* We are permitted by Prof. Russell to reprint his interesting article on Chinese Astronomy, which was originally published in the Proceedings of the Pekin Oriental Society.—[Ebs.]

discovered the precession of the equinoxes, *i. e.* about 500 years after it had been discovered by Hipparchus. The name given to the pole star in different dynasties brings out this point more clearly. Thus, at the time of the emperor Yao, about 2300 B.C., the pole star was  $\alpha$  Draco. Later on, about the beginning of the Chou dynasty, the pole star was  $\beta$  Ursæ Minoris. The name in both cases denotes the Emperor, clearly showing that these names were given to those two stars at those early dates. No reference, however, is made to the change in ancient Chinese history. A blind reverence for the past, inducing an implicit belief in their ancient records, has prevented the Chinese from making any material advance in astronomy, as well as in any other science.

The earliest references to astronomy in Chinese literature are found in the 'Shu Ching.' In the opening chapter are contained the directions of the emperor Yao to his four astronomers, how to observe the solstices and equinoxes. He commanded the second brother Hsi, going east, to reside at the "Bright Valley," so as respectfully to receive the rising Sun, adding that the day is of the medium length and the star Niao. According to Chinese commentators, Niao, which is not the name of a star but of a group of constellations, here corresponds to  $\alpha$  Hydræ. It should therefore have culminated about half an hour after sunset. The R.A. of Hydra, 2350 B.C., was  $87^{\circ} 38'$ . At 6.30 P.M., the earliest hour we can take for the observation, the star would have been about  $10^{\circ}$  past the meridian.

The emperor then commanded the third brother Hsi to go south and respectfully observe the limit of the shadow. Midsummer would be determined by the culmination of Huo<sup>3</sup>, which corresponds to  $\pi$  Scorpii. At the time of Yao, the R.A. of  $\pi$  Scorpii was  $180^{\circ} 39'$ . At the earliest, the observation could not have been made before 7 P.M., when the star would have already been  $14^{\circ}$  past the meridian.

The emperor again directed the second brother Ho to reside in the west and respectfully attend the setting Sun. By the culmination of a certain star he was to determine mid-autumn. This star corresponds to  $\beta$  Aquarius, and its R.A. at the time of Yao was  $263^{\circ} 14'$ . Taking 6.30 P.M. as the time of observation, this star would, at that epoch, have been  $14^{\circ}$  past the meridian. Lastly, the emperor directed the third brother Ho to go north, and by means of the star Mao to determine the winter solstice. This star corresponds to  $\eta$  Tauri. Taking the time of observation as 5.15 P.M., at the time of Yao it would have been  $6^{\circ}$  E. of the meridian. With the exception therefore of the winter solstice, the directions to determine the summer solstice and the two equinoxes would have been much more suitable several centuries later on. Evidently, however, the above directions were only intended roughly to indicate the seasons for the purpose of husbandry, and are of no use at all in fixing the date of Yao's

reign. The hours at which the observations were made are not mentioned; besides, the precession of the equinoxes is so slow as to leave the uncertainty within very large limits. It will be interesting here, however, to compare these directions of Yao to his four astronomers with the 'Hsia Hsiao Cheng,' the calendar of the Hsia dynasty, and with the 'Yueh Ling,' attributed by some commentators to the Chou dynasty, by others to the Ch'in dynasty. The 'Hsia Hsiao Cheng' is fragmentary, but the parts that remain show clearly that the directions contained in it are practically the same as those contained in the 'Shu Ching.' Thus, for example, in the 'Hsia Hsiao Cheng,' it is stated that in the fifth month  $\pi$  Scorpii is central at the beginning of dusk. Now, this is exactly what Yao told his astronomer Hsi.

The 'Yueh Ling' is a complete calendar for every month. It is, however, extremely vague, neither the day nor the hour of observation being stated. For example, it says: in the first month the Sun is in Ying<sup>2</sup> Shih<sup>1</sup>; whether this means that, at the Chieh Chi Li Ch'un or Yü<sup>3</sup> Shun<sup>3</sup>, or on the first day of the month, the Sun is in Ying<sup>2</sup> Shih, it is impossible to determine. The commentators of the 'Chin Ying Li Chi' say that these observations refer to the beginning of the month. I think this view is very probably correct, and that the directions in the 'Yueh Ling' were only intended roughly to indicate the several months.

We meet with no further astronomical allusions in the 'Shu Ching' until the reign of Chung K'ang, the fourth emperor of the Hsia dynasty. In his reign, probably the first year of his reign, occurred an eclipse of the Sun, the most celebrated on record—celebrated not only for its antiquity, more remote by about 1500 years than any recorded by any other nation, but also for the dread fate of the two astronomers Hsi and Ho, who were taken by surprise and unprepared, at its occurrence, to perform the customary rites. These rites were the shooting of arrows, beating of drums, gongs, &c., with the object of delivering the Sun from the monster that was devouring it. The astronomers Hsi and Ho, by virtue of their office, should have superintended these rites. They were, however, drunk and incapable of performing their duties, so that great confusion ensued. On this account, according to the narrative in the 'Shu Ching,' they were put to death. Our sympathy with them on their rather severe punishment will be heightened when we learn that the eclipse in question was only a partial one.

S. M. RUSSELL.

[To be continued.]

### *Bright Meteor of July 7, 1895.*

ON Sunday night, July 7, at about 10<sup>h</sup> 49<sup>m</sup>, a fine meteor with a double nucleus was observed from various parts of the country. The following are some of the descriptions:—

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