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## THE ECLIPSE IN CHINA

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Chinese history is romantic but difficult. The average Westerner soon gets confused by the endless succession of emperors and dynasties, with names hard to remember and even more difficult to pronounce. As a humble student, trying to absorb the contents of an "Outline of Chinese History" in order to satisfy the requirements of my Missionary Society, I can still remember with what glee I seized on the statement that in 2159 B.C. the emperor Chung K'ang executed the astronomers Hi and Ho for failing to predict an eclipse of the sun. The uniqueness of such an event provided at least one landmark and a few names that I *could* remember!

But such an incident is not only of interest to the student of Chinese History on the lookout for an easy date. The historian and the astronomer would naturally be overjoyed at such a good piece of material from the hoary past on which to work. What a splendid chance for the astronomer to verify this eclipse and then proceed to use these data to check up our values for the acceleration of the moon's motion! And then the historian could use the verified date for fixing remote periods in human history.

The execution of the unfortunate Astronomers Royal for failing to predict the eclipse would appear to justify the assumption that the Chinese were in the habit of predicting eclipses more than 4,000 years ago. But this is not the only astronomical marvel of the Golden Age of Chinese History. We can go even farther back, to the time of the famous emperor Shun, about 2300 B.C., who feared that his astronomers Hi and Ho, (probably the ancestors of the Hi and Ho of eclipse fame), were neglecting their duties (it must have been a family failing)! He thereupon commanded them to construct a figure showing the dome of the sky divided into degrees, with the earth in the center and the sun, moon, planets, and stars in their proper positions and giving the movements observed. Precious colored stones marked the poles, sun, moon, and planets, while pearls were used to indicate the stars. The emperor was apparently satisfied with this working model, and we can only infer that the famous Adler Planetarium at Chicago is about 4,200 years behind the times!

A study of Chinese Astronomy inevitably leads one back to the famous 2159 B.C. eclipse. It is an event which, in the words of the famous historian Cordier "*a fait couler beaucoup d'encre.*" The controversy is

not yet settled and it is encouraging to know that modern trained Chinese scholars are engaged in a critical study of the whole question of Chinese Astronomy. Their knowledge of the ancient Chinese classical writings concerned, (which require a lifetime of study for the Westerner), together with their modern scientific training, should prove very fruitful of results in clearing up many of the uncertainties in this field.

It would seem that the main difficulty is the question of the authenticity of the existing text of the "Shu King," one of the Five Canonical Books of the First Order; this "Book of History" covers the period from the time of the legendary emperors Yao and Shun (circa 2300 B.C.) down to the date 721 B.C. in the Chou Dynasty. The original Book of History was edited by the great sage Confucius who lived around 500 B.C.; he selected what he considered of value from a mass of historical records and traditions covering the above-mentioned 1600 years. It thus gives us first hand accounts of the state of early Chinese civilization, but it must be remembered that these were transmitted by the great Sage not as a strictly historical work but rather as a manual of political science. Recent scholarship therefore, recommends that the Shu King be used with great caution.

The Chou Dynasty came to an end in 255 B.C. The first emperor of the new dynasty, the Ch'in, is best known to us as the builder of one of the seven wonders of the world, the Great Wall of China. To the Chinese he is best remembered as the infamous Ch'in Shi Huang Ti, who had conquered the whole of China, and had proclaimed himself "The First Emperor." He was to be the Superman, from whom all history was to begin, and so he gave an order for the burning of all books, especially those which were historical works. We are told that he himself examined daily one hundred pounds by weight of books, and cast into the flames all works other than those dealing with the utilitarian subjects of Medicine, Agriculture, and Astrology. The "Book of History," reaching back through the centuries to an age two thousand years before his time, must have been particular anathema to our self-styled "First Emperor," and, so far as we know, not one complete edition escaped the flames.

Within twenty-five years another emperor was ordering the restoration of the destroyed works. But the only copy of the Shu King which could be found was an incomplete one which had been walled up by a devoted scholar. This consisted of only 28 or 29 out of the original 100 chapters, but there was no mention of the eclipse in this authentic copy. Another account says that an old scholar named Fu Cheng remembered by heart these 29 chapters and recited them to the authorities who were endeavoring to recover the ancient texts. It was about 75 years after the burning of the books that a descendant of Confucius discovered a version in archaic script of 16 more sections of the Shu King. These he edited and then they appear to have been again lost for about 450 years, until, in 320 A.D., they were put together out of fragmentary

quotations and similar material and presented to the emperor Yuan-ti. In the preface to one of these sections in the archaic script we read as follows: "Hsi and Ho, sunk in wine and excess, neglected the ordering of the seasons, and allowed the days to get into confusion. The prince of Yin went to punish them." This preface is followed by an account of the Punitive Expedition of Yin.

But there are other references to this famous eclipse. Some two centuries before the burning of the books we have the comments of a scholar named Tso, who in his "Commentary on Annals of State of Lu," wrote concerning the lost work (The Punitive Expedition of Yin), "The sun and moon did not meet harmoniously in Fang. The blind beat their drums; the inferior officers and the common people ran about."

A third reference is to be found in "The Annals of the Bamboo Books," which fortunately escaped the flames. These annals were written in the third century B.C., and in them we read as follows: "In his fifth year, in the autumn, in the ninth month, in the day kang sui, (47th of cycle), which was the first day of the month, there was an eclipse of the sun, when he ordered the prince of Yin to lead the Imperial forces to punish Hsi and Ho." This is the only account in which the Emperor's name is mentioned, but even though some authorities doubt the authenticity of these Bamboo Books, the placing of the eclipse in the reign of Chung K'ang is generally accepted both by unanimous Chinese tradition and by the celebrated historian Ssu Ma-chien.

The Bamboo Books give the date as Oct. 28, 1948 B.C., but there was no eclipse that day, not even a new moon. This would give point to Ssu Ma-chien's refusal to trace Chinese chronology farther back than 841 B.C. Beyond that date we know nothing beyond the names of the emperors and their relationships, and all we can say is that Chung K'ang reigned somewhere around 2000 B.C.

We have now disposed of the references to the eclipse in the ancient literature of China. We shall now see what some of the astronomers of both East and West have been able to do with these slender and ambiguous data.

In the Tang Dynasty (618 to 907 A.D.) Chinese astronomers attempted to fix the date by computation and placed it at 2155 B.C. But this was computed in ignorance of secular acceleration and the astronomer Largeteau has shown that the eclipse of that date was not visible in China.

At the time of Kublai Khan in the thirteenth century the astronomer Kuo Shou-ching computed the date to be 2128 B.C. Unfortunately, however, his methods did not prevent him from making two faulty predictions of solar eclipses himself!

Of the many European astronomers who have worked on the date of this eclipse, we may mention Oppolzer, who gives Oct. 22, 2137 B.C., and Schlegel with his two dates, May 7, 2165 or May 12, 1905 B.C. Fotheringham in his Halley Lecture at the University of Oxford con-

cluded that the evidence does not permit the identification of this eclipse. In fact, modern critics in the West are inclined to believe that Hsi and Ho were rebels and that the Prince of Yin was sent to punish them because of their known sympathies with the rebel faction of that time. It was not a question of failure to predict the eclipse; it was their failure in watching the sky and in not announcing the first contact of the moon's disc and so warning the populace to drive off the heavenly dragon from its meal. Apparently the eclipse caused considerable terror and confusion among the people, and this served as an excuse for the Emperor's punitive expedition. And the Higher Critics even go so far as to doubt the untimely end of the bucolic governors; they assert that the two astronomers took an active part in the rebellion that ensued and that they were hale and hearty some years subsequent to the eclipse!

In the Chinese records no solar eclipses are mentioned between 2159 and 776 B.C. Someone has suggested that this is because the fate of Hsi and Ho discouraged the scholars and the intelligentsia from taking an active interest in the science of Astronomy! The Burning of the Books probably explains this gap of nearly 1400 years, though one recent authority says that the astronomical works were not destroyed. There is a possibility that they were not, since astronomy in those remote times was the handmaid of agriculture and therefore may have been ranked as one of the utilitarian sciences spared by the "First Emperor." On the other hand astronomy was also the servant of the royal house, and was often called upon to work violent changes in the calendar, depending upon celestial events. We are told that in 2513 B.C. the five planets were in conjunction on the same day that the sun and moon were in conjunction, and therefore the Emperor declared that day to be the first of his calendar. From the seventh to the fifth centuries B.C., these dynastic calendars, with the commencement of the royal year still traditionally called the spring, were very confusing to the farmers, because the first day of "Spring" might fall anywhere between November and February, depending upon the number of intercalary months employed. It may have well been therefore that the Superman considered Court Astronomy more historical than useful!

It is possible also that far too much emphasis is laid on the Burning of the Books as an explanation for the loss of all astronomical literature. As a matter of fact the "Superman" only destroyed all private collections. He apparently had a private library. But history now seems to point to the great conflagration at the capital city of Shien-yang, when the short-lived Ch'in dynasty was overthrown. The fires burned for three months and effectively disposed of the royal library and any books which had been hidden inside the city. It must be remembered too, that on three subsequent occasions there have been literary catastrophes causing wholesale losses to Chinese literature.

From 776 B.C. on we have a large number of eclipses by means of which astronomers can confirm Chinese chronology. In that year the

“Shih King,” the “Book of Poetry,” records an eclipse of the sun preceded by an eclipse of the moon. The exact date of the solar eclipse is given and has been verified astronomically. Then, in the “Spring and Autumn Classic” written by Confucius, in a brief summary of the chief events that took place in the State of Lu between 722 and 481 B.C., there are records of 36 eclipses, 32 of which have been identified. It has been suggested that the other four were entered as eclipses because of some curious phenomenon seen near the sun, and the astronomers were not taking any chances! In short, from 776 B.C. to 1433 A.D. solar eclipses are mentioned every few years in various Chinese records. Then comes a blank of 200 years, when a few other notices terminate the catalog. It is interesting to note that very few eclipses of the moon are recorded, and also that whereas the Chaldeans gave details of their solar and lunar eclipses, the Chinese gave only the date.

We may doubt if the early astronomers were keen loyalists. It was supposed that there was a natural connection between actions of princes and celestial phenomena. Good or false actions of princes could change the movements of the stars. This false notion was particularly true of eclipses. In the third century A.D. Chinese astronomers said that in ancient times there were no eclipses, and that it was only the actions of bad rulers that had put them under the irksome necessity of predicting them! Astronomers of later dynasties have stated that it was not until the third century A.D. that there were fixed principles for calculating eclipses. But even in the eighth century we have as celebrated an astronomer as I-Hang triumphantly announcing two eclipses which failed to occur. He affirmed that his calculations were exact and said “It is the fault of the stars, which have changed their motions.” His failures, together with the subsequent predictions of other astronomers which failed to come to pass, served a very useful purpose when in 1299 the Tribunal of Mathematics announced a “two-finger” eclipse, which did not occur. People trembled for the fate of the members of the Tribunal, but they justified themselves by citing ten similar failures since the year 713!

The latter part of the thirteenth century has been referred to as the Golden Age of Chinese Astronomy, with its central figure, Kuo Shou-ching as the Chinese Tycho. Unfortunately, his valiant efforts to revive the science had little effect, for his death was followed by a period of inactivity lasting for more than three centuries. In 1573 Prince Tching tried to restore the science. Together with an astronomer named Hing he explained a method of predicting eclipses and calculated back to all eclipses mentioned in Chinese Annals, but even this work failed to bring the nation out of its indifference to Astronomy.

This brings us to the early part of the seventeenth century, when the calculated solar eclipse did not accord with the actual observations. The Assessor of the Tribunal of Mathematics proposed for membership the Jesuit missionary priests Longobardi and Terence. This could not be

done, however, without an order from the Emperor, whose sanction was necessary for any changes in the science of astronomy. This gave the anti-foreign element a chance to press the claims of the native science and to urge the abolition of the European astronomy practised by the missionaries. The Emperor settled the matter by summoning all the astronomers to his court and asking the Chinese to propose some test which would establish the superiority of their school. They did not know what to suggest, whereon Father Verbiest proposed that each school should calculate the length of the meridian shadows for gnomons of various lengths on the following day. The Emperor agreed to this suggestion, but to his dismay found that his own astronomers did not know how to calculate these lengths.

With Ferdinand Verbiest as Imperial Astronomer Chinese Astronomy was brought up to date and we hear no more of solar eclipses which did not agree with the predicted date and hour. It was only in the method of observing the eclipse that China now differed from the nations of the West. Delambre in his "Histoire de l'Astronomie Ancienne" tells us that the observation of eclipses was one of the first and most important functions of the Tribunal of Mathematics. It was their duty to inform the emperor several months beforehand of the exact date, time, and the part of the sky in which the eclipse would occur. These data had to be calculated for each provincial capital in the vast Chinese Empire. The Board of Rites and Ceremonies then became responsible for passing on this information to every city and had to see that the celestial event was observed according to the exact rites prescribed therefor. Several days prior to the eclipse, proclamations in large characters would be put up in public places and at the city gates, giving the hour of commencement, position in sky, duration, and time of ending. In the capital itself, mandarins of all ranks assembled at the Court of the Tribunal of Mathematics to await the eclipse. In their hands they carried papers on which were written the details of the approaching event. At the first contact of the moon with the sun's disc, all had to fall on the ground and kowtow, *i.e.* to touch the ground with the forehead. Meanwhile in each city as contact occurred the common people frantically beat drums and gongs to scare off the heavenly dragon as it devours the sun. By this time the various astronomers would have assembled at their observatories to note down the time of commencement and ending of the eclipse for comparison with their own predictions; then, making the necessary corrections, the various documents would be stamped with their personal and official seals and dispatched to the emperor. But since the overthrow of the Son of Heaven in 1911, republican China has been gradually discarding much of the pageantry and romance of her old customs, and never again shall we see a Chinese gunboat, armed with Krupp guns, turning out her crew, by order of the "Peking Gazette," to make a din with drums and bugles and gongs to save the moon from the dragon of the sky, at an eclipse of the moon.