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## TWO PREHISTORIC DRAWINGS OF POSSIBLE ASTRONOMICAL SIGNIFICANCE

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*Mount Wilson and Palomar Observatories*

Recent archaeological surveys by the Museum of Northern Arizona have brought to light two prehistorical drawings which may have astronomical significance. Both of these were found in wilderness areas of northern Arizona; one in a cave containing ruins located in the White Mesa, and the other on a canyon wall closely associated with ruins on a tributary of Navaho Canyon.

While it is a dubious undertaking to attempt to interpret the drawings left by the ancient Pueblo people, the unique character of these two drawings and their striking similarity prompted an exploration of the possibilities they suggest.

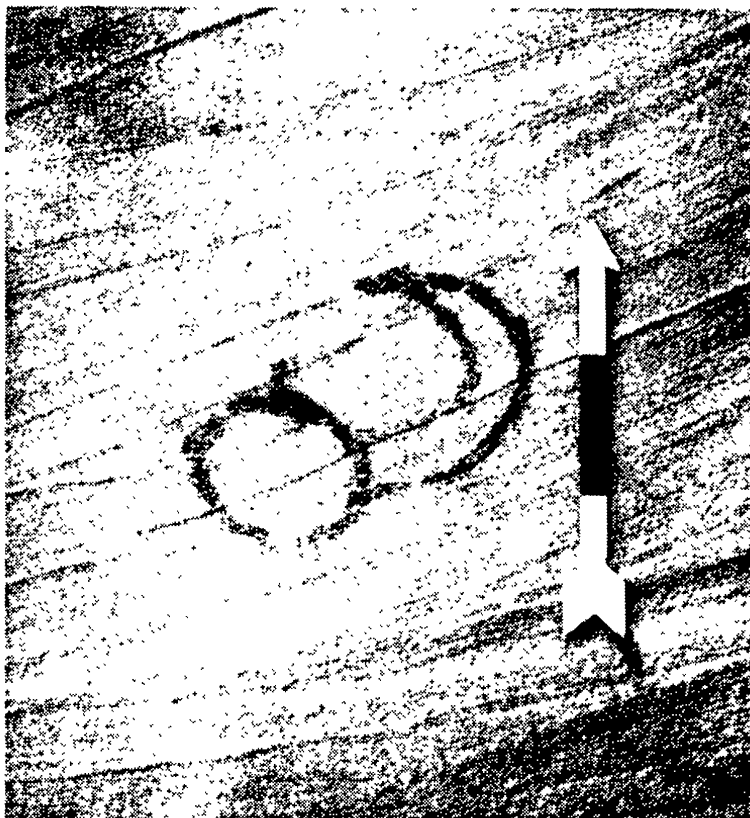
The drawings show a crescent in close association with a circle; in both the circle is located below the center of the crescent. Since the crescent is a very rare figure among the drawings found in northern Arizona, it at once attracted attention.

The first drawing shows the crescent with a circle eclipsing the lower cusp, and suggests, if the crescent is considered to represent the moon, that the drawing depicts an object passing between the earth and the moon. If such an object were a planetoid, it would not have appeared as a fully illuminated disk, but as a crescent similar to the moon, and would probably have been so depicted. It is unlikely that a self-luminous object ever passed between the earth and the moon, unless it were a

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comet, but a comet would have been too diffuse to be represented by a sharp circle. Such a close passage of either a planetoid or a comet borders on the impossible.

Assuming for the sake of argument that some astronomical event was the inspiration for the two drawings, is it possible that the same event in-

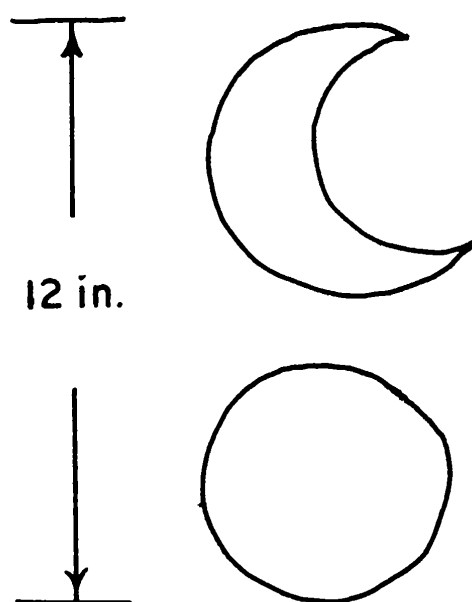


*Fig. 1—A photograph of the drawing found in a cave in the White Mesa, Arizona. The arrow is 12 inches in length.*

spired both? As the illustrations show, there are differences between the two. In the White Mesa drawing (Fig. 1) the crescent is shown convex to the right with the circle overlying the lower cusp. In the Navaho Canyon drawing (Fig. 2) the moon is convex to the left and the circle is shown well

below the crescent. Obviously the event occurred either in the evening or in the morning since the moon was in crescent phase. If both drawings depict the same event why the reversal of orientation?

It is not at all uncommon to find the moon shown in the wrong orientation even in modern illustra-



*Fig. 2—A sketch of the drawing found on a canyon wall in the Navaho Canyon system.*

tions and stage settings. Non-astronomically trained people show a notorious lack of concern about the matter. It would make an interesting experiment to call the attention of a group of people some evening to the crescent moon close to some object such as a church spire, and later ask them to draw what they had seen. How many would draw the moon convex in the correct direction?

The situation is further complicated by the fact that the ancient artists made the two drawings on cave and cliff walls which necessitated that they face north while drawing, after having viewed the scene while facing east or west. One wonders what

thought processes were involved in this transformation. Did one artist reproduce the scene as he had viewed it with the moon convex to his left, while the other reproduced it with the drawing of the moon convex in the same direction as the moon itself, i.e., convex to the east regardless of its relation to his left or right hand? Either case seems equally plausible.

The problem posed by the relative location of the circle in the two drawings is also of interest. In the White Mesa drawing the circle is shown overlying the lower cusp of the moon, suggesting that the two objects were very close together in the line of sight. The Navaho Canyon drawing shows a reasonable separation between the moon and the circle. When one inspects prehistoric drawings in general in that area he is immediately struck by the grotesque distortions and the complete lack of any sense of proportion. Therefore, little weight can be placed on the "scale" of the two drawings.

These general considerations, while leading to no definite conclusions, would suggest that it is possible for the two drawings to depict the same event. But what event?

Since the passage of a luminous body between the earth and the moon can be discarded as too improbable to warrant consideration, what other astronomical phenomenon might have inspired the drawings? To have merited special attention the event must have been exceedingly rare or highly spectacular, or both. During the centuries that the mesas and canyons of northern Arizona were occupied, the bright planets Venus and Jupiter appeared close to the moon often enough to call for no special attention, otherwise such drawings would be commonplace. The only other objects sufficiently unusual to attract attention are novae. Such an

object of sufficient brilliance could have presented a beautiful spectacle in conjunction with the crescent moon.

On the morning of July 4, 1054 A.D., Japanese and Chinese astronomers independently observed in the morning sky an extremely bright nova near the star Zeta Tauri. (Leaflet No. 119). It was so bright that it was easily visible in broad daylight. This was the famous supernova of 1054, believed to be the origin of the Crab Nebula. Recent discussions of the available data indicate that this supernova was about six times as bright as Venus, and was probably the brightest star-like object ever recorded. The known supernovae of our galaxy are:

Crab	1054 A.D.	Mag. —5
Tycho	1572	—4
Kepler	1604	—2

The possibility that the drawings found in northern Arizona depict an event which had been recorded nowhere else except in ancient oriental history was so intriguing that computations were undertaken to determine whether it might seem reasonable to associate the drawings with that event. The key to the problem lay in the fact that both drawings showed the crescent moon in close association with the circle assumed to represent the supernova. The first step consisted of establishing the location of the moon at the time the supernova flared to maximum brilliance. The requirements for a favorable answer were that the phase of the moon be only a few days before new moon on or near July 4, 1054, and that it be located within a few degrees of the known position of the supernova which would have been a brilliant object near the eastern horizon about an hour before sunrise.

These computations were carried out with the aid of tables prepared by Neugebauer which facilitate the location of all major planets, the sun, and the moon at any date as far back as 4000 B.C., and into the future to 3000 A.D. Computations were made to determine the location of the moon with respect to the supernova for the months of July and August, 1054, the period of maximum brilliance. The results show that (1) the moon was at crescent phase in the morning sky on July 4 and 5, and (2) at about three o'clock on the morning of the 5th was directly north of the supernova and only two degrees distant. The rather stringent conditions for a favorable answer seem to be met and strongly suggest the possibility that the two drawings actually depict the event of the apparition of the supernova of 1054.

There remains one point which must be settled, however. Were the two sites at which the drawings were found occupied in 1054 A.D.? This question can be answered by a study of the fragments of pottery collected about the sites. Archaeologists have established the dates at which certain diagnostic types of pottery were made, by means of chronology based on the study of tree-rings.

The potsherds collected at the two sites were analysed by Dr. Robert C. Euler, Curator of Anthropology at the Museum of Northern Arizona, Flagstaff. As a result of this analysis it was found that the majority of sherds collected at the White Mesa dated later than 1070, with only a trace of sherds dating around 1054. The later occupation would do much to dilute and obscure evidences of earlier occupation. The situation at the Navaho Canyon site was much more fortunate. Although an analysis of the sherds collected from the surface of the ground surrounding the site again showed

only slight evidence of occupation in 1054, a deep arroyo eroded into the canyon floor nearby and exposed deeper strata from which sherds were collected and correlated with their depth below the ground level. The lowest layer yielded sherds dating prior to 700 A.D., while the middle layer gave sherds dating to 1300 A.D., 21 percent of which dated between 900 and 1100.

The conditions encountered at the site in Navaho Canyon may well indicate what would be found at the White Mesa were it possible to study the stratigraphy of that site in a similar manner. In the light of this evidence it appears quite probable that the two sites, or at least their immediate environs, were occupied at the time of the supernova.

In conclusion let us summarize the evidence. Oriental records show that the supernova of 1054 first became visible in the morning sky of July 4; early on the morning of July 5, before dawn, the crescent moon stood just two degrees north of the supernova making a configuration of spectacular beauty; this supernova was probably the brightest object other than the sun and moon ever to appear in the sky in the memory of man and would certainly attract attention; the two prehistoric cliff sites at which the drawings were found both opened to the south and had an unobstructed view of the eastern sky; both sites, particularly that in Navaho Canyon, show evidence of occupation at the time of the supernova; although there are inconsistencies between the two drawings, both show the crescent moon at the same phase and both show the circle, assumed to represent the supernova, south of the center of the crescent, which agrees with reality.

While this evidence is admittedly circumstantial, the unique character of the drawings and the pos-

sibilities they suggest seem adequate justification for this investigation. It is hoped that other examples of similar prehistoric drawings in the southwest will come to attention and aid in resolving the problem.

The writer wishes to express his deep appreciation to many people for help in the work preliminary to this report. Among these are: Dr. Helmut Abt of the Yerkes Observatory, who assisted in the two archaeological surveys during which these two drawings were found, and who located the Navaho Canyon drawing; Dr. Fred Hoyle of St. John's College, Cambridge, England, who first suggested the possibilities offered by the supernova of 1054; and Dr. Walter Baade of the Mount Wilson and Palomar Observatories, under whose guiding hand the computations were carried out.