

PREHISTORIC HOPEWELL METEORITE COLLECTING: CONTEXT AND IMPLICATIONS

OLAF H. PRUFER

Department of Humanities and Social Studies, Case Institute of Technology, Cleveland, Ohio

INTRODUCTION

This paper examines and evaluates the curious practice of meteorite collecting among the prehistoric Hopewell people of Eastern North America and, more specifically, of Ohio.

The Hopewell culture complex, viewed in overall terms, covers a temporal range from approximately 400 B.C. to 400 A.D. It is not certain that this total range is applicable to the Ohio area, the center of Hopewell cultural intensity. There are indications that Ohio Hopewell began somewhat later and ended somewhat earlier than other Hopewell manifestations (Prufer, 1961). The Hopewell complex represents one of the most highly-developed prehistoric cultures of Eastern North America. It is principally characterized by a tendency toward an extreme mortuary ceremonialism expressed in the construction of large and richly furnished burial mounds and earthworks. The entire ethos of Hopewell culture appears to have been directed toward this ceremonialism. Nearly all artistic efforts, special technological skills, and a far-flung trading network were devoted to providing goods to be ultimately deposited in burials. The dichotomy between the fabulous Hopewell burial mounds and their contents, and the unspectacular Hopewell village sites is sharply apparent, especially in Ohio and Illinois, where some of the great tumuli have yielded literally thousands of ceremonial objects. The production of such objects of high quality seems to have been the main interest of the Hopewellians.

Part of this conspicuous collecting and mortuary disposal of wealth is a marked interest in exotic materials such as obsidian, from the Rockies or the Southwest, grizzly bear canine teeth from the Rockies, marine shells from Florida, native copper and silver from the Upper Great Lakes region, and mica from Virginia and the Carolinas. This interest in outlandish goods was the cause of intensive Hopewell trade which, in turn, resulted in the formation of numerous Hopewell-inspired culture groups from Florida to Wisconsin.

Among the exotic substances used by the Hopewellians, meteoric iron is conspicuous because of the obvious difficulties involved in securing it. In the Eastern United States it appears to be a horizon marker for Hopewell, since it has not been reliably reported from any other prehistoric culture complex.

Hopewell meteoric iron occurs in the form of "nuggets," i.e., unworked meteorite masses, as well as in the shape of tools and iron-foil overlay on other substances. Thus it is part of the extensive and complex pseudo-metallurgical native copper and silver technology so typical of the Hopewellians. The term pseudo-metallurgical is used advisedly, because notwithstanding the fact that Hopewell sites yielded large quantities of metal objects, these were always worked "cold"; smelting and casting remained unknown, though the native metal was frequently exposed to low heat before being worked in order to make it more malleable.

OHIO HOPEWELL METEORIC IRON

Ohio Hopewell mounds have yielded numerous undisputed meteoric-iron objects as well as a few dubious instances. The latter must be listed because they were reported early in the nineteenth century, when identification of finds

were often of doubtful value. None of these finds have been preserved for re-examination. Nonetheless, as will be shown below, it is well possible that these early reports refer to meteoric iron.

The following trait list, based on published data and museum collections, gives the range of meteoric-iron objects found. In many instances more than one such object was found at any given site; this is especially true of earspools which usually occur in pairs.

1. Copper earspools, one outer plate of which is plated with meteoric iron. (Hopewell, Marriott 1).
2. Copper earspools, one side of which is covered with silver, the other with copper, while the body is made of meteoric iron. (Hopewell).
3. Copper earspools, both outer plates of which are covered with meteoric-iron overlay. (Hopewell, Harness, Fort Ancient, Turner, Porter).
4. Earspools made entirely of meteoric iron. (Porter, Turner).
5. Awls made of meteoric iron. (Seip 1, Hopewell).
6. Cylindrical beads of rolled meteoric-iron sheeting. (Seip 1, Turner, Mound City).
7. Beads made of small marine shells covered with copper sheeting which in turn is covered with meteoric iron. (Mound City).
8. Hemispherical clay, wood, or sandstone buttons covered with meteoric-iron sheeting. (Hopewell, Seip 1, Mound City).
9. Buttons consisting of small hemispheres covered with meteoric iron and set in sheet-copper settings. (Harness).
10. So-called "ceremonial" solid, rounded cones of meteoric iron. (Hopewell).
11. Fragments of meteoric-iron sheeting suggestive of plain headdresses similar to the classic Hopewell copper "helmets." (Turner, Hopewell).
12. Triple conjoined tubes or pan-pipes made of meteoric iron. (Turner).
13. Axe made of meteoric iron. (Harness).
14. Adze made of meteoric iron. (Hopewell).
15. Small straight-sided chisel made of meteoric iron. (Hopewell).
16. Curved chisels of meteoric iron imitating beaver incisors in shape. (Hopewell).
17. Small meteoric-iron drill stuck in a pearl bead which it was used to perforate. (Hopewell).
18. Small boat-shaped hollow objects of meteoric iron. (Seip 1).
19. Small disc-shaped sheets of meteoric iron. (Harness).
20. Slate cone plated with meteoric-iron foil. (Tremper).
21. Human ulna banded and partly covered with meteoric-iron sheeting. (Hopewell).
22. Ball of meteoric iron set into hollowed bear canine tooth. (Seip 2).
23. "Nuggets" of meteoric iron. (Turner, Campbell, Hopewell, Marietta).

In addition to these well-documented examples of Ohio Hopewell meteoric iron, a number of less reliable cases should briefly be dealt with. In a recent letter to me, Gregory Perino of the Gilcrease Foundation states that ". . . we bought a group of Ohio copper earspools from Dr. Young of Nashville, and a few were covered with iron." (Perino correspondence, August 10, 1961).

Atwater (1820) refers to finds of iron from such well-known Hopewell sites as Marietta and Circleville. Putnam (1883) considered these early reports untrustworthy. While in the case of Marietta there is independent evidence for meteoric iron, the Circleville find remains uncertain. Atwater states that lying on a "mirrou" of mica there was found a ". . . plate of iron, which had become an oxyde; but before it was disturbed by the spade, resembled a plate of cast iron." (Atwater, 1820: 178). In addition he refers to a silver-banded antler sleeve which

he called a knife or sword handle. While he does not claim to have found an iron blade he does state that ". . . an oxyde remained of similar shape and size." Whatever the meaning of these reports are, it should be stressed that Atwater may actually have found remains of meteoric iron at Circleville. It certainly is curious that his account pertains precisely to a Hopewell site, the only prehistoric complex from which meteoric iron has been reliably reported.

A question that immediately arises upon contemplation of the numerous finds of meteoric iron in Ohio, is whether or not these instances represent the divided-up spoils of a single meteoritic fall. An affirmative answer to this question would have far-reaching chronological implications. It would indicate that all 12 Ohio sites involved, including all major localities, were roughly contemporaneous. This certainly does not agree with other archaeological evidence (Webb and Snow, 1945; Prufer, 1961). In fact, the few analyses made of Hopewell meteoric iron indicate that individuals of different meteoritic falls were involved in the Ohio finds.

Kinnicutt (1887) analyzed three meteorite "nuggets" from two of the Turner mounds in Hamilton County, Ohio. This material is known as the Anderson meteorite. Two of the specimens were found among the rich offerings on the "altar" of mound 3. The following are Kinnicutt's findings:

type:	probably a medium octahedrite
weight:	24 grams
specific gravity:	6.42
Iron:	86.66%
Nickel:	12.67%
Cobalt:	trace
Insoluble residue:	0.10%

Well-marked Widmannstätten figures are present. Small crystals of olivine and bronzite could easily be identified under the microscope. This specimen was detached from a larger mass. There was evidence of a third, unidentified substance. The second specimen from mound 3 gave these results:

type:	probably a medium octahedrite
weight:	52 grams
specific gravity:	6.51
Iron:	88.37%
Nickel:	10.90%
Cobalt:	0.44%
Copper:	trace
Phosphorus:	trace
Insoluble residue:	0.12%

Olivine crystals could be detected. This specimen had been subjected to hammering.

The third Turner specimen analyzed was found in an "altar" deposit of mound 4:

type:	pallasite, Krasnoyarsk group (Pk) of Brezina
weight:	767.5 grams
specific gravity:	4.72

The olivine crystals of this mass had a diameter range from 5 to 10 mm. Their specific gravity was found to be 3.33, and their analysis gave these results:

SiO ₂	40.02%
FeO	14.06%
MnO	0.10%
MgO	45.60%

The iron parts had a specific gravity of 7.894. They were analyzed as follows:

Iron:	89.00%
Nickel:	10.65%
Cobalt:	0.45%
Copper:	trace
Phosphorus:	trace
Insoluble residue:	0.09%

Microscopic analysis revealed the presence of bronzite. Schreibersite was surmised because of the phosphorus content.

While Kinnicutt makes it quite clear that the meteorites from mound 3 are similar, apparently representing the same fall, he also shows that the specimen from mound 4 is of a different nature. Nonetheless, the Turner meteorites are usually listed in the literature as representing one single fall. This was apparently based upon the identification of the Turner pallasite as being a fragment of the Brenham fall from Kiowa County, Kansas. This fall consists of both siderites and siderolites. It seems that by extension the two specimens from Turner 3 were classed with Brenham.

Palache has commented on this point stating that ". . . examination of the meteoric material still preserved in the Peabody Museum . . . showed that two distinct finds of meteoric iron were made there, a fact which seems to have been overlooked since the first description." (Palache, 1926: 149). Nonetheless Palache believed the Turner material to represent fragments of a single pallasite. He suggests that in the case of the mound 3 specimens, intensive hammering as exemplified by the distortion of the Widmannstätten figures, resulted in the loss of olivine. He suggests that this had been done deliberately in order to purify the metal. He further adds that, notwithstanding Kinnicutt's explicit remarks to the contrary, he could not detect traces of olivine in the two analyzed specimens from Turner 3.

Palache's findings are open to question. While there is no doubt that the irons from Turner 3 had been subjected to some hammering, it should be noted that at least one of the specimens had been cut and polished for examination. In other words, those parts of the mass were examined which had not been exposed before. It is difficult to see how the olivine inclusions, which in the case of the pallasite from Turner 4 are quite sizeable and which presumably would have been of about equal dimensions in the other specimens, had disappeared from the mass. The fact that the Widmannstätten figures in the latter pieces are perfectly recognizable, though bent, shows that the material was subjected to moderate hammering only. Furthermore, the data on specific gravity, which ever way one chooses to view them, do not necessarily lead to the conclusion that the Turner 3 and 4 specimens represent a single mass.

In view of these arguments it may be preferable to consider the Turner specimens as representing two different meteorites.

The literature abounds with attempts to relate the "Anderson" material, i.e., the pallasite from Turner 4, with known meteorites. Kinnicutt (1884) compared it to the Atacama mass from Chile. Kunz (1887) thought the Turner pallasite to have been part of the Eagle Station, Carroll County, Kentucky, meteorite, because at the time this was the only other known North American pallasite which, moreover, was found only 60 miles from the Turner earthworks. Subsequent investigation (Kunz, 1890) showed that the Carroll County mass was no pallasite but a brahinite; thus the hypothesis had to be abandoned. The Turner specimen was next thought to be identical with the Brenham pallasites from Kiowa County, Kansas. Kunz argued that the ". . . fact that in connection with the large Kiowa masses a number of small portions, weighing from half a pound to six pound each, were found, makes it very probable that a small mass,

of perhaps three or four pounds, had been conveyed by the Indians to the Ohio valley." (Kunz, 1890: 318). Brezina (1895) and Wülfing (1897) agree with this view. Huntington (1891), however, finds no solid grounds for this identification, noting that it may be just as reasonable to identify the Turner mass with the Krasnoyarsk pallasite as with the Brenham masses. Farrington follows this view when he states that ". . . unless there can be traced a more positive connection than has hitherto been done, it seems better to consider Anderson separate." (Farrington, 1915: 33). In sum, it has not been possible to identify the Turner material with any known meteorites.

Farrington (1902) analyzed a heavily oxydized mass of meteoric iron found at Mound 25 of the Hopewell Group in Ross County, Ohio. The following are Farrington's findings:

type:	medium octahedrite (Om) of Brezina
weight:	130 grams
specific gravity:	not given
Iron:	95.20%
Nickel:	4.64%
Cobalt:	0.404%
Copper:	0.035%
Manganese:	trace
Tin:	trace
Sulphur:	0.13%
Phosphorus:	0.07%

Widmannstätten figures are clearly marked, though distorted as a result of hammering. Bands of kamacite separated by thin ribbons of taenite are clearly discernable. The presence of troilite and schreibersite is indicated by the percentages of sulphur and phosphorus.

The results of this analysis preclude the conclusion frequently found in the older literature that all meteoric iron found in Ohio Mounds came from the same source, ". . . the differences in percentages being greater than are known to occur among the individuals of a single fall." (Farrington, 1902: 314). Three radiocarbon dates are available for Hopewell 25. One of these, having been obtained from a composite sample (C-137) need not concern us here. It is out of line with the other dates, possibly because of its composite nature. The other two dates yielded values of 94 B.C. \pm 250 (sample C-139) and 1 B.C. \pm 200 (sample C-136) respectively (Griffin, 1958).

No other analyses of prehistoric Hopewell meteoric iron from Ohio are available. The findings indicate with certainty that the Turner and Hopewell masses are of different origin, while there is considerable evidence that the Turner 3 and 4 specimens are of different origin as well. Extending these results to the numerous other known finds of Ohio Hopewell meteoric iron, it can validly be postulated that these too, represent masses of different origins. The implications of these conclusions and assumptions will be discussed below.

EXTRA-OHIO HOPEWELL METEORIC IRON

Illinois Hopewell has yielded two documented cases of meteoric iron. One of these is the find of 22 oxydized beads, recovered from burial 10 of the Havana Mound 9 in Mason County. The metal was hammered into cylindrical shape. Nonetheless relict Widmannstätten figures, kamacite and taenite could be identified (Grogan, 1948). These beads may originally have been part of an octahedrite. Havana 9 yielded two radiocarbon dates of 386 B.C. \pm 256 (sample C-152) and 250 B.C. \pm 250 (sample M-20) respectively (Griffin, 1958).

The second instance of Hopewell meteoric iron in Illinois was communicated to me by Perino: "Several years ago L. R. Gibson of Alton, Ill., excavated what

we now call the Gibson Mound 4, and found in a log tomb containing 3 individuals, 4 pipes, beads, and 3 pairs of copper earspools. One pair had the face, or outer side, covered with a thin sheet of meteoric or other iron. . . . The Gibson Mounds are the southern group at Kampsville." (Perino correspondence, August 10, 1961).

At the Mandeville site in southwestern Georgia recent excavations (Kellar, Kelly, and McMichael, n.d.) of Mound B have yielded a burial accompanied by two copper earspools with meteoric-iron overlay. This site was clearly involved in the Hopewell trade between Ohio and the South.

The famous Crystal River site of the Santa Rosa—Swift Creek Hopewell phase on the Florida Gulf Coast yielded copper earspools covered with meteoric iron (Wiley, 1949). The Murphy Island (North) site of the Hopewellian St. Johns la (late) phase in northern Florida yielded unspecified fragments of meteoric iron (Goggin, 1952).

In addition to these documented and identifiable instances another prehistoric find of meteoric iron east of the Mississippi should be mentioned here. This is the nickel meteorite from Oktibbeha County, Mississippi (Taylor, 1857; Farrington, 1907). This mass was found in an "Indian mound" on which no data have been recorded. Upon analysis it proved to be an ataxite of very high nickel content. The specimen weighed 5.25 grams and had a specific gravity of 6.854. The iron content was 39.69 percent while nickel accounted for 59.69 percent. In addition there were small amounts of cobalt, copper, phosphorus, aluminum, and calcium, in each case amounting to less than 1.0 percent.

No Widmannstätten figures could be detected. The metal proved to be malleable but very tough. It is uncertain whether this specimen was found in a Hopewell mound; in view of the fact that all other finds of prehistoric meteorites east of the Mississippi came from Hopewell sites, it is well possible that the Oktibbeha Mound belonged to that culture complex as well.

This brings to a close the discussion of Hopewell meteorites. In the following section the implications of these discoveries will be discussed.

CHRONOLOGY, HORIZON MARKERS, AND CEREMONIALISM

It appears to be highly significant that in Eastern North America all documented cases of prehistoric meteorite collecting are associated with Hopewell sites. Moreover a number of the older, poorly documented instances were reported from Hopewell sites as well.

Earlier in this paper allusion has been made to the older hypothesis that all Ohio Hopewell meteorites (the extra-Ohio specimens having not yet been discovered or described) represent a single fall dispersed among the Hopewellians by trade. It has been shown on the grounds of meteoritic analyses that this was not the case with the specimens examined. They represent two if not three different masses. While no analytical data are available for other Hopewell meteorite specimens, there exists independent chronological evidence indicating that many of the sites involved in this study were not contemporaneous.

Considering the problem in terms of absolute chronology, it is apparent from the radiocarbon dates for Havana 9 and Hopewell 25 that these sites are not contemporaneous. In fact, quite apart from radiocarbon dating, on the basis of ceramic stratigraphy, Havana 9 has been considered Early Hopewell in Illinois, while Hopewell 25 would be Middle Hopewell in Illinoian terms.

Within Ohio two attempts have been made to derive a relative chronology for Ohio Hopewell (Webb and Snow, 1945; Prufer, 1961). The earlier of these attempts need not be considered here since the latter is more detailed and inclusive in its analysis, considering the question in a wider framework of Eastern archaeology.

Attempting a qualitative as well as quantitative correlation of Hopewell traits with pre- and post-Hopewell phases in Ohio, and with extra-Ohio Hopewell manifestations, Prufer (1961) comes to the conclusion that the bulk of Ohio Hopewell

can be temporally equated with Middle Hopewell in Illinois. The earliest site, in this view, is Tremper, because it lacks as yet the typical Middle Hopewell ceramic complex. Mound City, nearly equally early, already has characteristic Middle Hopewell pottery, while the famed caches of effigy platform pipes at both sites place Tremper and Mound City into close chronological proximity. Harness, Seip, and Hopewell are Middle Hopewell in Ohio terms, or middle Middle Hopewell by Illinois standards. Turner is late in Ohio, and late Middle Hopewell in Illinoian terms, because of the massive appearance of stone cist burials not covered by mounds, and because of the decline of cremation practices; both traits foreshadow characteristic Late Hopewell traits in Illinois as well as Fort Ancient Aspect traits in Ohio. Latest in this sequence are the well-known hilltop fortifications such as Fort Ancient and Fort Hill, which may represent a retreat of the Hopewellians in the face of some unknown disturbance, from their great ceremonial centers in the river valleys onto the hilly mountain tops that offered defensive advantages.

If this sequence is extended to extra-Ohio Hopewell sequences it is clear that Havana 9 antedates nearly all sites in Ohio. The Gibson Mound is Middle Hopewell in Illinoian terms. The Florida sites are almost certainly late on the Middle Hopewell horizon, and there are indications that this is also true of Mandeville in Georgia. The Ohio sites represent the full chronological range of Hopewell in that state.

For the Hopewell area in general, and for Ohio-Illinois Hopewell in particular, the data clearly suggest that meteoric iron was used at various times *within* Hopewell and throughout the geographic range covered by the Hopewell complex. The implications are, in the absence of reports from other eastern prehistoric complexes, that the use of meteoric iron is a true Hopewell horizon marker.

Considering the extreme scarcity of meteoric iron and the considerable amount of knowledge required to identify this substance, the massive use of meteoric iron by the Hopewellians is nothing short of amazing. It is difficult to believe that the use of this material by the Hopewellians was dependent upon its mere accidental discovery. On the other hand, the use to which it was put fits into the general pattern of Hopewell pseudo-metallurgical techniques. The most common metal used in the manufacture of metal objects was native copper, readily available by trade from the North; similarly, native silver and galena were imported from outside sources. In none of these cases did the acquisition of raw material have to depend on either luck or the most determined sort of perseverance as in the case of seeking the heavenly bodies.

Therefore the very consistency with which meteoric iron was used by the Hopewellians throughout seems to preclude the notion that they depended upon sheer chance finds. In other words, the abundance of the material appears to be evidence for deliberate meteorite collecting. For a people so much bent on continental-wide trade, this in itself perfectly fits the picture. What were the motivations for such a postulated deliberate search?

The obvious answer to this question would seem to be at first sight that ceremonial reasons underlay meteorite collecting. Conceivably the Hopewellians at one time or another witnessed a meteoric fall which started them off on a supernaturally-charged search. In view of the overwhelmingly ceremonial orientation of Hopewell culture this would be in no way surprising. Furthermore, it should be noted that all finds of Hopewell meteoric iron were recovered from mortuary-ceremonial contexts.

On the other hand, there is the fact that the usage and treatment of meteoric iron by the Hopewellians is in no way different from that of other metals. Except for its common occurrence, there is no evidence whatever of an awareness that meteoric iron was something special. However, practically all Hopewell metal objects, including some that also served ornamental or functional purposes, had

ceremonial significance. Thus, the majority of all Hopewell copper axes shows no signs of use; there are several very large and exceedingly heavy implements of this kind which obviously could not have served functional purposes; copper headdresses and breast plates, no doubt, were used ceremonially; and many of the copper earspools occur in the hands of the dead or in rows alongside the skeletons. Many spectacular Hopewell artifacts, including meteoric iron at Turner, were found in caches, sometimes ceremonially "killed." Finally, the ceremonial character of metal objects as well as of other characteristically ornate and exotic artifacts is underscored by the fact that they have not been found at village sites. In other words, whatever ceremonial attributes meteoric iron may have had, were simply submerged in the general ceremonial character of all typical Hopewell material from the great burial structures.

I suggest that Hopewell meteorite collecting was, in part, motivated by the characteristic reverence of the Hopewellians for exotic materials which in turn were used almost exclusively in the mortuary ceremonies as a form of conspicuous consumption. A deeper motivation may have been the possibility mentioned earlier that some Hopewellians actually witnessed a meteoric fall, in which case they may have had some knowledge of the nature of meteoric iron and of how to recognize it. Ethnographic evidence from aboriginal North America for witnessed falls will be discussed in the final section of this paper.

COMPARATIVE PREHISTORIC AND ETHNOGRAPHIC MATERIAL

This is not the place to discuss the abundant references to the use of meteoric iron and to historically recorded myths and accounts of meteors and meteorites in the Old World since the time of the invention of writing. The interested reader will find compilations of such data in Beck (1880), Brezina (1904), Farrington (1900), Newton (1897), and Zimmer (1916).

References to finds of prehistoric meteorites in the Old World are far less common. By way of exemplification the finds of an iron meteorite at an Upper Palaeolithic site in Czechoslovakia (Anonymous, 1930), and of a mass in a prehistoric burial at Mordvinovka near Ekaterinoslav in Russia (Brezina, 1904) may be mentioned here.

The remainder of this discussion will be devoted to data from North America and Mexico.

Outside of the Hopewell area and context, archaeological finds of meteorites are rare. They do not show a consistent cultural pattern of distribution. In fact, authenticated associations seem to be more a matter of casual meteorite collecting, perhaps because the fall was witnessed, or because the meteorites looked out of place in the environment in which they were found. This may especially have been true in certain areas of the Southwest and on the Plains. In this connection it should be remembered that the Brenham masses were noticed by local Kansas farmers because they occurred in an area otherwise devoid of rocks.

Nininger (1938) has reported finds of stony meteorites from four archaeological camp sites in western Kansas and Colorado. He notes that these associations may be fortuitous. The same may be the case with a series of additional meteorites found at a number of archaeological surface sites west of the Mississippi (Nininger, 1952). In none of these cases, totalling nine, were the specimens worked. No data on cultural context are given.

More interesting is the find of the Winona meteorite, a siderolite, Grahameite 44 in Brezina's classification, found in 1928, 5 miles northeast of Winona in northern Arizona near a small group of prehistoric ruins (Brady, 1928). The broken mass was discovered carefully buried in a sub-floor stone cist of a kind usually found to contain burials. A similar stone cist containing an iron meteorite carefully wrapped in a feather blanket, was found in a Pueblo ruin, 100 miles south of

Winona, at Camp Verde, Arizona. Associated ceramics indicate an age of 800 to 900 years (Nininger, 1952).

Another iron meteorite, classed as finest octahedrite, was found in 1930 in the old Pueblo of Pojoaque near Santa Fe, New Mexico, in association with a very small black-on-white pot. These finds were ploughed out of the ground by an Indian. The worn condition of the meteorite suggests that it may have been part of a medicine man's paraphernalia (Brady, 1931). Nininger (1938) states that this iron was a fragment of the Glorietta mass discovered 30 miles from Pojoaque.

In 1922 a medium-sized iron meteorite, weighing in excess of 7 pounds, was found in a prehistoric ruin in Mesa Verde National Park, Colorado. Merrill states that the specimen was found ". . . commingled with miscellaneous rock fragments in the Sun Shrine at the north end of Pipe Shrine House. . . . There was nothing in its position or surroundings to indicate that the aborigines by whom it was placed realized its ultra-terrestrial origin or regarded it with other or more interest than was attached to the fragments of soft sandstone and other rock débris with which it was associated." (Merrill, 1924: 1).

The large Huizopa iron, weighing 238.5 pounds was found in a prehistoric ruin near Huizopa, Chihuahua, Mexico, 60 miles west of Temosachic (Nininger, 1932). It is possible that the building had been constructed around the meteorite.

The Casas Grandes meteorite, a medium octahedrite, was found in the prehistoric Casas Grandes ruin in Chihuahua, 150 miles south of El Paso del Norte. The discovery dates from the middle of the nineteenth century. The meteorite weighed 3,407 pounds and was found in a "sort of grave" in the middle of a room, carefully wrapped in coarse cloth. The latter was similar to shrouds enveloping the bodies in nearby graves (Farrington, 1915).

Nininger (1938) refers to a small axe, shaped from a nickel-iron meteorite fragment and excavated in an unspecified ruin in New Mexico.

Finally, the Navajo Iron should be mentioned here. This large ataxite, consisting of two masses and weighing 4,814 pounds, was found in 1922, about 13 miles from Navajo, in Apache County, Arizona. Both masses were familiar to the Navajo Indians who claim to have known about them since their arrival in the Southwest. They regarded them as sacred and had hidden them under rocks and earth (Roy and Wyant, 1949). While these data properly are part of the ethnographic discussion of this section, the fact that one of the masses bears marks made by some kind of instrument may be of archaeological interest. The Navajo disclaim authorship of these markings, attributing them to the prehistoric pottery makers. In this connection a series of pictographs on nearby rock outcroppings should be noted. In addition, human bones were found buried underneath or beside the grooved mass (Brady, 1928).

Apart from the instances cited here, no other data are available on the prehistoric utilization of meteorites in North America. It will be noted that all references are to areas west of the Mississippi, and that with the exception of Camp Verde and Winona, the finds lack the patterning and cultural exclusiveness characteristic of the Hopewell material. Nonetheless, the very fact that a fair number of the meteorites reported here were obviously treated with ceremonial reverence suggests that the prehistoric Indians had some notion as to the meteorites' special nature. On the other hand, the Mesa Verde mass and the finds on camp sites suggest no such awareness. I suggest that those meteorites accorded special treatment may have been witnessed falls or that they attracted attention because of their unusual nature and location, or both. The "unceremonial" treatment of other specimens, such as Mesa Verde, implies that the Indians did not have sufficient knowledge to identify a meteorite per se as anything out of the ordinary.

The haphazard occurrence of archaeological meteorites outside the Hopewell culture province shows that we deal here with different patterns of meteorite

collecting. In the Hopewell cases some knowledge of the mineralogical nature as well as (less certainly) of the genesis of meteorites is indicated. Combined with a profoundly ceremonial orientation and an unflagging fascination for exotic goods, this led to a determined search for meteoric iron. Elsewhere in North America the preoccupation with meteorites was casual and unsystematic, as well as unsupported by deeper curiosity or a tightly knit ceremonialism directed toward the conspicuous consumption of precious and outlandish materials. It is significant that non-Hopewell prehistoric meteorite collectors, with one exception, never attempted to work the iron into tools or ornaments. The masses were always left intact.

There remains to be discussed the ethnographic evidence available for some of the suggestions and assumptions made in the preceding paragraphs. The discussion will be restricted to Greenland and North America.

The special treatment known to have been given by Indians and Eskimos to some well-known meteorites suggests a degree of awareness of their nature, presumably similar to that discussed in connection with prehistoric meteorite collecting. The degree of sacredness in which any given meteorite was held was, however, variable. Thus, the Eskimo near Cape York, Greenland, showed only vague ceremonial and mythological interest when Lt. Peary discovered and tried to remove the large Cape York irons in the 1890's. Prior to Peary's arrival, the Eskimo had for many years fashioned implements out of the metal; such tools were known as early as 1819 to Captain Ross. The Eskimo regarded the masses as heaven sent (Farrington, 1915).

The Red River meteorites in Texas were considered sacred by local tribes, though there is no evidence that they knew anything about their extra-terrestrial origin (Farrington, 1915). Similarly there was no awareness among the Comanches that the Wichita County iron of Texas came from the skies. In fact, they do not seem to have considered it sacred until they failed to break it up and to melt it down with fires built around it (Farrington, 1915).

The Toluca meteorites of Mexico, consisting of several hundred masses, have been known since before 1776. Local inhabitants, including Indians, avidly collected the metal, forging it into tools. The Toluca irons were neither held sacred nor was there any local knowledge of their origin (Farrington, 1915).

There is evidence that at contact time the Aztecs were familiar with meteorite iron which they considered more valuable than gold.

The Iron Creek meteorite in Alberta, Canada, was considered sacred by the Cree and Blackfeet who made annual pilgrimages to this mass which was considered potent medicine. Nonetheless the Indians had no notions of its extra-terrestrial nature (Farrington, 1915).

In the case of the Willamette iron in Oregon, local Indians considered the meteorite sacred, and believed it to have fallen from the moon. Similarly the Chilkoot iron of Alaska, while its sacredness is uncertain, was stated in the 1880's by its Indian owner to have been seen falling by the father of one of the tribe's oldest Indians about 100 years before. This meteorite shows signs of much handling (Farrington, 1915; Nininger, 1952).

Swanson notes, without giving his sources, that in historic times ". . . pieces of meteoric iron . . . were occasionally used for ornaments and implements . . ." by the Indians of the Southeastern United States (Swanton, 1946: 244).

Ethnographic data on beliefs regarding the origins of meteorites in general are scanty. Swanton (1928) reports that the Cree believed meteorites to have been heavenly "excrements cast upon the earth," which they mixed with their medicines. Hoffman reports a Menominee myth regarding meteorites which is worth quoting: "When a star falls from the sky, it leaves a fiery trail; it does not die, but its shade goes to the place where it dropped to shine again. The Indians sometimes find

the small stars in the prairie where they have fallen. They are of stone. . . ." (Hoffman, 1896: 210).

Reports of meteoric displays observed by Indians do not make it clear whether the aborigines connected such events with meteorites occasionally found on the earth's surface. The great display of 1833, which was observed over large parts of North America, is said to have caused great consternation among many tribes. Among the Pima in the Southwest it was considered an augury of disaster (Russel, 1908). The Kiowa referred to it for many years as the "winter that the stars fell," believing it to be a sign of danger. Similar views were held by the tribes of Missouri and some Mexican groups (Mooney, 1898). Many pictographic representations of this display and others are known from among Plains Indian tribes (Mallery, 1893). For many of these tribes it was the starting point of calendrical reckoning (Mooney, 1898).

The ethnographic evidence for Indian meteorite collecting is, on the whole, similar in pattern to that derived from prehistoric finds outside the Hopewell area. While in some cases the heavenly origin of the masses was known, in others this was not the case. Such meteorites were held to be special because of their unusual nature setting them apart from their environment. While there are some reports showing that implements were occasionally made of meteoric iron, this was not a consistent activity. In fact such practices may have been European inspired. In most cases the meteorites were considered objects of interest or veneration without being modified.

This pattern, as revealed by ethnographic sources, is quite similar to that of extra-Hopewell prehistoric meteorite collecting. It seems to be quite different from the pattern extrapolated for the Hopewell culture complex which appears to have been unique in aboriginal North America.

REFERENCES

- Anonymous.** 1930. Cave men collected meteorites in Europe, but they failed to make use of the iron. *N. Y. Times*. Sept. 18: 3.
- Atwater, C.** 1820. Description of the antiquities discovered in the state of Ohio and other western states. *Am. Antiq. Soc., Archaeol. Am., Trans. and Coll.* 1: 105-267.
- Beck, L.** 1880. Das Meteoreisen in technischer und culturgeschichtlicher Beziehung. *Archiv für Anthropologie* 12: 293-314.
- Brady, L. F.** 1928. The Winona meteorite. *Am. J. Sci.* 18: 477-86.
- . 1931. A new iron meteorite from Pojoaque, New Mexico. *Am. J. Sci.* 21: 178.
- Brezina, A.** 1895. Die Meteoritensammlung des k.k. Naturhistorischen Hof Museums am 1 Mai 1895. *Ann. des Naturhist. Mus. in Wien* 10: 231-70.
- . 1904. The arrangement of collections of meteorites. *Proc. Am. Philos. Soc.* 43: 211-47.
- Farrington, O. C.** 1900. The worship and folklore of meteorites. *J. Am. Folklore* 13: 199-208.
- . 1902. Meteorite studies I. *Field Mus. Nat. Hist., Geol. Ser.* 1: 283-333.
- . 1907. Analyses of iron meteorites compiled and classified. *Field Mus. Nat. Hist., Geol. Ser.* 3: 59-110.
- . 1915. Catalogue of the meteorites of North America to January 1, 1909. *Nat. Acad. Sci.*, 13: 513 p.
- Goggin, J. M.** 1952. Space and time perspective in Northern St. Johns archaeology. *Yale Univ. Pubs. in Anthropol.* 47: 147 p.
- Griffin, J. B.** 1958. The chronological position of the Hopewellian culture in the Eastern United States. *Anthropol. Papers, Mus. of Anthropol., Univ. of Michigan* 12: 27 p.
- Grogan, R. M.** 1948. Beads of meteoric iron from an Indian mound near Havana, Illinois. *Am. Antiquity* 13: 302-5.
- Hoffman, W. J.** 1896. The Menominee Indians. *Bur. Am. Ethnol., 14th Ann. Rept. for 1892-93*: 3-328.
- Huntington, O. W.** 1891. The prehistoric and Kiowa County pallasites. *Am. Acad. Arts and Sci., Proc.* 26: 1-12.
- Kellar, J. H., A. R. Kelly, and E. V. McMichael.** n.d. The Mandeville Site in Southwest Georgia. Mimeographed manuscript, 25 p.
- Kinnicutt, L. P.** 1884. Report on the meteoric iron from the altar mounds in the Little Miami valley, Ohio. 16th and 17th Ann. Rept. for 1882 and 1883, Cambridge, 1884; bound in Peabody Mus. Rept. 3: 381-84, 1887.
- Kunz, G. F.** 1887. On two new meteorites from Carroll County, Kentucky and Catorze, Mexico. *Am. J. Sci.* 33: 228-35.

- . 1890. On five new American meteorites. *Am. J. Sci.* 40: 312-23.
- Mallery, G.** 1893. Picture-writing of the American Indians. *Bur. Am. Ethnol.*, 10th Ann. Rept. for 1888-89: 3-807.
- Merrill, G. P.** 1924. Recently found meteoric irons from Mesa Verde Park, Colorado, and Savannah, Tennessee. *U. S. Nat. Mus., Proc.* 63: 4 p.
- Mooney, J.** 1898. Calendar history of the Kiowa Indians. *Bur. of Am. Ethnol.*, 17th Ann. Rept. for 1895-96: 129-444.
- Newton, H. A.** 1897. The worship of meteorites. *Am. J. Sci.* 3: 1-14.
- Nininger, H. H.** 1932. The Huizopa meteorite. *The Mines Mag.* 22: 11-12, 27.
- . 1938. Meteorite collecting among ancient Americans. *Am. Antiquity* 4: 39-40.
- . 1952. *Out of the sky.* Denver Univ. Press. 336 p.
- Palache, C.** Notes on new or incompletely described meteorites in the Mineralogical Museum of Harvard University. *Am. J. Sci.* 12: 136-50.
- Prufer, O. H.** 1961. The Hopewell complex of Ohio. Unpublished Ph.D. dissertation, Peabody Mus., Harvard Univ. x+784 p.
- Putnam, F. W.** 1883. Iron from the Ohio mounds. *Am. Antiq. Soc.* 2: 349-63.
- Roy, S. K., and R. K. Wyant.** 1949. The Navajo meteorite. *Field Mus. Nat. Hist., Geol. Ser.* 7: 113-27.
- Russell, F.** 1908. The Pima Indians. *Bur. of Am. Ethnol.*, 26th Ann. Rept. for 1904-05: 3-389.
- Swanton, J. R.** 1928. Religious beliefs and medical practices of the Creek Indians. *Bur. of Am. Ethnol.*, 42nd Ann. Rept. for 1924-25: 473-672.
- . 1946. The Indians of the Southeastern United States. *Bur. of Am. Ethnol.*, Bull. 137: 943 p.
- Taylor, W. J.** 1857. Examination of a nickel meteorite from Oktibbeha County, Mississippi. *Am. J. Sci.* 24: 293-4.
- Webb, W. S., and C. E. Snow.** 1945. The Adena people. *Reports in Anthropol. and Archaeol. Univ. of Kentucky.* 4: 369 p.
- Willey, G. R.** 1949. Archaeology of the Florida Gulf Coast. *Smiths. Inst., Misc. Coll.* 113: xxiii+599 p.
- Wülfing, E. A.** 1897. *Die Meteoriten in Sammlungen und ihre Literatur.* 460 p. Tübingen.
- Zimmer, G. F.** 1916. The use of meteoric iron by primitive man. *J. Iron and Steel Inst.* 94: 306-49.
-