RECENTLY FOUND METEORIC IRONS FROM MESA VERDE PARK, COLO., AND SAVANNAH, TENN.

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1. MESA VERDE PARK, COLO.[1]

The iron described below was brought to the Museum by Dr. J. Walter Fewkes, Director of the Bureau of American Ethnology, on his return from a field inspection trip during the summer of 1922. It was found, commingled with miscellaneous rock fragments, in the Sun Shrine at the north end of Pipe Shrine House in the Mesa Verde National Park of Colorado. 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.

As found, the iron—in the position indicated in the plate—stood 16 cm. in height by 10 cm. in breadth and 8 cm. in maximum thickness and weighed when cleaned 3.52 kilograms. It was considerably oxidized and many of the depressions partially filled with the oxidation products. The characteristic thumb marks or depressions are still in evidence, sufficiently plain to enable one to pronounce at once upon its meteoric nature. There are no broken surfaces, and evidently it represents a "complete individual." An etched surface (pl. 1, fig. 3) shows it to be a medium octahedrite of ordinary type. The kamacite bands are slightly swollen and plessite areas are proportionally abundant. Schreibersite and taenite are quite inconspicuous except under a glass. No secondary granulation (metabolism) is recognizable. Doctor Fewkes says that the position of the find was such as to indicate with a fair degree of certainty that it was placed there during the period of construction, and therefore that the time of fall can not be later than the thirteenth century, the date commonly assigned to these ruins.

[1] Museum Catalogue, No. 645.

It would seem strange that the iron had not excited more than passing notice by the native builders, but, as stated, there is nothing to indicate that it received other attention than that given to the Cretaceous fossiliferous limestone and sandstone fragments with which it was commingled. There is, however, a singular lack of evidence to show that the early American, even down to the modern Indian, realized the possible uses of metal, although quick to discriminate in the character of stone selected from which to make his weapons or articles for domestic use. The writer has elsewhere [2] called attention to the abundant small, sharp-edged thin flakes of meteoric iron found lying on the surface in the vicinity of the Canon Diablo crater. Many of these would seem to have been admirably adapted even in their natural condition to cutting and scraping purposes or even to weapons, but thus far there has not been put on record a single case of such usage. That the fall was an ancient one is beyond question, yet through all the hundreds of subsequent years the material has been ignored, if not wholly overlooked.

2. SAVANNAH, HARDIN COUNTY, TENN.[3]

The meteoric iron figured and described in the following pages was brought to my attention by Prof. Wilbur A. Nelson, State geologist of Tennessee, who reports that it was found by Messrs. C. D. Wright and M. W. Spencer while working on the road forming the main highway between Savannah and Cerro Gordo in Hardin County and some 4 miles northeast of the first-named town. The mass was brought to the survey office of the State geologist under the supposition that it was an iron ore, and there identified. In the autumn of the present year it was sent to the National Museum, where it has been cut along its greatest diameter and etched and portions submitted for analysis with results given below.

As found the iron is in form of a rough, somewhat flattened, dumbbell-shaped mass (see pl. 2) greatly oxidized on the exterior surface. Its maximum dimensions were 143.5 by 25.5 by 16.5 cm. and its weight some 60 kilograms (135 pounds). Neither dimensions nor weight can be given accurately, as small fragments of oxidized material were continually scaling away.

An etched surface shows the iron to be, with the exception noted later, a normal coarse ochtahedrite but much pitted by oxidation, which has so deeply penetrated the mass as to greatly weaken it and render it liable to fracture through the middle or most constricted portion. The kamacite bands are quite variable, being at times of

[2] Contributions to the Study of the Canon Diablo Meteorite, Smithsonian Misc. Coll., vol. 50, pt. 2, 1907. Note particularly pl. 21.
[3] Museum Catalogue, No. 706.

uniform thickness throughout or again swollen, as is shown in the plate. Plessite areas are abundant and large, varying in size up to 10 mm. in diameter. No troilite nodules are visible on the cut surface, and no schreibersite. The taenite is visible on the etched surface only in the usual disconnected thin films.

The striking feature of the iron lies in the varied orientation of the crystal plates in the center and two end portions of the mass (see pls. 2 and 3). It will be noted that in this central portion (*D*) the kamacite plates are for the most part thin, closely crowded, and lie nearly horizontally (in the figure). To the left they become separated and the structure becomes more nearly that of a normal octahedrite. On the right, however, along the somewhat wavy line *A–B*, they abut against a single disconnected row of plates extending nearly vertical and are no longer continuous throughout the remaining portion of the mass to the right. Nor are the vertical and diagonal plates *C* and *E* in the two portions quite parallel with one another, and there is a slight difference in manner of etching and in the relative thickness of the kamacite bands in the two portions. This last is most plainly noticeable in the lower part of plate 3. What portion of these differences may be due to the angle of cutting, the writer is not at present prepared to say; the appearance is certainly such as to suggest the welding of two quite similar irons along this line rather than twinning after the manner of the Mukerop, as is described by Berwerth.

Chemical analysis by Whitfield yielded:

	Per cent.
Iron	83.621
Nickel	7.762
Cobalt	.333
Phosphorus	.130
Sulphur	.058
Chlorine	.107
Carbon	.475
Silicon	None.
Manganese	None.
Copper	None.
Metallic oxides	5.895
Water	1.290
Insoluble	.346
	100.017

The 5.895 per cent metallic oxides yielded ferric oxide (Fe_2O_3), 4.995 per cent; nickel and cobalt oxides (NiO—CoO), 0.94 per cent. The 0.346 per cent insoluble yielded 0.242 per cent iron. A "direct" determination gave 87.802 per cent total iron. This is a little below the average for a coarse octahedrite, though, as usual, this is com-

pensated for by a correspondingly high content of nickel, as exemplified also in the irons of Bendego, Canyon City, and Magura. Otherwise the results seem in no way worthy of remark, unless the absence of copper and tin should be so considered.

EXPLANATION OF PLATES.

PLATE 1.

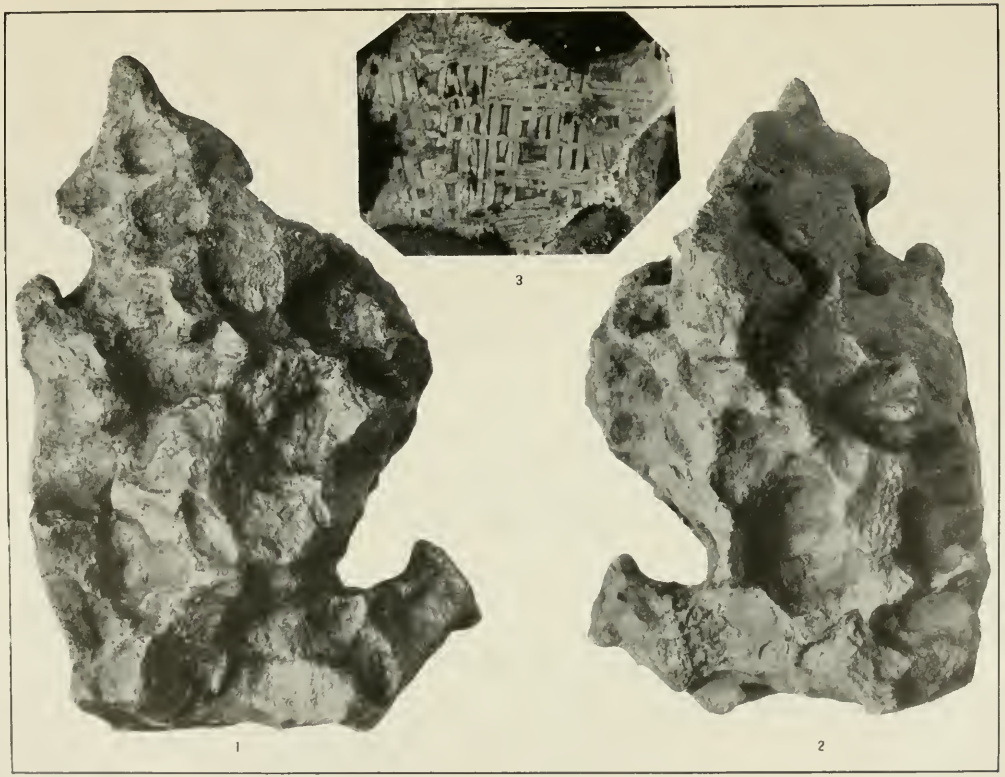
Figs. 1 and 2.—Mesa Verde iron in reversed positions. Fig. 3.—Etched surface of portion of Mesa Verde iron.

PLATE 2.

Etched surface of Savannah meteoric iron; full-length section.

PLATE 3.

Etched surface central portion of Savannah meteorite enlarged.

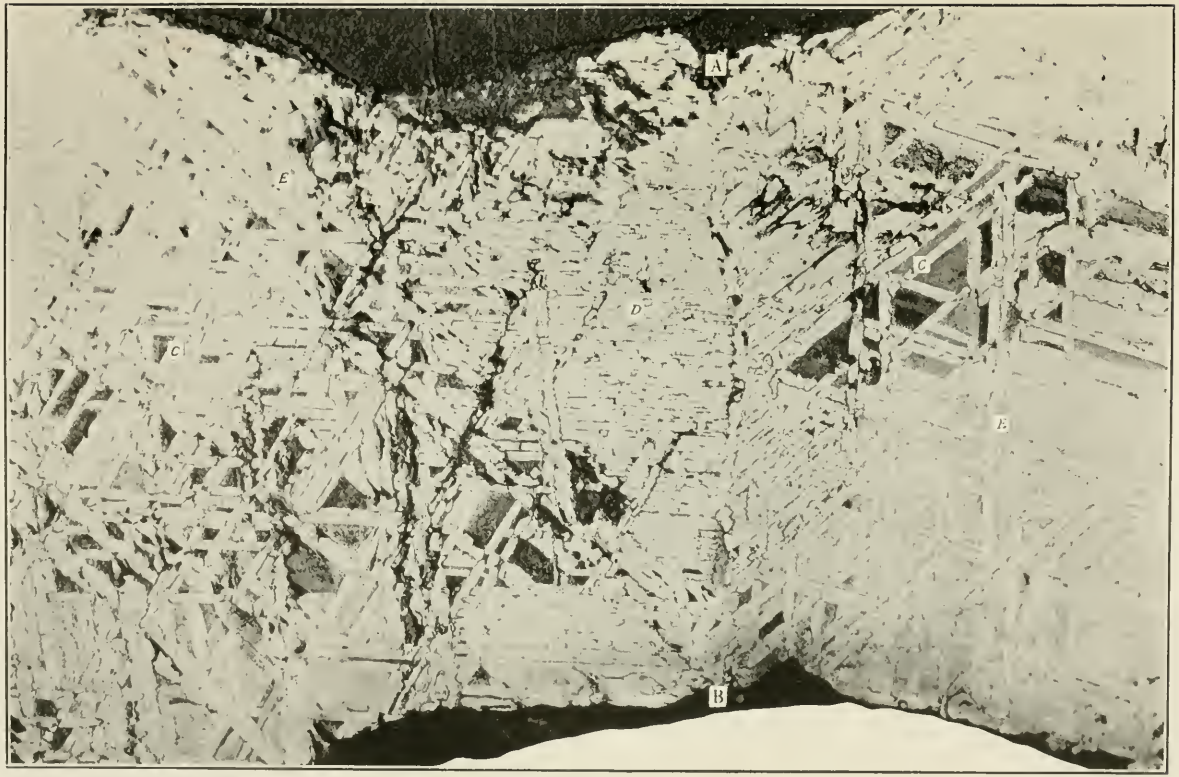


MESA VERDE PARK, COLORADO, METEORIC IRON.

FOR EXPLANATION OF PLATE SEE PAGE 4.

The Savannah, Tennessee, Meteoric Iron.

For explanation of plate see page 4



THE SAVANNAH, TENNESSEE, METEORIC IRON.

FOR EXPLANATION OF PLATE SEE PAGE 4.