31

Estacado

Dupe.

[From The American Journal of Science, Vol. XXII, July, 1906.]

THE ESTACADO AEROLITE.

Description by Kenneth S. Howard, Analysis by John M. Davison.

ART. IX.—*The Estacado Aërolite;* Description by KENNETH S. HOWARD; Analysis by JOHN M. DAVISON.

I

THE aërolite from Texas recently obtained by Ward's Natural Science Establishment, as noted in the February issue of this Journal, has been brought to Rochester, sliced, and analyzed chemically and petrographically.

What is known concerning the fall of this meteorite is told by a resident of Hale Center, Texas: "The best history I can give of the meteorite is as follows: It was found twelve miles south of Hale Center, which is located in the center of Hale County, Texas, in the spring of 1902, or rather that is when it was taken home by R. A. McWhorter, who has been the owner of it all the time. In the year of 1882 a bright meteor was seen one night by the people of a Quaker colony called Estacado. This place is about fifteen miles southeast of where the meteor was found. The meteor was seen to pass to the west and fall northwest from them. At that time this Quaker colony was the only settlement on the whole Staked Plains, and the only people outside of them were a few scattering cowmen. In the following year of 1883 a few cowboys, in rounding up the range, saw this meteor and the Estacado people felt certain that this was what they saw fall the year before, and we have all considered it so." As the region is a stoneless one, the attention of the people of the vicinity were naturally attracted to this remarkable mass. The name of the settlement, Estacado, seems most appropriate for the aërolite.

The weight of the meteorite before sawing was about two hundred ninety kilograms, it thus being among the largest of known aërolites. Its form was trapezoidal, as shown by the photographs. Its longest diameter was 58·5^{cm}, while its other two diameters measured 45·7^{cm} and 44·4^{cm}. It was cut in half parallel to its longest and shortest diameters. Several slabs were taken off at the same time, one of them being shown in photograph 3. The greatest vertical diameter of this slab is about 18^{cm} back of what was apparently the "nose" of the meteorite.

The exterior of the mass is rusty brown in color, probably due to terrestrial oxidation. The sawed slices of the stone show a tendency to rust rapidly. Hardly any of the coating of the meteorite approaches in appearance the black of an original crust. On some of the sides the oxidation has been considerable, a scale knocked off of one side being 3 to 4^{mm} thick. As shown by the photographs (figs. 1, 2), the mass has

FIGURE 1.

FIGURE 2.
The Estacado Aërolite.

eight well-marked sides, one of which (F in photograph 3) looks like an old fracture surface. The oxidation on this side is less than elsewhere and there is no apparent variation in structure as the edge is approached, such as there is on the other sides. The sides are quite flat, some of them even slightly concave, the edges between adjoining sides being, for an aërolite, fairly angular.

Side A has a smoothed appearance and may have been the "nose" of the mass in flight. The surface markings on this

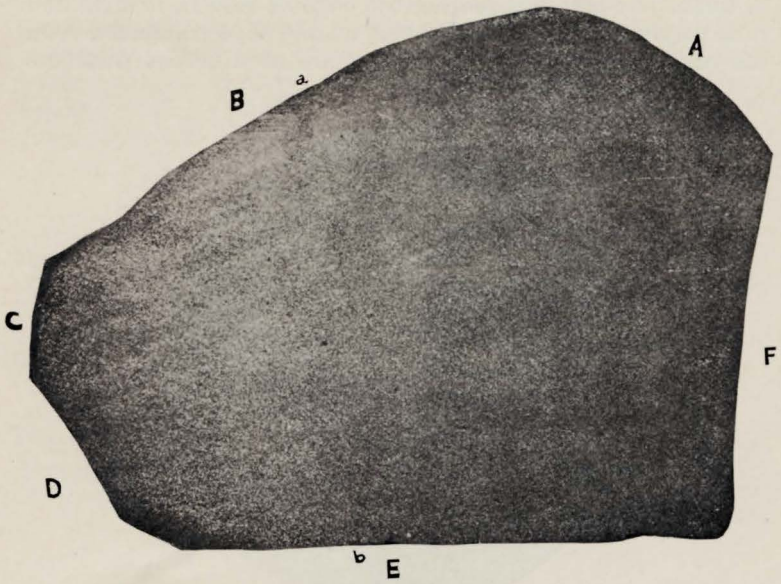

FIGURE 3. Longitudinal slice of Aërolite.

side are not deep, while on sides D and E, which are opposite A, there are well defined pittings.

The stone is a crystalline chondrite, its structure being very similar to the Pipe Creek aërolite, which is also from Texas. In Brezina's classification Pipe Creek is placed in group Cka.

The slab shown in the photograph is 53·4^{cm} in length and 40·6^{cm} in height. The polished surface shows a dull black ground mass thickly permeated with irregular particles of nickel iron. Roundish enstatite chondrules of a more shiny black are scattered through the stone. Here and there are green olivine chondrules, some of which are larger than any of the black chondrules. The largest of the green ones, which is in the center of the slice shown in the photograph (fig. 3), measures about 1^{cm} in length.

The slice also shows some other interesting markings. Some five centimeters from the center toward the smaller end a straight dark line (ab) runs across the meteorite at an inclination of about 15° from the vertical. It passes just to one side of one of the olivine chondrules shown in the photograph. Parallel to, and 15^{cm} from, side A is an irregular and somewhat broken line composed of the metallic particles. This line runs from the edge of side F nearly to the edge of side B.

The line also shows on some of the other slabs, and on one of them, just before it reaches the edge of side B, it turns and runs parallel with the edge for a couple of centimeters. On the various slabs the metallic lines are at different distances

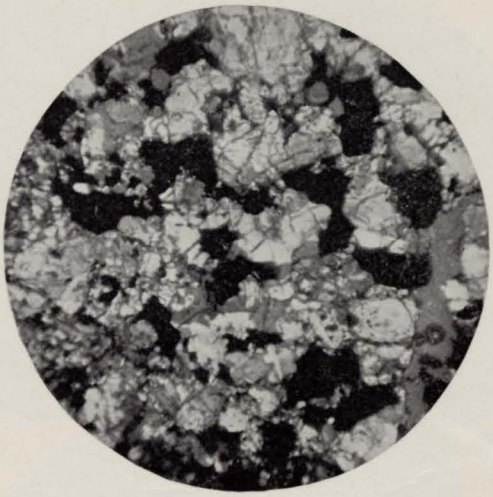

FIGURE 4. Micro-section. ×40.

from side A, indicating that a seam of this material passes through the meteorite obliquely to the cut surface. From the edge of side F, which shows comparatively slight oxidation, three indistinct veins run into the meteorite. They are black, indefinite in outline, and somewhat branching.

A petrological analysis by W. Harold Tomlinson of Germantown, Pa. shows that the mineral constituents are olivine and enstatite. Some pyrrhotite was also found. Mr. Tomlinson remarks: "The olivine and enstatite occur both as grains and as chondri. The grains of olivine contain frequent inclusions of smaller grains and of iron, and occasionally have gase-

ous inclusions. The inclusions in the enstatite are generally parallel to the cleavage." He found the specific gravity to be 3·60. The microphotograph (fig. 4) was made between cross nicol prisms, the magnification being about forty diameters.

II

Chemical Analysis by John M. Davison.

The specific gravity of the Estacado aërolite is 3·63. The metallic part was separated with a magnet, and the slight amount of adhering stony matter determined and deducted.

The stony part was separated by hydrochloric acid into a soluble and an insoluble portion. The insoluble portion was digested with a solution of Na_2CO_3 and the dissolved SiO_2 added to that dissolved by HCl. This analysis gave

Metallic		16·41 per cent.
Stony	Soluble in HCl	41·09 "
	Insoluble in HCl	42·50 "
		100

Analyses of these, omitting minor constituents and calculated to 100, gave

Metallic.		Soluble in HCl.		Insoluble in HCl.	
Fe	89·45	SiO_2	32·00	SiO_2	63·57
Ni	9·99	MgO	32·02	MgO	23·45
Co	0·56	FeO	31·60	FeO	9·54
		CaO	4·38	CaO	3·44
	100		100		100

The stony part appears to be mainly olivine and enstatite. The analysis of the entire mass gave the following percentages:

Fe	14·68	Al_2O_3	3·60
Ni	1·60	Na_2O	2·07
Co	0·08	K_2O	0·32
Cu	trace	TiO_2 found but not determined	
C found but not determined		Cr_2O_3 " " " "	
S	1·37	MnO " " " "	
P	0·15		
SiO_2	35·82		100·95
FeO	15·53	Less O for S	·68
MgO	22·74		100·27
CaO	2·99		

Of the S found 0·82 per cent came from the metallic and the portion soluble in HCl, and 0·55 per cent from the insoluble portion fused with Na_2CO_3. In this fusion the crucible was screened by a close fitting asbestos board, and a blank experiment showed that there was no contamination from the gas flame. This distribution of the S would indicate that nearly half of the troilite was embedded in the enstatite protected from action of acids.

From 3·9597 grams of the aërolite 0·025 gm. of chromite was separated by repeated treatment with HFl and other acids. With the chromite were a few minute particles of a transparent colorless mineral that had survived this usage, though evidently attacked.

Search was made for ZrO_2, with negative result.