A GOLD-BEARING STONY METEORITE FROM MELROSE, NEW MEXICO

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The Melrose meteorite, which was first recognized by the writer in February, 1933, evidently represents a very old fall. The 68½ lbs. (31 kgs.) stone which constitutes so far as known, the principal mass of the fall, had been encountered by the plow each season for a number of years. Finally it was hauled away to a ditch and later sought out to be used as a weight on one of the farm implements where it was doing service when its true nature became known.

As the stone reached the laboratory it was rather badly fractured from weathering, and one end had been seriously shattered by a blow from a hammer. The original fusion crust of the stone had all been displaced by oxides of iron, but these oxides nowhere formed a heavy scale except where large metallic inclusions lay immediately below the surface. The surface contour of the meteorite was typical of aerolites—angular, with rounded corners and edges, and noticeable pitting on two sides. It showed no orientation. In weathering, however, the stone showed a tendency to fracture along parallel planes which observed from the outside, suggested a layered structure. Cutting and polishing did not, however, reveal any trace of stratification.

The general color of the stone was somewhat lighter brown than is usually the case with weathered aerolites. This is thought to have been due to its long burial in the soil for the four other stones from this fall which were found later showed the usual dark brown oxide coat. These stones were exposed on the surface when found.

A few months after the first stone was recognized, four other stones weighing respectively: 7021 grams; 5660 grams; 4077 grams, and 3624 grams, were found about 26 miles west of Melrose, near Lalande postoffice. Because of their resemblance to the Melrose stone, these were at once suspected of belonging to the same fall, and a microscopic examination of the polished sections justified such a conclusion even though the distance between the two locations is greater than has ever been recorded for members of the same fall.

The interior of all of these five stones showed, on fresh fracture, a dark brownish gray color with a greenish tinge much like the

McKinney, Texas, stones. Abundant small grains of sulphide were in evidence and in a few cases inclusions of this material were found measuring several mm. in diameter. No nickel-iron could be detected on a surface exposed by fracture; but grinding on a carborundum wheel quickly revealed numerous irregular grains of this alloy.

The large stone was taken to the Nininger Laboratory and some slices removed and polished. An examination of these proved that the stone was to some extent chondritic; but showed no color contrast between the chondri and the ground mass. Nickel-iron was of

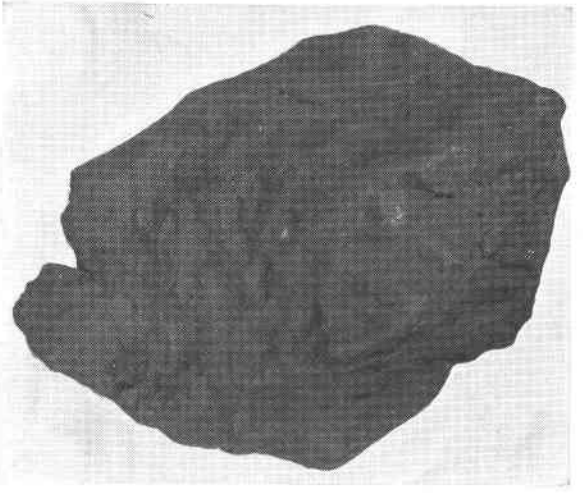

FIG. 1. The Melrose meterorite. Weight 68½ lbs.

ordinary abundance, the grains ranging from minute particles too small to be seen by the unaided eye, up to 7 mm. or 8 mm. in largest dimensions. The sulphide also showed a great range in size of particles. The largest reaching as much as 12 mm. in the greatest diameter. The sulphide grains were frequently found in intimate association with the nickel-iron, sometimes completely surrounded by the latter.

When one of the later-found stones arrived and was cut, it was found to be in a much better state of preservation and the polished surface evidenced characters not visible in the first stone. Distributed through the matrix, according to much the same pattern as is the olivine in pallasites of the Krasnojarsk group, were plainly

seen greenish oval inclusions of this material standing out in rather bold contrast with the surrounding matrix. In other respects the stones appeared similar and a chemical test seemed to confirm their identity as to origin.

The most striking characteristic of this meteorite is its content of gold. In carrying out the usual chemical analysis for stony meteorites, Mr. F. G. Hawley, under date of July 24, 1933, reported as follows: "The generous sample which you sent permitted me to make a good determination for Pt. metals. I think not very many stony meteorites have been tested for Pt. It surprised me somewhat to find so much in a stony meteorite so I made a second assay to be sure there was no mistake.

"Always as a confirmatory test for Pt I dissolve the bead of Pt metals in aqua regia, then concentrate and add stannous chloride which gives a reddish brown color if Pt is present. If gold is present it will give a purple color known as the "Purple of Cassius Test." In all of my previous tests for Pt in meteorites I have obtained only the red-brown color, but this time I got a decided purple tint to the color which apparently indicates that some gold is present with the Pt. If I am correct this is surprising, for I understand that Au has rarely, if ever, been found in meteorites. Also, in dissolving the Pt metals button in aqua regia any iridium or ruthenium will remain insoluble and show up as dark specks of undecomposed residue. Practically always, I have noticed this phenomenon but in this case it dissolved completely with no trace of Ir or Ru (see "Composition and Structure of Meteorites" *U. S. Nat. Museum Bul.* **149**, p. 8 footnote).

"I think I am right about the presence of Au; but before certifying it I should like to make two more tests by fire and run them a little differently to separate the gold, if you will send me more material.

"If I find gold is really present I think you should have some other chemist, experienced in this work, check my results so as to leave no doubt in the minds of other scientists regarding its correctness."

The requested sample was sent at once, and on August 15, 1933, Mr. Hawley reported that he had made two more tests which checked exactly, giving .03 oz. Au per ton, and .12 oz. Pt per ton; but stated that the indications were that this second sample was not as rich as the first.

Meanwhile, a sample consisting of many small chips from the shattered portion of the large stone had been submitted to the American Smelting and Refining Company of Denver, for a gold assay. This plant was considered to be in a position to give an extremely accurate assay since no gold samples are handled in the laboratory where the work was done—all gold assays being sent to another plant, hence there would be no danger of accidental "salting." Duplicate tests were run, resulting in .30 oz. and .32 oz. per ton, respectively.

When the later-found stones were sectioned the slush from the saw was saved as nearly complete as possible and sent to Mr. Hawley for another assay. As nearly as could be computed this slush contained about 150 grams of meteoritic dust. The assay again proved that gold was present, and on the basis of our estimate of 150 grams the sample yielded .02 oz. per ton.

In the light of these various assays it is evident that the gold is unequally distributed throughout the meteorite. The chemical analysis by F. G. Hawley was reported as follows:

ANALYSIS OF THE MELROSE METEORITE

Metallic Portion ..... 0.222 grms.

Analysis

Fe	89.1 %
Ni	9.2 %
Co	1.5 %
Cu	0.02%

Non-Metallic Portion ..... 49.6 grms.

Analysis

FeO	16.13%
Fe_2O_3	12.03%
NiO	1.23%
CoO	0.08%
Cr_2O_3	0.56%
Al_2O_3	2.20%
TiO_2	0.12%
MnO	0.29%
CaO	2.35%
MgO	22.15%
K_2O	0.08%
Na_2O	0.29%
SiO_2	35.90%
SO_3	0.35%
Cl	0.06%

P_2O_5	0.22%
FeS	4.95%
H_2O	1.16%
	100.15

Pt. metals ..... 0.24 oz. per ton.

Gold Assays on the Melrose Meteorite. All made in Duplicate.

No. 1. F. G. Hawley ..... 0.03 oz. per ton.
No. 2. F. G. Hawley ..... 0.02 oz. per ton.
No. 3. American Smelting & Refining Company ..... 0.30 and 0.32 oz. per ton.

A petrographic examination of the Melrose stone is being made by W. A. Waldschmidt of the Colorado School of Mines and will be reported upon later by that investigator.