

HERETOFORE UNDESCRIBED METEORIC IRONS FROM  
[1] BOLIVIA, SOUTH AMERICA, [2] WESTERN ARKAN-  
SAS, AND [3] SENECA TOWNSHIP, MICHIGAN

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The recently received F. A. Canfield bequest of minerals contained representatives of seven falls of meteorites one of which (that of Nanjemoy, Md.) was a stone, one a pallasite, and the remaining five irons. Among these last were two with localities quite too indefinite to make them of great value or consequence, but which should nevertheless be recorded. These are as follows:

[1] *Bolivia (Cat. No. 793)*.—This is a complete individual in form of a flattened oval (see pl. 1) without deep pittings or unusual surface markings, quite fresh, and weighing 21.25 kilograms (46.75 lbs.). The only information regarding it is given in Canfield's own hand in a leaf from an old letter of which the first page and date are missing. It reads: "A friend has given me a mass of meteoric iron which weighs 47 pounds and has never been cut. It was found 30 years ago and purchased by a priest, who thinking it was silver paid \$600 in gold for it."

The iron is soft and malleable, and etches but poorly (pl. 2, lower), showing irregular somewhat wavy kamacite bands with little or no plessite and taenite in minute, almost microscopic films; schreibersite is present in scattered granules. The kamacite bands show under a low power a very fine granular structure. A representative piece submitted to E. V. Shannon was reported on as follows:

The piece of the iron which, ground free from scale, was used for the analysis weighed 22.1325 grams. Except insoluble matter, copper, and platinum, the determinations were made upon aliquot portions of this solution equivalent to 1.1066 grams each. Copper and platinum were determined in the residuum of the solution equivalent to 15.4929 grams of the iron. The results of the analysis are as follows:

	Per cent
Insol.....	0.042
Fe.....	94.212
Ni.....	5.626
Co.....	.320
Cu.....	.0004
Mn.....	None.
S.....	.014
P.....	.261
Pt.....	Trace.
	100.4754

The insoluble matter, very small in amount, was examined under the microscope and found to consist of fine quartz and carborundum grains and a little opaque dust. It is probably all extraneous.

The reaction for platinum is of special interest. A portion of the hydrochloric acid solution of the iron equivalent to 15.4929 grams was saturated with hydrogen disulphide ( $H_2S$ ) and filtered. The separated sulphur was filtered out together with the platinum (Pt) and copper (Cu) as sulphides, and ignited in a porcelain crucible. The residue, consisting in considerable part of iron oxide, was digested overnight in strong hot hydrochloric acid, diluted and filtered through a very small filter. The filter paper showed a visible black residue ( $PtS?$ ). This was returned to the porcelain crucible, ignited and treated with aqua regia in the crucible and evaporated to dryness. After several evaporations to dryness with hydrochloric acid to expel free chlorine and nitrates the residue was several times evaporated to dryness with water, taken up in water and a few drops of potassium iodide were added. The red color characteristic of platinum immediately appeared. The procedure was repeated and the result was the same. This composition taken in connection with the structure would relegate the mass to the class of kamacite octahedrites.

[2] *Western Arkansas (Cat. No. 794)*.—This is a somewhat rounded triangular mass, polished and etched on one side and weighing 1.75 kilograms. It was labeled in Canfield's hand "Meteor found in Arkansas, presented by I. Price Wetherill, (?) June, 1890," and on the obverse "Mr. Wilkins said a native mountaineer brought this specimen to him in Joplin." With so little of its history known the iron would have not been considered worthy of investigation but for peculiarities noted below.

The iron etches very poorly, yielding a dull lusterless surface on which the taenite plates are so thin as to be scarcely distinguishable but by the aid of a lens. The kamacite bands are rarely over 1 millimeter in thickness and are very finely granulated throughout. Two very thin dull black wavy lines or veins the nature of which can not be determined traverse this face diagonally. Numerous very

small glistening points are assumed to be schreibersite. On account of lack of information regarding it further investigation was not attempted. Mr. Shannon has, however, made an analysis, the results of which are given in column I below.

The iron was analyzed by the usual methods on a piece, ground free from scale or inclusions, weighing 11.0383 grams. The composition is shown in column I below:

	I	II
	Per cent	Per cent
Insoluble .....	.013	
Iron .....	94.858	94.07
Nickel .....	5.121	5.02
Cobalt .....	.353	.38
Copper .....	.013	Trace.
Platinum .....	None.	
Manganese .....	Trace.	
Phosphorous .....	.020	.06
Sulphur .....	.009	
Chromium .....	None.	Sn .09
	100.387	99.62

There is nothing striking in this result, but by a singular coincidence Prof. S. W. McCallie (of the Georgia State Survey) has but recently reported an iron found at a locality called Social Circle in his State that presents an almost identical appearance and granulated etched surface. The composition (column II above) agrees so closely that both analyses might have been thought made from the same mass except for the 0.09 per cent of tin, which is perhaps open to question.

[3] *Seneca Township, Lenawee County, Michigan (Cat. No. 786).*—This iron was brought to my attention by Stuart H. Perry, of the Adrian Daily Telegram, with the statement that it was found in July, 1923, and that it is supposed to be the result of a fall seen at Seneca Township in 1914. The evidence thus far submitted can not, however, be considered as altogether confirmatory.

As shown in the plate (pl. 2, upper), the mass is in the form of a flattened oval, and though oxidized and scaling somewhat on the outer surface still shows traces of the larger original thumb markings. That it has lain exposed for some years is unmistakable. The present weight is 11.5 kilograms. An analysis by E. V. Shannon in the Museum laboratories yielded:

	Per cent
Iron .....	87.77
Nickel .....	11.41
Cobalt .....	0.26
Copper .....	0.01
Sulphur .....	0.05
Phosphorus .....	0.15
	99.65

No platinum was detected, as the amount of material furnished was insufficient for a satisfactory test.

An etched surface shows the iron to be a medium octahedrite, the content of nickel places it with the rodeo group.

#### DESCRIPTION OF PLATES

##### PLATE 1

Two views of the Bolivian meteoric iron in the Canfield Collection.

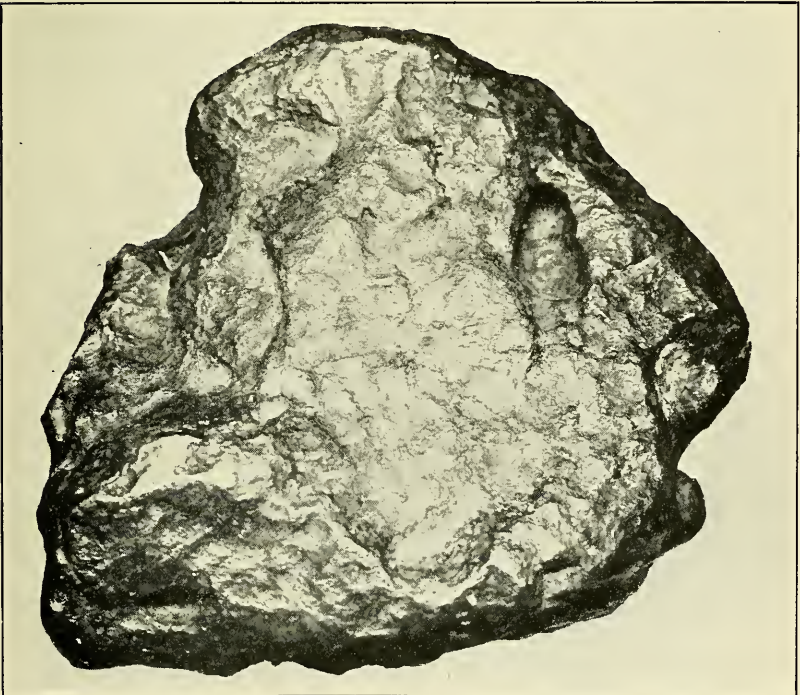
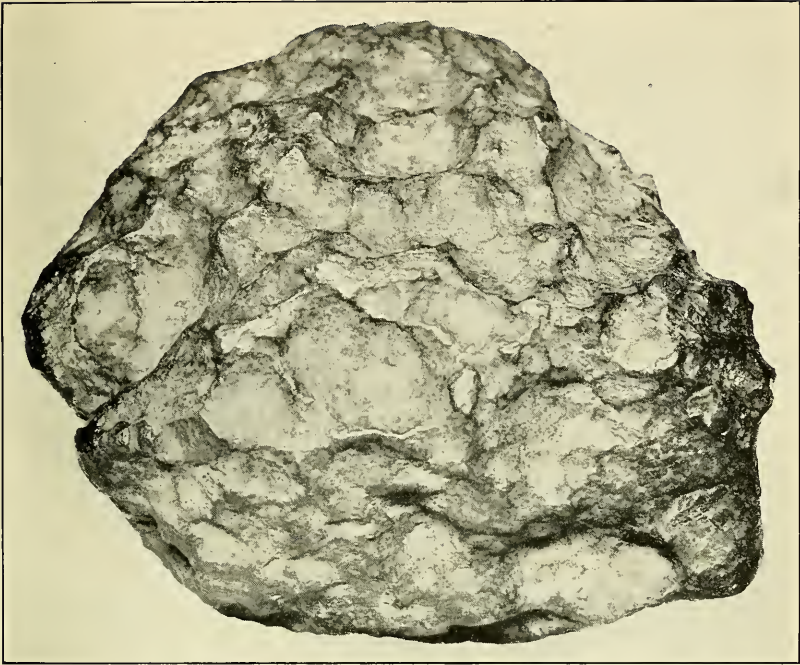
##### PLATE 2

Upper: Meteoric iron from Seneca Township, Michigan.

Lower: Etched slice of Bolivian meteoric iron shown in plate 1.







**BOLIVIAN METEORIC IRON**

FOR EXPLANATION OF PLATE SEE PAGE 4



METEORIC IRON FROM SENECA TOWNSHIP, MICHIGAN



ETCHED SLICE OF BOLIVIAN METEORIC IRON

FOR EXPLANATION OF PLATE SEE PAGE 4