

THE FISHER, POLK COUNTY, MINNESOTA, METEORITE.

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In the *American Geologist* for December, 1894, brief mention is made of the finding near Fisher, Polk County, Minnesota, of a meteoric stone weighing $9\frac{1}{2}$ pounds. This, the first found within the State limits, was assumed to be a representative of a reported fall which took place on the 9th of the preceding April. In a subsequent number of the *Geologist*, Prof. N. H. Winchell began a petrographic description of the stone, which was continued over into volume 20, 1897, but not completed, nor was a satisfactory chemical analysis made.¹ In view of these facts and the subsequent finding of more material, a complete reviewal of the matter seems desirable.

According to Professor Winchell there had been found at the time he wrote but two stones, one, the $9\frac{1}{2}$ -pound mass mentioned above, and one, weight unknown, "but larger," which was broken up and largely lost, though several pieces passed into the possession of Dr. George F. Kunz. Later three other individuals were found, one of which, a beautifully perfect stone weighing 1,312 grams, came into the possession of the United States National Museum. The following information concerning the fall and finding of these pieces was furnished the writer by Mr. C. J. Sweet:

On that date [that is, April 9, 1894] persons in the neighborhood of here [Fisher] heard a loud explosion followed by a hissing noise as of steam escaping from high pressure, and then a thud as if something had struck the earth very solidly. Of course nothing was known of the cause of the disturbance at this time, but in the summer following a black stone was found which proved to be a meteorite of $9\frac{1}{4}$ pounds weight. This piece was sold to the Minnesota State University, the authorities there claiming it the first which was ever found in this State. The next summer (1895) two small pieces of the same meteorite were found by me and sold to a firm in New York. This summer (1898) I found another piece when breaking up a new field. This piece weighs slightly less than 3 pounds.

In addition to information furnished as above, I am informed by Dr. E. O. Hovey that there is in the American Museum of Natural History, New York, "a beautiful specimen of Fisher, Polk County,

¹ See *American Geologist*, vol. 14, 1894, page 389; vol. 17, 1896, page 173; and vol. 20, 1897, page 316.

Minnesota, aerolite approximately 16.4 cm. by 10.6 cm. by 8.1 cm., weighing 1,765 grams, with crust well preserved. One curved surface shows the original crust and there are about six fractured surfaces showing a secondary, tertiary, or perhaps quarternary crust with pittings and flowage lines." Doctor Hovey further states that a second mass from the same source, weighing 1,850 grams, was sent by the American Museum to Doctor Gottsche of Hamburg. These two stones were originally in the possession of Dr. G. F. Kunz and are beyond doubt the two found in 1895 as mentioned by Mr. Sweet above. A third fragment, weighing 28 grams, he also records as having passed in 1913 into the hands of the dealer, W. M. Foote, and 22 grams are listed by Doctor Berwerth in his collections in the Vienna Museum. Dr. O. C. Farrington reports, in answer to inquiry, that the Field Museum collections include three fragments weighing, respectively, 133, 185, and 277 grams. Two of these are doubtless from the Ward-Coonley collection mentioned in the catalogue of 1904. It would seem practically certain that all of these fragments were from the larger mass mentioned by Winchell, the principal portion of which is lost. The distribution and weights as known to-day are then as follows:

	Grams.
University of Minnesota, Minneapolis	¹ 4,340
United States National Museum, Washington	² 1,300
American Museum, New York	1,765
Natural History Museum, Hamburg.....	1,850
Field Museum, Chicago.....	595
Vienna Museum, Austria.....	22
W. M. Foote, Philadelphia.....	28
Total.....	9,900

Through the courtesy of Prof. W. H. Emmons of the University of Minnesota, the writer has had the opportunity of examining the stone in the possession of that institution and was also granted permission to cut from it a sufficient amount to guarantee its identity with that in the Museum collections and to supplement sufficiently that cut from our own specimen to insure a satisfactory chemical analysis.

The general appearance of the stone on a broken or polished surface is closely similar to that of Forest City, Iowa, and still more to that of Coon Butte, Arizona.³ The stone is of a compact texture, sufficiently firm to admit of a polish, of a light gray color, and is thickly spotted with metallic points in sizes up to 3 mm. in diameter with numerous small, distinct, light gray chondrules and more rarely larger (2 mm.) white forms. Each specimen examined shows one curved, crusted area, with few distinct pittings, evidently a portion

¹ 4,390, when found. ² 1,312, when found. ³ J. W. Mallet, *Am. Journ. Sci.*, vol. 21, May, 1906, p. 347.

of the surface once continuous over the entire mass (A in plate). The remaining surfaces, which are plainly due to the fracturing of the stone in the lower atmosphere, are characterized by shallow pits. All are coated with a black, lustreless, somewhat rough coating caused by the unequal fusibility of the various constituents. This is plainly shown in the half tone reproductions from the photographs. Three crusts are recognizable (1) that first formed (A in plate), (2) a thinner crust covering the earliest fractures, and (3) a very thin crust covering limited areas of secondary fracture. I find no certain evidence of a quarternary coating, as mentioned by Doctor Hovey, on the specimen in the American Museum.

Under the microscope the stone is found to consist of a confused aggregate of irregular crystalline granules of olivine and pyroxene interspersed with numerous imperfectly outlined chondrules, consisting also of olivine and pyroxene, throughout which are occasional interstitial areas occupied by a colorless, pellucid, faintly doubly refracting or quite isotropic material, referred to maskelynite. Small areas of nickel and iron sulphide complete the list of determinable minerals. The chondrules are sometimes wholly of pyroxene, either in stout irregular crystals or in fan-shaped and dendritic forms, and sometimes of olivine, the latter also in barred and radiating forms. Both types of chondrules contain numerous inclosures of the colorless mineral mentioned above. No truly porphyritic forms were noted. The pyroxenes all give parallel extinctions and are devoid of twin structure. The colorless interstitial material seems sometimes quite isotropic or again faintly doubly refracting, with an index of a refraction of but 1.51 as determined by the immersion method.¹

A chemical analysis on materials selected to insure its representative character, yielded Dr. J. E. Whitfield results as below:

	Per cent.
Metallic constituents.....	11.44
Silicate constituents.....	88.56

The silicate portion yielded:

	Per cent.
Silica, SiO ₂	43.70
Alumina, Al ₂ O ₃	4.96
Ferrous oxide, FeO.....	18.27
Manganous oxide, MnO.....	0.38
Nickel oxide, NiO.....	0.23
Lime, CaO.....	2.19
Magnesia, MgO.....	29.38
Chromite, FeO.Cr ₂ O ₃	0.80
	99.91

¹ It should be noted in this connection that Professor Winchell, in the description above referred to, noted the mineral composition essentially as I have given it.

The chromium present is tabulated as chromite, as it occurs as such in the stone. No barium, strontium, zirconium or potassium could be detected by analysis.

The metallic portion freed from the last trace of siliceous matter contained:

	Per cent.
Iron, Fe.....	85.00
Nickel, Ni.....	14.15
Cobalt, Co.....	0.74
Copper, Cu.....	Trace.
	99.89

On recalculating, these figures give the bulk or mass composition of the stone as follows:

	Per cent.
Silica, SiO ₂	38.70
Alumina, Al ₂ O ₃	4.39
Ferrous oxide, FeO.....	16.18
Manganous oxide, MnO.....	0.336
Nickel oxide, NiO.....	0.204
Lime, CaO.....	1.939
Magnesia, MgO.....	26.018
Chromite, FeO.Cr ₂ O ₃	0.708
Metallic iron, Fe.....	9.724
Metallic nickel, Ni.....	1.618
Metallic cobalt, Co.....	0.084
Total.....	99.901

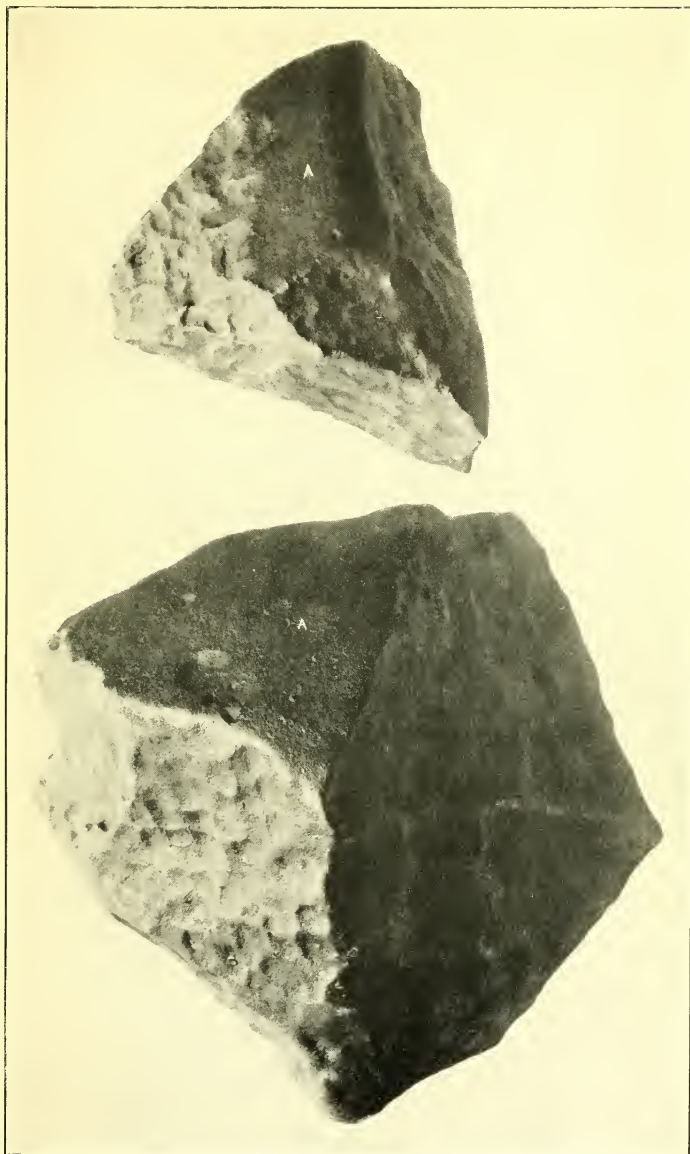
With traces of sulphur and soda but none of barium, strontium, zirconium, or potassium. Specific gravity, 3.37. Following Brezina's classification the stone would be placed in the group of intermediate chondrites Ci, or perhaps Cia, as one cut surface shows a small threadlike black vein.

EXPLANATION OF PLATE 29.

FIG. 1. The 1,300-gram piece in the United States National Museum, Cat. No. 212.

2. The 4,340-gram piece in the museum of the University of Minnesota.

In both figures the areas marked "A" show the earliest formed crust, the other pitted surfaces, the secondary and tertiary crusts.



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FOR EXPLANATION OF PLATE SEE PAGE 506.

