

# NOTES ON THE METEORIC STONE OF COLBY, WISCONSIN

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The stone described below was made the subject of a preliminary description<sup>1</sup> shortly after its fall by Prof. H. L. Ward, then director of the Public Museum of Milwaukee. Other data than those given were subsequently secured by Mr. Ward and an informal agreement entered into by which a joint descriptive paper was to be prepared by Mr. Ward and the present writer. Ill health and business matters on the part of the first named prevented the carrying out of this agreement and the matter has lain dormant—indeed was forgotten—until recently found while clearing up matters relating to my recent investigations under a grant from the National Academy of Sciences. As in the meantime the stone has been widely circulated, it would seem advisable to publish so much of the matter as pertains to my own studies, together with that which is essential from the first publication of Professor Ward.

The fall took place about 6.20 in the afternoon, July 4, 1917, within the corporate limits of Colby, Clark County, Wis. According to Professor Ward's original paper

two pieces fell, the smaller about one half mile NNE, from the other. The larger stone (said to weigh 150 pounds) fell in a pasture, striking a granite rock, at least 2 inches in thickness, lying upon or near the surface, breaking this rock into many fragments and itself breaking into 27 or more pieces. The larger mass, weighing  $22\frac{3}{4}$  pounds, penetrated the stiff Colby clay to a depth of 5 feet. Some of the smaller pieces are said to have distributed themselves in the soil to the extent of about 4 feet.

The smaller stone fell in a cultivated field without breaking and is said to have penetrated the soil about 2 feet. This stone is variously described as about 10 by 14 by 3 or 4 inches, 17 or 18 inches by 9 by 9 inches and 21 by 11 by 11 inches at larger end, sloping in two directions to a wedge shape with rounded corners. This piece was said to be entirely covered with crust and to have weighed from 75 to 85 pounds.

The man who extracted it from the earth informs me that it was so cold that frost immediately formed on its surface when exposed to the air.

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<sup>1</sup> Science, vol. 46, Sept. 14, 1917.

Of the 75 or 85 pounds of material mentioned above, two pieces weighing, respectively, 1,686 and 1,956 grams, were received at the United States National Museum, and it is upon these that the following descriptive matter is based.

Macroscopically the stone is of a fine compact texture, sufficiently firm to take a polish, showing on a sawn surface an abundant sprinkling of small white and gray chondrules in part breaking with the matrix and but little metal, though it must be confessed that there is apparently more than indicated in the analysis quoted below. There are a number of sharp black veins along which a slight movement has taken place, producing slicken-sided or *hornischfläche* surfaces. They are plainly fractures due to crushing or some sudden shock, and not true veins.

Microscopic examination shows the silicate portion of the stone (91.415 per cent) to consist of olivine and enstatite, with small amounts of a maskelynite and more rarely the calcium phosphate merrillite. (See pl. 1.) There are also small black granules, assumed to be chromite. Troilite is rather abundant. An analysis made by Dr. J. E. Whitfield for the Milwaukee Museum, which I am permitted to use here, yielded:

Mineral portion.....	91.415
Metallic portion.....	} 0.995
Iron nickel alloy.....	
Troilite (FeS).....	7.590
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	100.000

Composition of the mineral portion:

Silica (SiO <sub>2</sub> ).....	45.280
Alumina (Al <sub>2</sub> O <sub>3</sub> ).....	3.103
Chromic acid (Cr <sub>2</sub> O <sub>3</sub> ).....	0.547
Phosphoric acid (P <sub>2</sub> O <sub>5</sub> ).....	0.284
Ferrous oxide (FeO).....	16.484
Manganese oxide (MnO).....	0.500
Calcium oxide (CaO).....	none
Magnesium oxide (MgO).....	32.166
Nickel oxide (NiO).....	0.231
Cobalt oxide (CoO).....	0.028
Soda (Na <sub>2</sub> O).....	1.218
Potash (K <sub>2</sub> O).....	0.158
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	99.999

The composition of the metal alloy obtained by analysis of 0.4400 grams separated from accompanying troilite is as follows:

	Per cent
Iron.....	0.4025 = 91.4777
Nickel.....	0.0338 = 7.682
Cobalt.....	0.0037 = 0.841

Recalculated, this gave the following totals:

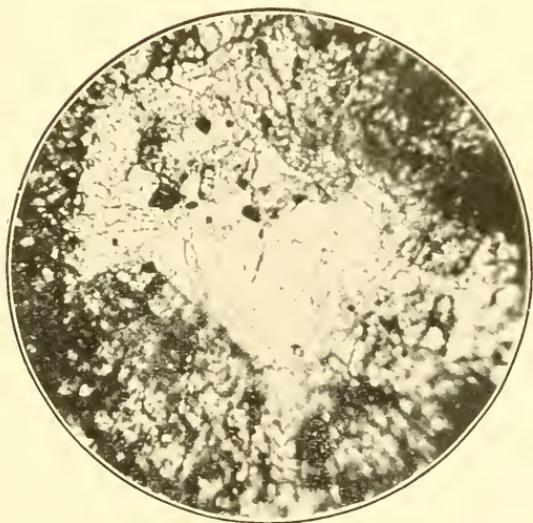
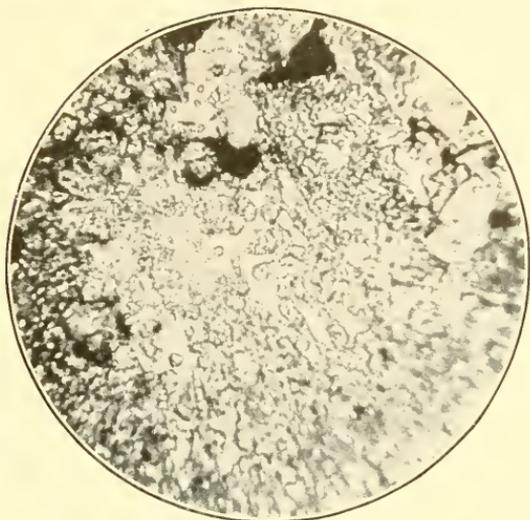
SiO <sub>2</sub> -----	41.39	} Silicate portion.
Al <sub>2</sub> O <sub>3</sub> -----	2.83	
Cr <sub>2</sub> O <sub>3</sub> -----	0.50	
P <sub>2</sub> O <sub>5</sub> -----	0.25	
FeO-----	15.06	
MnO-----	0.45	
CaO-----	none	
MgO-----	29.40	
NiO-----	0.21	
CoO-----	0.02	
Na <sub>2</sub> O-----	1.11	
K <sub>2</sub> O-----	0.14	
Fe-----	0.90	
Ni-----	0.07	
Co-----	0.02	
Fe-----	4.83	} Troilite.
S-----	2.76	
	99.94	

Two features of the fall of this stone, as reported, are of unusual interest. (1,) The force of impact which was such as to fracture a piece of granite two inches in thickness and to penetrate the stiff clay—probably ground moraine—to a depth of five feet, and (2,) the temperature, which was so low that frost formed immediately upon its surface. In this respect the fall resembles that of Dhurmsala.

The statement made by Professor Ward that the stone was an achondrite is obviously an error, due either to a superficial examination or perhaps a typographical error. According to the prevailing method it should be classed as an intermediate chondrite.







METEORIC STONE FROM COLBY, WISCONSIN

FOR REFERENCE TO PLATE SEE PAGE 2

