THE AGGIE CREEK METEORITE FROM SEWARD PENINSULA, ALASKA*

EDWARD P. HENDERSON,
U. S. National Museum, Washington, D.C.

This iron meteorite, reported to weigh about 95 pounds (43.18 kg.), was found on Aug. 11, 1942, during a gold dredging operation in Aggie Creek, Alaska, (Lat. 64° 53′ N., Long. 163° 10′ W.) by Mr. F. K. Dent of the Council Dredging Co., Nome, Alaska.

The first information that the United States National Museum had of this meteorite came from Mr. Eskil Anderson of the University of Alaska, who after visiting the meteorite display came to the office to ask if we had any record of this discovery. Some time later the U. S. National Museum obtained a 968 gram sample of this iron as a gift from Mr. Stuart H. Perry, who had acquired the specimen from Mr. Dent.

The following information concerning the location and conditions under which this iron was discovered was supplied by Mr. Dent.

> This meteorite was found while dredging Aggie Creek for gold and was very close to bedrock when the dredge bucket picked it up. Bedrock at this point was about 12 feet deep from the surface. Aggie Creek is on Seward Peninsula, Alaska, and is a tributary to Fish River which empties into Golovin Bay about 90 miles southeast of Nome. It will be easy to locate Fish River and by following up this river about 40 miles you will find the Niukluk River empties into Fish River on the left side going up, and about 15 miles on up Fish River you will find Aggie Creek which flows into Fish River on the right side going up. About 2 miles up Aggie Creek is where this was found, just below the mouth of Rock Creek which empties into Aggie Creek. . . .
>
> The whole piece weighed 95 pounds, and as previously advised the balance of it is at the University of Alaska. I was standing in the winch room of the dredge when I heard something heavy hit the dump plate and immediately went to investigate. Finding this piece so heavy that it would not float out the flume under the water pressure, I shut the dredge down to investigate. When I first saw it and lifted it I thought it was gold as it was nearly the color of gold all over, as you will notice on the specimen but when using a file on it was soon disappointed. This was on August 11, 1942.

The specimen of Aggie Creek meteorite has a highly altered iron oxide crust over the outside but this oxide crust in not much thicker than the crust on the average iron meteorite. In fact this crust is surprisingly thin for an iron which has been buried for any length of time. Perhaps this is due to the fact that there has been little oxidation as during the greater part of the year the ground water is frozen. On the polished face (Fig. 1) narrow bands of oxide can be seen which follow the borders of the kamacite. Weathering has removed all traces of the original surface structure, due to flight of the meteorite through the atmosphere, but there still remain a few small depressions on the specimen.

* Published by permission of the Secretary of the Smithsonian Institution.

This iron is a normal, medium octahedrite without any unusual structures. The kamacite bands vary in width between from 1 to 2 mm. and some of them extend 4.5 cm. in length. Some schreibersite is present and occurs in narrow elongated inclusions located about equidistant from the borders of the kamacite bands. In many places the schreibersite forms a series of isolated inclusions so located as to be almost always in the center of a kamacite band. It is estimated that there is about 1 per cent of schreibersite present in this meteorite. Only one small round

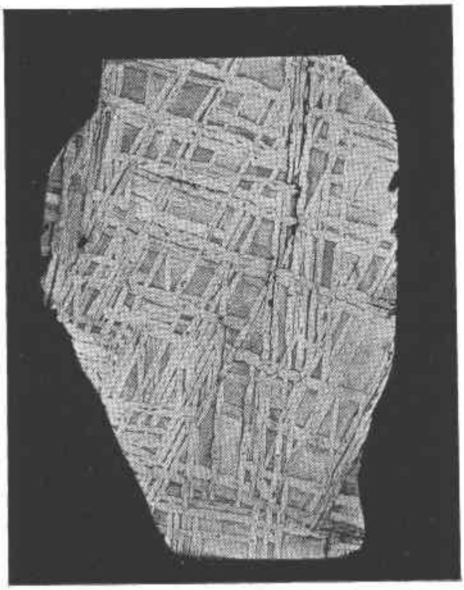

FIG. 1. Etch Pattern of the Aggie Creek, Alaska Meteorite $\frac{3}{4}$ Natural Size.

inclusion of troilite was seen; this is about 2.5 mm. in diameter and in it there is some schreibersite located between the troilite and the kamacite.

A slice was cut from this meteorite and after polishing and etching, an area, with typical average structure for this iron, was selected for the chemical analysis. This was treated as follows. The selected sample for analysis was divided into two portions and a specific gravity determination was made on each portion. The two pieces were then dissolved in 1-3 hydrochloric acid and the gas liberated was passed through a series of wash bottles containing lead acetate solution to collect any hydrogen sulfide gas that would be given off from the troilite. After 36 hours of this acid treatment, and many intermittent boilings, the acid soluble portion was decanted and separately analyzed. The weights of the re-

TABLE 1. ANALYSIS OF AGGIE CREEK, ALASKA METEORITE
E. P. HENDERSON, *analyst*

	A	*B*	*C*	
Fe	8.3590 gms.	.0717 gms.	8.4307 gms.	90.89%
Ni	.7595 "	.0332 "	.7927 "	8.54
Co	.0589 "	.0033 "	.0622 "	.67
P		.0175 "	.0175 "	.18
S	none	none	none	.00
Insol.		.0030 "	.0030 "	.03
	9.1774 gms.	.1287 gms.	9.3061 gms.	100.31%

Sp. G. 8.004
7.96

$$\text{Mol. Ratio } \frac{\text{Fe}}{\text{Ni, Co}} = 10.42.$$

covered elements are given in Table 1 (*A*). The insoluble residue from the 1–3 hydrochloric acid was than dissolved in aqua regia and analyzed separately, (*B*). The results of *B* indicate that the insoluble residue is schreibersite, but because the quantity of material available for this

TABLE 2. METEORITES WITH COMPOSITIONS SIMILAR TO THE AGGIE CREEK IRON

	Aggie Creek, Seward Peninsula, Alaska	Drum Mts., Utah	Mbosi, Tanganyika, E. Africa	Baquedano, Atacama Desert, Chile	Karee Kloof, Cape Province, S. Africa	Lanton, Missouri	Moorumbunna, Central Australia
		1	2	3	4	5	6
Fe	90.89	90.70	90.45	90.90	90.79	90.40	89.53
Ni	8.54	8.59	8.69	8.82	8.27	8.33	8.82
Co	.67	.58	.66	.15	.68	.61	.56
P	.18	.tr	.11	.24	.24	.18	.29
S	.00	.00	.01	.05	—	—	.02
Cu	N.D.	N.D.	tr.	.03	.03	—	.07
Insol.	.03	.01	.03	.01	.03	.005	.30
Mol. Ratio Fe/Ni+Co	10.42	10.47	10.23	10.68	10.76	10.64	10.08

1. *Smithsonian Misc. Coll.*, **110**, No. 12 (1948), E. P. Henderson and S. H. Perry.
2. *Mineral. Mag.*, **22**, 487 (1931). D. R. Grantham and Frank Oates.
3. *Am. Mineral.*, **17**, 357 (1932). Charles Palache and F. A. Gonyer.
4. *Mineral. Mag.*, **20**, 134 (1923). G. T. Prior.
5. *Jour. Geol.*, **42**, 305 (1934). James S. Cullison and Garrett A. Muilenburg.
6. *Tran. Royal Soc. S. Australia*, **70** (2) (1946). A. B. Edwards and D. Mawson.

analysis was so small, the results are not much more than of qualitative importance and must not be considered as an analysis of schreibersite.

The sum of the determinations in *A* is 9.177 gms. and the weight of the sample originally taken was 9.275 gms. Thus the sum of *B* should be 0.098 gms., whereas 0.1287 gms. were found. With *A* there was ample solution to make check determinations, but not with *B*, so the analytical errors are essentially confined to the results shown in *B*. It can be found by simple calculation that the schreibersite content of Aggie Creek meteorite is somewhere between 1 and 1.3 per cent by weight. The analysis of this meteorite is the sum of *A* and *B*, and reported in column *C*.

The analysis of Aggie Creek meteorite is remarkably similar to several other iron meteorites from widely separated localities, Table 2. It may be that a detailed metallographic study would show that there are certain differences in these indicating that they have had different histories, but until these are so studied it would appear that these make a rather definite group of octahedral irons which may be cosmically related.

It can not be established how long ago or how closely spaced in time these falls occurred as none of these are witnessed falls. These may have come from a swarm of meteors of similar origin and came to our earth within a brief interval of time. This is mere conjecture and is offered only to stimulate suggestions regarding this possibility.

Supplementary Note on the Aggie Creek Meteorite

Charles P. Olivier,
Flower Observatory, Upper Darby, Pa.

While in Washington for the meeting of the A.A.A.S. I had an opportunity to see the manuscript on this meteorite and my attention was called to the fact that this iron had almost identical composition with several other meteorites listed for comparison. This led to some discussion on the subject which may be of interest to the readers of the article.

The fundamental question is whether meteorites of similar composition found even in different hemispheres could ever have been part of a single body which disrupted for some reason or other, which for this purpose need not necessarily be explained. An answer to this question, in our present state of knowledge, can I believe, be given partly from analogy, using the example of meteor streams.

Ignoring the question of the origin of such a stream as the August Perseids, we do know that for several days, as admitted by everyone, or for some weeks if we take the opinions of others, the earth meets meteors which evidently belong to the same system. The common origin of all meteors of a given stream is generally admitted, yet, accepting the shortest estimate of a week's duration of activity, the earth meets meteors from the same stream over a distance of two per cent of the earth's orbit, roughly 12 million miles. During this interval of time, a week or more, meteors moving in approximately parallel paths meet the earth, are seen at every hour and every place, except those too far south for the radiant to rise. But at a given place and for a period of a few hours, the radiant is not a point but an area of 1° to 2° in diameter. This means that meteors, having a common origin, due to the perturbations are gradually shifted from their original orbits, yet not so much but that their family connections can be traced. Many other meteor streams act similarly.

Supposing that in disruption of a large body vast numbers of fragments of all sizes are formed, a certain proportion will follow almost but not absolutely the orbit of the parent body, the deviations being due both to succeeding perturbations from the planets and also to slight original differences of velocity of projection at the disruption. Evidently the orbits of most of the innumerable fragments would never meet the earth, their orbit planes having every inclination in space. That more than one fragment would be so well aimed as to strike the earth would mean that such fragments came from a very small portion indeed of the disrupted body, hence often may be of similar composition. If there is the minutest difference in projection velocities these bodies would follow one another at distances which would increase with time and not be in precisely the same orbits. An example of such a case is the periods calculated for the disrupted nucleus of the Great Comet of 1882, the results of which may be found in *Comets*, pp. 40–44, C. P. Oliviers.

If the above reasoning is correct, meteorites from the same very small portion of any disrupted body could fall on the earth, striking any place. We would not have the least reason to think the places of fall should be near one another. Further, they need not strike at one time, but could fall at the same approximate date over a long period of years. To carry this period into thousands of years would not be justified from the probabilities involved, but it might be over a considerable period.

In conclusion, any point of the earth could receive such fragments, provided only that the radiant point of the stream rose above the horizon. The meteorites need not fall simultaneously nor along the great circle. It seems, therefore, a perfectly possible hypothesis that the seven meteorites mentioned, are possibly of identical primordial origin with Aggie Creek. It could indeed be disproved only by showing that the orbits could not have been similar, and such proof seems totally unattainable since none of these falls was witnessed.