SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
WASHINGTON, D. C. 20560

December 27, 1965

Mr. Oscar E. Monnig
29 Chelsea Drive
Forth Worth, Texas 76115

Dear Oscar:

The second and larger of the Tishomingo iron arrived safely in this office and a couple of days after receiving the two kodachrome pictures.

We have done a great deal of work and several have had a hand in the problem. As yet, we have no proof that it is a meteorite; however, we are making our tests in a fashion that will consume material, and the best test is to measure He_3 which will show it has been exposed to cosmic rays in space. We are going to send to another laboratory a sample for the He_3 test, perhaps this week. They will need about 3 grams and if the results are negative, then it is going to be increasingly difficult to prove this is a meteorite.

One laboratory test by an electron probe got an average Ni content of 29.1%. Kurt Fredriksson got an average variation of 31-33; however, he found local spots that were higher and some which were lower.

I then gave Roy Clarke a piece for a rock chemical analysis and his first Ni figure was 32.5%,Co and phosphorus value have not been determined yet.

Fredriksson states carbon is low; I find there are black segregations in places which look like carbon. I can see no phosphide bodies and most ataxites contain considerable phosphides. The probe shows that the two phases making up the structure in the iron are essentially the same and in this respect this iron is identical to mastensite.

Joseph Goldstein tells me the structure shown in this is the same as he would expect to find in a nickel alloy of this composition and has offered to make such an alloy if we decide it must be done to prove this is artificial iron-nickel.

NASA has made a quench at 26 measurement, but the one we first gave them did not have the best size and weight, yet they did then. They have a reading which is at the lower limit of detectability of their instrument. We are loaning them the second piece for a check. They think there is a trace of Al_{26}.

If this iron has been in the earth 500,000 years, the Al_{26} may be so low that it will be difficult to detect. Hence, their test is not very useful.

If this proves to be a meteorite, our proof will depend upon the finding of He_3. If it is there, then we will have a most unusual type of meteorite. Knowing what the facts are and after seeing the alteration on the sample just received together with its flat shape makes me question or feel doubtful that it is a meteorite, but I am not yet ready to give up.

I have measured its hardness and the values I got are as follows.

Position	Vicker's Hardness Number - 50 g. load
1	307
2	373
3	368
4	302
5	351
6	340
7	285
8	302
9	356

The picture enclosed shows 9 holes in a row which are numbered from left to right, 1-9. The other picture is at higher magnification and shows the character of the impressions. A structure like this can be produced out of nickel iron alloys by quenching them to very low temperatures. It is possible for a meteorite to get such a treatment. This treatment known in iron meteorites so far have different phases and these different phases have different iron and nickel percentages. This sample has what appears as two phases, but both have some composition.

We may have to do more work yet, but when we all get through we will have a much better case. If it does prove to be a meteorite then we have a prize.

Thanks a million for letting us work out this problem.

Best wishes to all.

Cordially,

Ed per ch

E. P. Henderson
Curator
Division of Meteorites

Enclosures