galena-bearing solutions, possibly from deep seated sources, with shallow water solutions which had dissolved from the limestones some of their strontium content. This is in agreement with the hypothesis suggested by Uglow for the calcite-barite-fluorite-galena veins of this district. He[2] assigns these deposites to solutions in part of meteoric, in part of magmatic origin.

THE FLORENCE METEORITE OF WILLIAMSON COUNTY, TEXAS

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The Florence Meteorite, the history of which is given below,[1] is of interest because of its excellent state of preservation and petrographic characters. The stone was a small one, measuring 11.5×14×11 cm. and weighed 3640 grams before cutting. The shape was roughly rectangular with four faces approximately plane the other two being rounded. All faces except the rounded ones show the characteristic pitted surfaces, the largest pits being 2 cm. in greatest dimensions. The unbroken surface of the stone is black while the interior is light gray. The black surface material is present as an exceedingly thin skin of oxidation. Plate I, figure 2 shows the external features of the meteorite.

[2] *Ontario Bureau of Mines,* Volume **XXV**, Part No. 2, page 40.

[1] The meteorite fell on the night of January 21, 1922 on the farm of T. H. Lindsey, five miles northeast of Florence, Williamson County, Texas. The stone subsequently came into the possession of Dr. F. W. Simonds of the University of Texas to whom the writer is indebted for details concerning the history of the fall and for the opportunity of studying the specimen. Through the kindly offices of Dr. G. P. Merrill of the U. S. National Museum the stone was cut, sectioned, and analyzed. One half of the meteorite and a cast are deposited in the U. S. National Museum while the other half and a second cast remain in the collections of the University of Texas.

Details concerning the fall of the stone show that it fell at about 8 P. M. after darkness had come on. The direction was from the southwest and the fall was accompanied by a noise "almost like thunder and a great light streak toward the west." The stone fell on the edge of a dry water-course covered with cobbles and "did not knock much of a hole in the ground." The stone was found the next morning ten or twelve hours after the fall. The latitude and longitude of the locality as nearly as can be stated are 30° 52′ north and 97° 43′ west.

Thin sections show the stone to be a chondrite with several kinds of chondrules and to contain mainly olivene, enstatite, metallic iron and iron sulphide. Olivene and enstatite are the most abundant minerals but metallic iron is plentiful. Texturally the stone consists of chondrules, fragments of chondrules, silicate minerals and metallic iron imbedded in a ground mass of the same materials. Glass is lacking and veining was not seen in the sections studied or on polished surfaces of the stone. The presence of fragments of chondrules and a general brecciated aspect of the stone cause it to be classed as a gray breccia-like chondrite (Cgb). Plate I, figure 3 shows the general textural features of the stone.

Metallic iron is abundantly developed generally as a matrix mineral though small grains are found in chondrules. In the larger granular olivene chondrules the metal occupies interstices between the grains of the silicate. The shape of the iron grains is very irregular there being both isolated irregular masses and larger more continuous masses inclosing grains and fragments of silicates. In the latter type of occurrence, the pattern formed suggests intergrowth of the two materials. In a number of cases the iron is rimmed by minute grains and fragments of iron sulphide.

Enstatite occurs in chondrules and as anhedral crystals and grains in the general mass of the stone. The chondrules generally radiate in which the enstatite is very finely fibrous. In some of these bodies the fibers radiate irregularly the resultant shape being fern like or plumose. PLATE II, figure 3 shows one of the radiating enstatite chondrules while Plate II, figure 4 shows a large enstatite chondrule with a barred structure. Enstatite occurs also in the porphyritic chondrules where it forms the groundmass in which the phenocrysts are set.

Olivene is found in chondrules of various kinds, as large grains and crystals, and as smaller grains in the mass of the stone. Some of the larger crystals both in chondrules and otherwise are euhedral though the greater number are anhedral. Plate I, figure 4 shows a section from a chondrule containing a number of euhedral olivenes. Single crystals of the mineral form the monosomatic chondrules found and in a few cases granular chondrules occur composed entirely of olivene. In most instances, however, other minerals such as iron or enstatite are present. In the porphyritic chondrules olivene is generally subhedral to anhedral and in one case the center of the chondrule is formed of a single large olivene set in the fibrous enstatite and surrounded by smaller grains of olivene. Plate I, figures 1 and 4 and Plate II, figures 1, 2, 5, and 6 show the various occurrences of the mineral.

Iron sulphide is present in appreciable amount in the stone. It is a matrix mineral occurring in irregular masses and as minute grains frequently in association with metallic iron. In one section a single small plate of plagioclase feldspar was observed. The mineral was brownish on the edges and showed polysynthetic twinning. During the analysis Mr. Shannon isolated grains of chromite and of a silicate resembling diopside.

The most striking feature of the Florence Meteorite is the variety of chondrules present. These are both monosomatic and polysomatic the forms present including granular, porphyritic, radiating, grating or gridiron, barred and others for which no descriptive names are known. All of the chondrules are somewhat irregular in shape and lend a breccia-like aspect to the stone. The more perfect ones are oval in shape in cross section while the greater number are irregular or even fragmentary. Measurements of the chondrules show sizes ranging from 0.3 mm. for a fibrous olivene chondrule to 1.35 mm. for a porphyritic chondrule. Olivene chondrules are more abundant than enstatite, though the latter are numerous. The granular chondrules consist of anhedral grains of olivene with or without other minerals. In the large chondrule of the type shown in Plate II, figure 1, iron is present in addition to olivene, but in other examples only the silicate is present, the irregular grains being arranged in a mosaic pattern without other material filling the interstices. A fibrous or barred olivene chondrule is shown in Plate II, figure 2, in which the fibers are parallel and essentially straight. Radiating enstatite chondrules are present as shown in Plate II, figure 3. These differ from the fibrous olivene chondrules in that the fibers are radially and eccentrically arranged. In some of these masses the outer ends of the fibers flare outward giving a plumose appearance. The gridiron or grate chondrule in Plate I, figure 1, is monosomatic, a single crystal only of olivene being present. Two of the most striking chondrules are shown in Plate II, figures 5 and 6. Both are of olivene one being barred in three directions, the other being divided roughly into quadrants best observed between crossed nicols.

A chemical analysis of the meteorite, made by Mr. E. V. Shannon of the United States National Museum, is given below:

	Per cent
Metallic portions	17.62
Troilite (calculated by writer)	5.01
Rock material	77.37
	100.00

The composition of the metallic portion is:

	Per cent
Iron	91.277
Nickel	8.270
Cobalt	.426
Copper	.009
Phosphorus	.018
	100.000

The composition of the soluble silicate portion is shown in Column 1 below. The insoluble part is shown in column 2 while column 3 gives the net composition of the stone with the metallic portion included.

	1	2	3
SiO_2	28.069	56.94	36.115
Al_2O_3	0.542	4.86	2.756
TiO_2	trace	trace	trace
FeO	18.104	8.98	10.880
CaO	1.628	4.86	2.782
MgO	35.714	22.28	23.370
MnO	1.465		0.539
NiO	0.379	None	0.140
Fe	8.509		19.290
Ni			1.492
Chromite		0.60	
Co			0.075
Cu			0.002
S	4.884		1.842
P			0.003
P_2O_5	0.706		0.259
Cr_2O_3			0.183
K_2O		1.28	0.573
Na_2O		0.87	0.388
	100.00	100.37	100.689

EXPLANATION OF PLATES

Plate I

Figure 1. Monosomatic chondrule with grating structure.

2. The stone before cutting.
3. Thin section of the stone. Black is metallic iron and iron sulphide. Light colored areas are olivene and enstatite. A number of chondrules are in the field and the breciated character of the stone is well shown.
4. Thin section of a porphyritic chondrule. The light areas are olivene crystals, a number of which are euhedral. The darker portions consist of a felty, fibrous mass of enstatite.

Plate II

Figure 1. Granular olivene chondrule composed of irregular grains of olivene with interstices occupied by metallic iron.

2. Fragment of barred or fibrous olivene chondrule.
3. Radiating enstatite chondrule, very finely fibrous.
4. Enstatite chondrule with fibers well developed and arranged in groups at sharp angles.
5. Olivene chondrule composed of fibers or laths of the mineral oriented in three different planes.
6. Olivene chondrule somewhat similar to 5. The fibers are indistinct but between crossed nicols are seen to be arranged in four directions dividing the chondrule into quadrants.

PLATE I

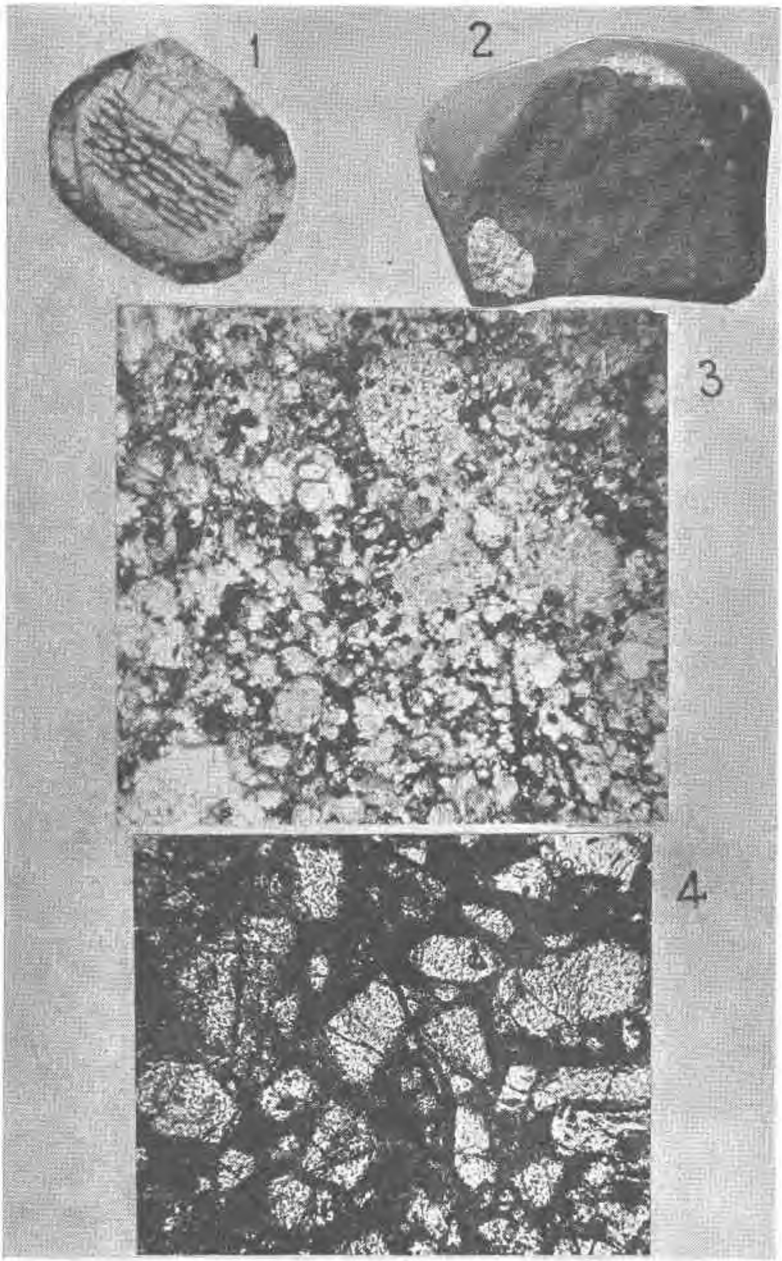

PLATE II