

Cherokee Springs

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By STUART H. PERRY

On July 1, 1933, at about 9:42 A.M., a detonating meteor passed over Rutherford county, North Carolina, and Spartanburg county, South Carolina, from which two meteorites were recovered in the latter county. They fell, close to observers, about $6\frac{1}{2}$ miles apart.

The larger mass, weighing about 12 pounds, fell at the village of Cherokee Springs, about 12 miles north-northeast of Spartanburg, South Carolina, and about the same distance south of the North Carolina state line. The other stone, about half as large, fell on the farm of E. P. Cash about four miles from Chesnee, South Carolina. The farm is near what is known as the Bush Creek church, and according to local information is $6\frac{1}{2}$ miles north by east from Cherokee Springs. The region is a somewhat rolling farming country about twenty miles southeast of the Appalachian mountains.

The fall of the larger stone is described as follows by G. E. Mayfield, the proprietor of a store at Cherokee Springs:

The morning of July 1 I was sitting on the porch of the store talking with Arthur Swafford. We heard a noise like an airplane and for two or three minutes the approach sounded nearer. Finally we went to the edge of the porch to look for the plane, and as I caught around the post at the corner of the porch it sounded as if the plane was just over the building.

On looking for it to come into view I caught sight of the meteorite just as it struck the limb of a hickory tree, to the rear and to one side of the Methodist church, and strike the ground. As soon as it struck the sound died away. It went into the ground, which was sandy, about 15 to 18 inches, then bounced out and was lying 15 inches from the hole it made.

I hurried to the spot and picked it up, but found it was so hot that I had to change it from one hand to the other to keep it from hurting my hands. It fell in a grove of trees. It struck a hickory limb about three-quarters of an inch in diameter and cut it off as if cut by shears. The leaves from the tree fluttering down showed us to the spot.

When we first heard it, the noise was like a plane with the motor racing, but the nearer it came the slower it turned and just before it struck the ground it sounded like a plane with the motor idling.

As nearly as we could determine, after the excitement was over, the time was about 9:42 A.M. The weather was fine, the sun shining, and it was clear with just a few small clouds in sight.

Mr. Mayfield's statement that the noise was audible "two or three minutes" prompted a request to him for a more definite estimate, to which he made the following circumstantial reply:

In regard to the time it was heard before it struck the ground, I am sure that it was fully two minutes, as we were talking and mentioned the fact.

In front of the store, but some distance from the road, a Mrs. Davis was picking figs. We looked for the airplane, as we thought it was, and

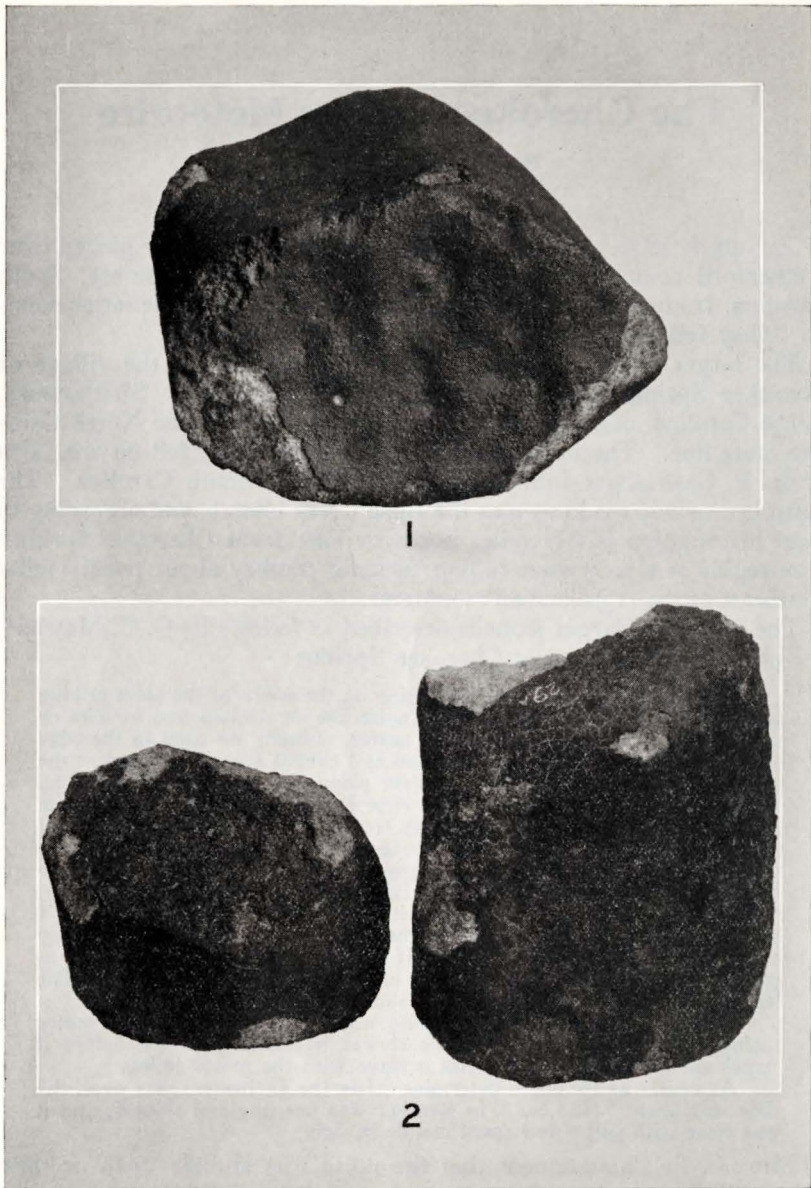


FIG. 1. Base (rear side) of the larger stone showing shallow pitting.

FIG. 2. The two stones placed upright on their bases.

noticed Mrs. Davis come from under the fig bush and look in the north-western direction, from which it seemed to be approaching. She looked for almost a minute and went back to picking figs.

It seemed to be getting nearer, so I got up and went to the edge of

the porch and looked for it, and turned to Mr. Swafford saying "I don't see it." He got up and came to the edge of the porch. I caught around the post and was looking in the direction it seemed to be coming from, when I saw it hit the limb and turn over two or three times before it struck the ground.

The above estimate of the duration of the sound is in substantial agreement with the statement of Robert Johnson, who was working in the church cemetery about 300 feet from where the stone fell. He writes:

I saw it in the air about 300 feet above me. It was moving at high speed and coming downward. It left a little blue smoke behind it. The noise sounded like an airplane when I first heard it until it got closer; then it sounded like a stone whizzing, as if someone had thrown it. I could hear it "frying" as if it was hot. I estimate that between the time I first heard it and the falling was about a minute and a half.

Miss Agnes Painter, another nearby observer, relates the occurrences as follows:

First I heard a report that sounded like a blast, or thunder, in the northwest. Then in a few seconds I heard the noise which I thought was an airplane speeding down to earth. It sounded like a plane in trouble. I ran to the front yard, expecting to find a plane falling in the yard. I looked up and around but could see no plane, yet I heard the noise over the grove in front of the house.

Rushing over there, expecting to find a smashed plane, I only saw the stone which had fallen, making a hole in the ground two feet deep. When I had the stone in my hands it was most hot enough to burn me, a few minutes after it fell.

I was about 75 feet from where it struck. It passed over the house and fell about 75 feet in front of the house in the grove. I did not see it fall, but by the path made by the stone in falling through the trees it seemed to be moving southeast.

She estimated that it was "about three to five seconds" from the time she first heard the noise until the stone struck the earth; but from her narrative of what she did it is obvious that the time must have been much longer.

Newspaper reporters from Spartanburg reported that the stone was still warm when they arrived at 10:25 A.M.

The fall of the smaller stone was witnessed at even closer range. Mrs. E. P. Cash, who was only fifty feet from where it struck, describes the occurrence as follows:

On the morning of July 1 my husband called me from the field down below the house to bring him some peas. When I reached the barn to get the peas I heard something like a blast, but it sounded like it was way up in the elements. It was to the north. It made me feel queer. I started to go back to the house for my little girl, but I didn't; I picked up the peas and started, and my husband's brother (E. H. Cash) was coming to meet me.

I heard something in the air like an airplane. I looked. He had his hat off and was looking. It was cloudy. I saw something, still thinking it was an airplane real high in the air. By the time I saw it, it came over my head and fell at the corner of our lot fence, made a hole in the ground four or five inches deep, and bounced out on top of the ground. It fell ten feet from our barn.

I was so scared I did not go to it. I went to the house to the children. My husband's brother came and was hunting for it. He picked it

up. My husband hollered for us not to go to it. I was kind of getting over my scare, and I told him it was at the corner of the lot fence. He picked it up. It was warm. I don't know how long it was before he picked it up, but it wasn't but a few minutes. No one saw it except myself; my husband and son heard and knew it fell close to me but did not see it.

Numerous inquiries in both localities brought no information of any other meteorites having been found, although for months afterwards people in the vicinity searched for them and many curious stones were picked up in the belief that they might have fallen. It is possible that smaller pieces may have fallen somewhere northward of the spot where the smaller stone fell. The larger stone, which naturally would carry farthest, marked the end of the flight because all observers around Cherokee Springs reported that the whizzing sound ceased when it struck the earth. If any other stone had fallen farther to the south it probably would have been still larger and its noise would have been heard.

All the above observers, and numerous others, likened the sound they heard to that of an airplane. The detonations, likened to the sound of blasting, mentioned by Mr. Johnson, Miss Painter, and Mrs. Cash as coming from the north or west, were also heard by Mrs. Ada Johnson who lives three miles west of Cherokee Springs and who said they seemed to come from a westerly direction. C. B. Whiteside who lives a mile and a half from Cherokee Springs (direction not stated) was reported in a Spartanburg paper as having heard "four cracks that sounded like a blast; then I heard the swish; I thought it was an airplane coming down."

Several persons near Rutherfordton, North Carolina, about twenty miles north by west from Cherokee Springs, told Mr. Mayfield that they heard "three or four explosions high in the air, and at that time they heard the noise begin which resembled an airplane."

A fair inference from the positions and reports of the various observers would be that as many as three or four detonations took place, of which two were loud enough to be heard at Cherokee Springs, and that the flight of the meteor was approximately from north-northwest to south-southeast.

Inquiries addressed to local newspapers in all cities and villages in the half-dozen counties to the north and northwest of Rutherfordton brought no reports of anyone having heard any such noises, which would indicate that the source of the detonations was probably in the vicinity of Rutherfordton.

The larger stone when obtained by the writer weighed about 5.7 kg. A portion had been broken from one end when it struck, as related by the finder, and later some small fragments were broken off at that spot by unknown persons. The total material lost, however, could hardly have exceeded 300 grams.

The form of the mass is that of a somewhat flattened five-sided prism 18 cm long with transverse diameters of about 15 and 10 cm. Though

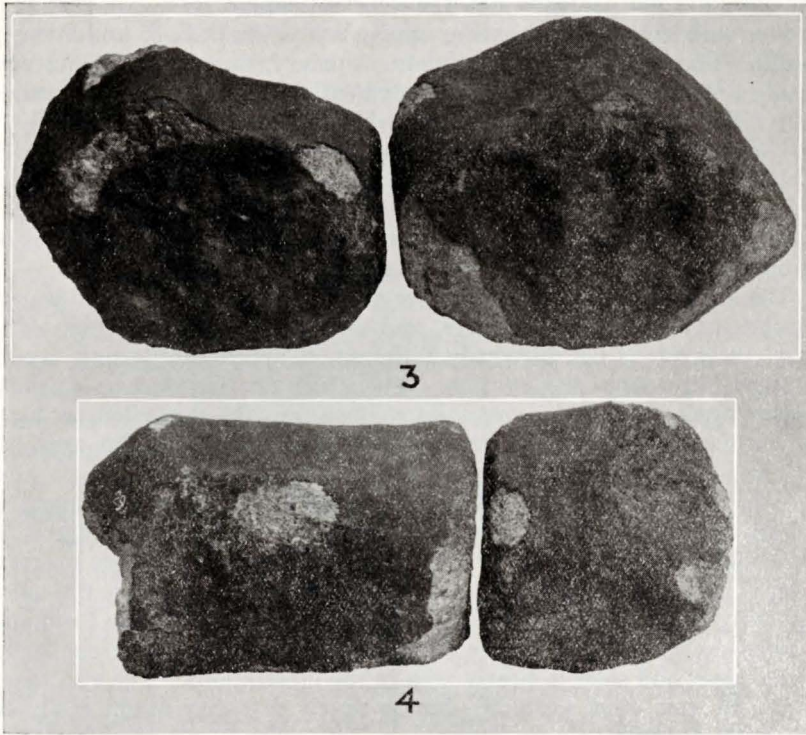


FIG. 3. Bases of the two stones; the larger one at the right.
FIG. 4. The two stones with their bases placed together.

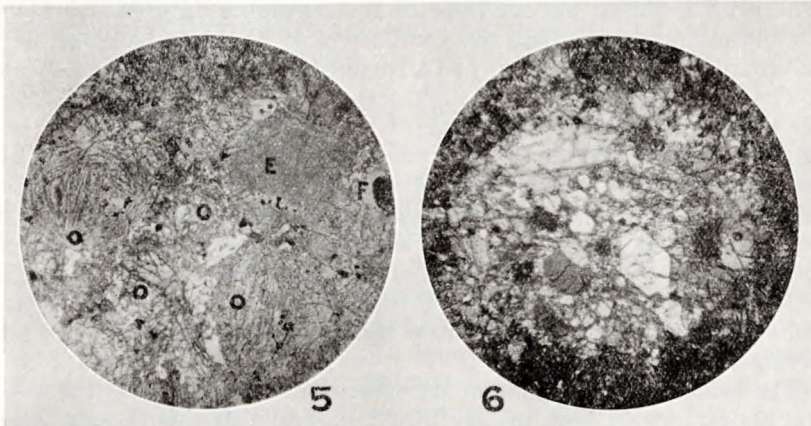


FIG. 5. Field showing three chondrules. O, olivine; E, enstatite; F, feldspar.
x 20, plane light.

FIG. 6. Olivine crystals in granular olivine. x 40, crossed Nicols.

the sides are not perfectly flat, the general shape is distinctly that of a prism, with the sides measuring approximately 6, 8, 8, 9, and 9 cm in width. The base has a flat undulatory surface, the mass standing vertically on that end. The original form of the other end was rounded with a flat apex, a small remnant of which remains.

The entire surface, except the broken spot mentioned, is covered with a black primary crust, which near the apical end is crazed with a coarse reticulation. In some places the crust reaches the thickness of a millimeter, but generally it is thinner. In seven or eight places, on edges or at corners, small areas of secondary crust appear.

The sides present an even surface and a smooth crust, with no projections or noticeable roughness, and with no traces of pitting. The base, however, is conspicuously different in appearance, being evenly covered with very shallow pits. The crust on that face is thick, a deeper black, and scoriaceous. Its surface presents a curdled or finely vermiculated appearance, with here and there small irregular areas or islands with a smoother surface.

When the smaller stone, which weighs about 2.7 kg, was obtained at a later date the similarity of the two was so striking as to suggest at once the probability that they are the broken parts of a single original mass. Like the larger stone, it is prismatic in cross-section, the sides smoothly crusted, with a flat base having practically the same form and dimensions and with the same peculiar characteristics. The similarity of the bases and sides is clearly seen in the illustrations. The two bases do not fit each other perfectly, but so nearly that they might easily be cemented together.

The height of the smaller stone when standing on its base is about 11 cm. The apical end does not give clear indications of its original shape, as in the case of the larger stone, because a fairly large piece was broken off in flight; but the slope of the remaining unbroken surfaces would indicate that perhaps five centimeters of its length had been lost, and that the end was originally of a rounded pyramidal or wedge shape.

The large piece separated in flight left an area of dark brown secondary crust about 7 by 12 cm. One of the sides of the prism has been similarly broken, leaving a flat area of secondary crust about 6 by 10 cm. Still another irregular area of secondary crust appears where the edge of the base had been broken away, and four or five smaller areas where chips had been broken from edges and corners. Two or three of the smaller spots show only a faintly brown scorching, with small bright inclusions of troilite but slightly tarnished. Two small bright, untarnished spots of troilite appear in the heavily crusted base, the crust not having closed over them.

The evidences of orientation are somewhat conflicting, but the general appearance of both masses would suggest that their points were forward in flight after they broke apart.

On the larger stone a remnant of the flat apex shows the fused matter running around an edge onto one of the sides. That side, which is

very smooth, nevertheless shows faint indications of drift crosswise, at right angles to the axis of the prism. On the base the curdled or vermiculated surface is very uniform and gives no evidence of drift in any direction, except for a small rounded protuberance caused by a chondrule which shows fine striations diverging radially from its center, and three small spots where the crust shows signs of drift outward and around the edges of the base.

The sides of the smaller stone are smooth, like those of the larger one, save one on which the crust is a deeper black and somewhat scoriaeous, showing at one point some evidence of drift toward the adjoining smooth side. The base of the smaller stone gives no indications of drift. The primary crust surrounding areas of secondary crust shows sharp, though slightly fused, edges which are not indicative of any special position in flight. Both bases have fairly sharp edges, from which numerous chips were broken away in flight leaving small areas of light secondary crust.

On the whole, the surface characteristics would be consistent with the hypothesis that the apex of the larger stone was the front of the original mass before disruption, that afterwards the freshly broken surfaces forming the bases of the two pieces were for a time rearmost, but that both pieces may have occupied other positions during a portion of their flight. The appearance of uniform shallow pitting on the two bases might be due to an uneven fractured surface, later encrusted, rather than to the usual process of erosion by atmospheric friction and heat.

The material of the two stones is identical. The freshly broken surface is light gray and shows a coarse chondritic structure strongly developed, the chondrules mostly not breaking with the matrix. Many of them are as large as peas, and two were observed with diameters of 10 or 12 mm. Troilite occurs rather abundantly in irregular brilliant masses up to 5 mm in size and granules of nickel-iron, often fairly large, are scattered throughout the mass. No indication of veins or fissures was observed.

The chondrules are mostly spherical, ovoid, or rounded, rarely of irregular or angular outlines, and varying widely in size and composition. (Fig. 5). The majority of the chondrules consist of olivine in a wide variety of forms, a number of which are shown in the photomicrographs. In Figure 6 euhedral crystals are shown in a chondrule of granular olivine. Figure 7 shows a chondrule composed of barred crystals in lath-like form variously oriented, and one in Figure 5 exhibits a similar structure. In Figure 8 the olivine appears as crystalline grains in an anorthite base. It also appears as skeleton crystals including anorthite, and as granular aggregates. Occasionally residual glass is included, which appears in tufted forms in Figure 9.

Enstatite is abundant and in its usual characteristic forms. It is conspicuous in round or oval chondrules in which the fibres are eccentrically radiating, or in sheaved groups of which an example is shown in Fig-

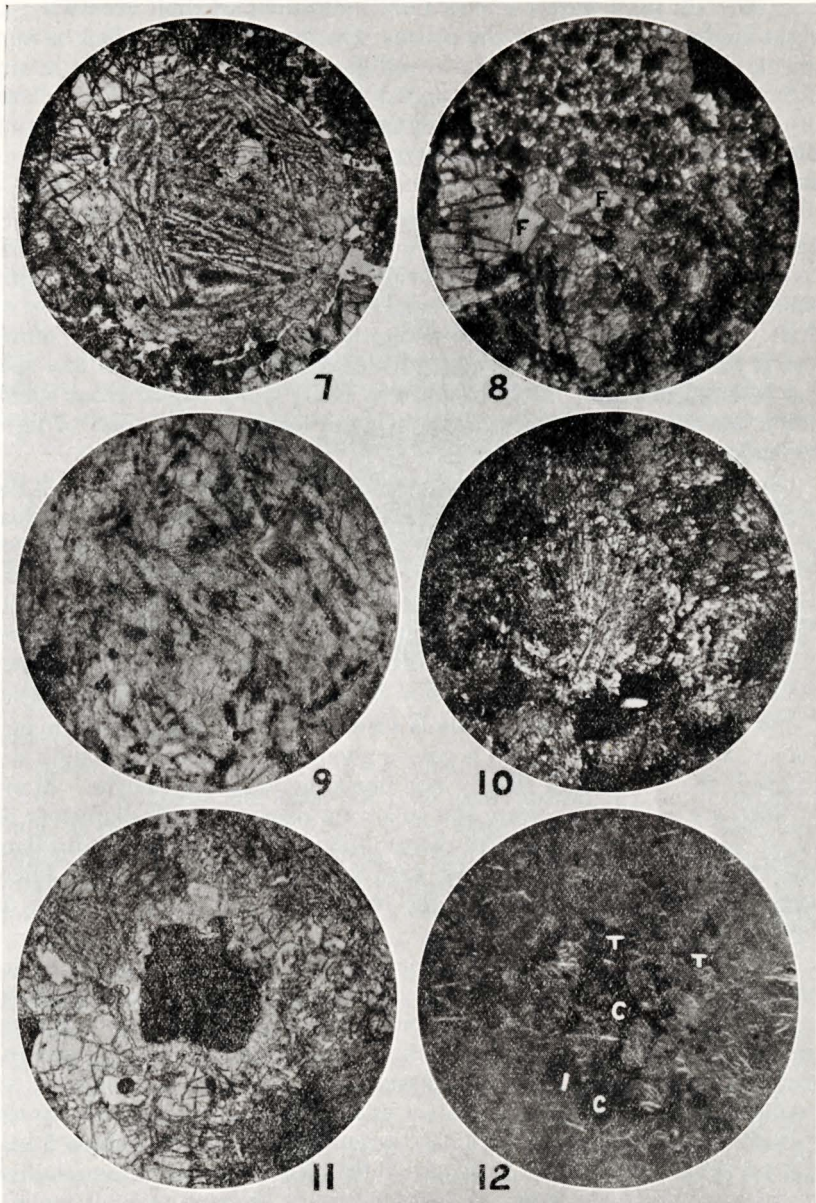


FIG. 7. Several groups of barred olivine crystals in a chondrule. x 40, plane light.
 FIG. 8. Crystalline grains of olivine in anorthite base (F). x 150, crossed Nicols.
 FIG. 9. Tufts of included residual glass in olivine crystal. x 40, plane light.
 FIG. 10. Enstatite with sheaved group of radiating fibers. x 40, crossed Nicols.
 FIG. 11. Grain of iron surrounded by feldspar. x 40, plane light.
 FIG. 12. Metallic iron (I), troilite (T), and chromite (C). x 40, reflected light.

ure 10. It also occurs in the form of monosomatic crystals and crystal grains.

The following observations on the mineral constituents are made by Mr. W. Harold Tomlinson:

There is roughly about twice as much olivine as pyroxene. The principal pyroxene present is enstatite. Most of the enstatite chondrules are composed entirely of that mineral, though some contain also small amounts of olivine and anorthite. There is also present a clino-pyroxene of the general form of enstatite which has been called clino-enstatite, and a clino-pyroxene in crystalline grains of the type of diopside.

In addition to the silicates of the olivine and pyroxene groups there is a small amount of plagioclase having about the indices of anorthite. The mineral is unevenly distributed, occurring in some chondrules and not in others.

The amount of metallic minerals is small, not more than 6 to 8 percent. Troilite is most abundant; iron and chromite in about equal proportions. Spherical chondrules having rather perfect crystals of olivine in a granular base, and practically no iron, are rather characteristic of the stone.

A grain of iron surrounded by feldspar is shown in Figure 11, while Figure 12 shows inclusions of iron, troilite, and chromite.

An analysis made by Mr. R. Rupert Kountz under the direction of Professor Louis Waldbauer of the University of Iowa gave the following results:

SiO ₂	24.55
Fe ₂ O ₃	40.03
Al ₂ O ₃	12.19
NiO	15.40
CaO	1.43
MgO	5.17
Na ₂ O, K ₂ O	1.23
	100.00

The unusually high percentage of Fe₂O₃ in the analysis is evidently due to the fact that the sample did not fairly represent the average composition of the mass. The absence of sulphur also is probably accounted for by the fact that the sample did not happen to include any of the troilite inclusions.

The name Cherokee Springs has been chosen for the two meteorites here described, both of which are preserved in the writer's collection. Though the village where the larger mass fell appears in the postal directory as Cherokee, it has long borne the name of Cherokee Springs by reason of its mineral waters, which have been known from the earliest times. Inasmuch as the name Cherokee County is attached to another meteorite, the name Cherokee Springs would seem less likely to cause confusion than the name Cherokee alone. The meteorites may be classified as gray chondrite (Cg).

MAY 2, 1934.