NOTES ON SOME INDIAN AEROLITES.

BY

L. L. FERMOR, A.R.S.M., B.Sc., F.G.S.

(With Plates 4 to 15.)

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CONTENTS.

I.—GENERAL REMARKS.

THE object of this paper is to put on record an account of the circumstances of the fall and external characteristics of specimens of four Indian aerolites or stony meteorites, concerning which only preliminary notices have appeared.[1] No attempt has been made to investigate the mineralogical and chemical composition of these aerolites. Two of these, Karkh and Bholghâti, fell in the year 1905, whilst the other two, Haraiya and Delhi, fell in the years 1878 and 1897 respectively, but have only recently been acquired by the Geological Survey of India.

[1] *Rec. Geol. Surv. Ind.*, XXXIII, pp. 72, 73, (1906); *Journ. and Proceedings, Asiatic Soc. Beng., II*, pp. *xlix*, *l*, (June 1906).

An account is also given of the fall which took place at Andhára in 1880, although this meteorite is lost to science, as it has been made an object of worship by the inhabitants of the part of Bengal in which it fell.

It will be convenient to give in this place a list, as far as possible in chronological order, of all the falls known to have taken place within the bounds of the Indian Empire. It is possible, of course, that by a search of old astronomical and historical works records of other falls might be obtained. The list is as follows :—

List of Indian Meteoric Falls.

Year of fall.	Name of fall.	Year of fall.	Name of fall.
1798	Benares.	1857	Parnallee.
1808	Moradábád.	1860	Khairagarh.
1814	Gurram Konda.	1860	Kusiali.
1814	Chail.	1860	Dharmsála.
1815	Durala.	1861	Batsura.
1822	Kadonah.	1860-62	Meerut.
1822	Fatehpur.	1863	Pulsora.
1822 or '23	Ambála (Umballa).	1863	Shaital.
1827	Mhow (Mau).	1863	Mánbázár pargana.
1834	Chaharwala.	1865	Supuhi.
1838	Akbarpur.	1865	Gopálpur.
1838	Chandakapur.	1865	Sherghotty.
1843	Mánegáon.	1865	Maddur táluk.
1850	Shalka (Sáluká).	1866	Udipi.
1852	Yatur.	1866	Pokhra.
1852	Basti.	1866	Jamkhair.
1853	Segauli (Segowlie).	1867	Khetri.

List of Indian Meteoric Falls—contd.

Year of fall.	Name of fall.	Year of fall.	Name of fall.
1868	Lodhrán.	1886	Nammianthal.
1868	Moti-ka-nagla.	1887	Lalitpur.
1870	Nedagolla.	1890	Kakangarai.
1872	Dyalpur.	1890	Nawapali.
1873	Jhang.	1893	Bherai.
1873	Khairpur (and Maili).	1894	Bori.
1875	Sitathâli.	1895	Bishanpur (and Parjabatpur).
1875	Nagaria.	1895	Ambapur Nagla.
1875	Queng-gouk.	1897	Gambat.
1876	Judesgherry (Judesegeri).	1897	Delhi.
1877	Bhágur (Dhulia).	1897	Kángra Valley.[1]
1878	Haraiya.	1898 (found)	Kodaikánal.
1878	Dandapur.	1899	Donga Khurd (Kohrod).
1879	Kalambi.	1901	Sindhri.
1880	Andhára.	1903	Dokáchi.
1882	Pirganj.	1905	Karkh.
1884	Pirthalla.	1905	Bholgháti.
1885	Chandpur.	Unknown	Goalpára.
1885	Sabet Mahet.		

The total number of falls recorded in this list is 71, of which all but three (Nedagolla and Kodaikánal) are stony meteorites or aerolites. Of these, 66 took place during the nineteenth century, or an average of 2 every three years. During the second half of the century,

[1] This is a meteorite recently described by Professor W. N. Hartley in *Proc. Chem. Soc., London*, Vol. 22, p. 251.

in which, in all probability, a larger proportion than previously of the falls which occurred were brought to the notice of science, 52 falls were recorded in 50 years or roughly 1 every year. Hence it can be expected that on the average at least one meteoric fall a year within the limits of the Indian Empire will be recorded during the twentieth century. The actual number of falls is probably considerably larger than the recorded number; for if the falls be arranged according to provinces, thus:—

United Provinces	21
Panjáb	10
Bengal	8
Madras	8
Bombay	7
Central Provinces	5
Eastern Bengal and Assam	4
Rájputána	3
Central India	2
Mysore	2
Baluchistán	1
Burma	1
	72[1]

it becomes evident that meteoric falls are most frequently reported in areas where the population is densest. Meteorites probably fall just as often in the less densely populated areas, where, however, they have less chance of being observed. Similar considerations, no doubt, explain why India, being, on the average, a very densely populated country, is apparently one of the most favoured parts of the earth's surface for meteoric falls. They do not explain, however, why the 71 falls recorded for India consist of 68 aerolites, 2 siderites or irons (Nedagolla and Kodaikánal), and 1 siderolite (Lodhrán), while out of 24[2] supposed meteorites recorded from Australia, 19 are siderites or irons, 2 are siderolites, and only 3 are aerolites or stones.

Specimens of all the falls given in the list on pages 80 and 81 are in the Museum of the Geological Survey of India, with the exception of Gurram Konda, Chail, Bherai, and Kangra Valley, portions of all of which we should like to acquire by exchange, and of Andhára of which no portion has reached any museum.

[1] One fall, Khairpur and Mailsi, took place in both the Panjáb and Rájputána.

[2] According to the 1904 "Catalogue of the Ward-Coonlay Collection of Meteorites," by the late H. A. Ward.

II.—THE BHOLGHÁTI METEORITE (No. 241).[1]

This meteorite fell at about 8-30 A.M., on 29th October, 1905, at Bholgháti village (22° 5′ N. and 86° 54′ E.), Deoli pargana, Morbhanj State, Bengal. According to a statement of Karu Majhi, son of Anupa Majhi, of Bholgháti, forwarded under cover of a letter from His Highness the Maharaja of Morbhanj,

"The sky was not cloudy. The meteorites fell almost simultaneously. His attention was first attracted by the noise resembling the roaring (dho—dho—) of the clouds. He looked up and saw two stones approaching the earth. They were not luminous. When they approached further the noise resembled that of rocket (sar-r-r). One of the meteorites fell a few paces off his verandah where he was sitting at the time of the occurrence, and the other in the jungle about 150 yards off his house. He took away the first one as soon as it fell down."

This is the meteoric stone (241·A) which was forwarded and presented to the Geological Survey of India by Mr. P. N. Bose, Geologist to the Morbhanj State, on behalf of the Maharaja. The second piece (241·B), which fell in the jungle close by, was also recovered and is the property of the Morbhanj Museum, but has been lent to the Geological Survey for examination.

These two pieces weighed respectively 1,000·6 and 1,578·9 grammes, giving a total of 2,579·5 grammes for the fall.

The first meteorite (241·A) received weighs 1,000·6 grammes, and is almost a complete aerolite, except for a few pieces chipped off. Its general appearance and shape are well shown in Plates 4 to 6.[2] If the portions chipped off were restored to the stone its shape would be roughly that of a tetrahedron, of which one side forms the base on which the meteorite rests in Plates 4 and 5. The other three sides of the tetrahedron may be designated A, B, and C, as indicated on the plates. In Plate 6, the meteorite is inverted so as to show this base uppermost. The crust is brownish-black, in some places dull, but in others shining black. The shiny parts form little glossy specks and patches, the latter being in places quite large, as is well

[1] The number of the meteorite in the register of the Geological Survey collection.

[2] I must express my thanks to Mr. H. B. W. Garrick for the fine set of photographs with which I am able to illustrate this paper.

seen in Plate 4, fig. 1. There are a few shallow pittings shown in Plate 4, fig. 1.

Where fractured the aerolite shows a dark-grey matrix in which are set many white greenish and brownish, angular and rounded, patches, shown well in Plate 4, fig. 2, which is somewhat enlarged, the photographic plate having been exposed for the contrast in the fractured part of the meteorite instead of for the detail in the crust, as was the case in fig. 1.

Some of these patches are $\frac{1}{4}$ or even $\frac{3}{8}$ inch long, and while some of them are seen to be composed entirely of one mineral, others resemble rather fine-grained rock fragments, and together they cause the meteorite to resemble a volcanic rock containing phenocrysts and angular fragments of rock in a dark fine-grained matrix. There are also some included black patches up to $\frac{1}{4}$ inch in diameter, one of which is shown in Plate 5 in the fractured part. A small chip of this heated on platinum became pale greyish in colour, so that it is probably partly composed of carbonaceous matter.

The second aerolite (241·B) weighs 1,578·9 grammes and is figured in Plates 7 and 8. The stone is roughly rectangular in shape and is covered with crust on five sides. The remaining one, the top side as seen in Plate 7, is made up of fracture-surfaces, of which the left hand portion is quite free from crust; whilst the right hand portion is a fracture which must have formed by the splitting off of a piece of the aerolite whilst still in air, for the fracture has since been partly covered with a new crust. This new crust is well shown in Plate 8, on the fracture-surface seen to the left. The front face of the meteorite (Plate 7) is beautifully curved and is covered with a dull blackish crust, on top of which are patches and networks, especially towards the edges, of a shining dark brown slag-like vitreous crust. The right hand end seen in Plate 8 shows parallel fluidal ridges of shiny brownish-black crust with some of the same smooth angular black patches of shiny crust as are seen in the other aerolite. In only one place on either stone does one of these smooth black patches of crust come against the edge of a fracture, and here it is seen to correspond to one of the whitish angular rock-like fragments which are included in the dark grey ground-mass; the probability therefore is that all these shiny smooth parts of the crust correspond to underlying breccia-like or porphyritic inclusions in the dark-grey ground-mass. This indicates that at least some of the light angular

patches are more easily fused than the main part of the aerolite. The back side of the aerolite is similar to the right hand end, whilst the left hand end and base of the stone are formed by fracture-surfaces, formed long before the stone reached the earth, as they have been almost completely recovered by crust.

III.—THE KARKH METEORITE (No. 239).

The first indication that a meteoric fall had taken place in the Jhálawán Agency, Baluchistán, was an extract from the diary of Major H. L. Showers, Political Agent, Kalat, forwarded to the Geological Survey Office by the First Assistant to the Agent to the Governor-General and Chief Commissioner in Baluchistán. This extract contained an extract from the diary of the Native Assistant, Jhálawán, relating to phenomena noticed on the 27th April, 1905. The Native Assistant was passing near the Nar spring in the Mula Pass about 1 P.M. when he heard what he thought was the report of a gun on the adjacent hills. This was followed by another "echo" of the same sort, soon followed by a "thundering noise." The sky was cloudless. This noise resembling thunder is reported to have been heard all round the Mula Pass up to Naulang and several people are said to have seen "a flaming star like a ball running about during the middle of the day. Before the thundering noise ended the ball became extinguished and left clouds of smoke after it. The flaming ball is said to have had a long tail of smoke."

The Native Assistant's diary further states:—

"It is reported from Karkh that the noise rose in the Wehari Hills near Karkh and a star was seen rising from the top of a hill and some big stones were heard falling from the hill."

It seemed probable that this last passage indicated the fall of a large meteorite near Karkh, and this probability was confirmed when, in response to a request from the Director of the Geological Survey that a search should be made, the fine mass of meteoric stone shown in Plates 9 to 11 was received from Karkh, having been obtained by Major Showers.

Mr. Vredenburg of the Geological Survey of India subsequently visited Karkh and obtained from the Native Assistant, Jhálawán, a second piece of the meteorite, shown in Plate 12. He was unable however, to obtain any trustworthy details as to the exact circumstances of the find, or to trace what had become of the remainder of

the meteorite, for the two masses obtained were evidently only portions of a very large meteorite.

Subsequently, however, as the result of further enquiries, Major Showers gained some additional information, according to which the meteorites fell at two different places, 15 miles apart, on the same date. The large piece (239·A), and probably also the second piece (239·B) mentioned above, was found on the banks of a dry nullah below the Sumbáji Hills. Many small fragments (239·C and 239·D) were collected at this locality where they "were found in a small oval-shaped hollow about two feet in diameter and one foot deep." "The second meteorite fell in the Michára hills on a flat piece of sheet rock. In falling it fractured the rock and was itself broken into four pieces." Two of these, 239·E and 239·F, have reached the Geological Survey collection through the Second Assistant to the Agent to the Governor-General in Baluchistán, and Mr. G. H. Tipper.

The Sumbáji Hills (highest point △ 6,448 feet) lie about 14 miles W. N. W. of Karkh and the Michára Hills about 5 miles W. N. W. of this place, so that the distance between the two spots is about 9 miles. The line joining these two sets of hills lies about W. N. W. to N. W. and this line should correspond with that of the flight of the meteorite. If the fact[1] that a much larger total weight (18,896 grammes) of meteorite was received from the Sumbáji Hills than from the Michára Hills (2,939 grammes) can be taken to indicate that a larger weight fell in the former place, then it seems probable that the direction of flight was from S. E. to N. W. or from E. S. E. to W. N. W. For we can suppose that the original meteoritic mass fractured at a considerable height above the earth's surface into two main pieces, of which the heavier travelled farther than the lighter. The piece which fell in the Sumbáji Hills may not have suffered further disruption till impact with the earth's surface or until broken by human agency. But the Michára portion must have disrupted before impact with the earth's surface, for the two pieces received from these hills had evidently become separate before they reached the earth's surface, as the fracture-surfaces of one piece are covered with a thin crust.

[1] On page 89 it is noticed that there has evidently been some mistake made with regard to the place of origin of C, D, E, and F. But even if we suppose C and D, as well as E and F, to have come from the Michára Hills, it still gives a much larger total weight from the Sumbáji Hills.

The weights of the various pieces of this fall as received in the Geological Survey Office are shown in the following table :—

Place of Origin.	Number.	Weight.	Total weight for each locality.	Total weight of fall received.
		Grammes.	Grammes.	Grammes.
The Sumbáji Hills	239·A	14,546		
	239·B	3,087		
	239·C	878		
	239·D	385	18,896	
The Michára Hills	239·E	2,196		
	239·F	743	2,939	21,735

21,735 grammes is about 47·7 lbs.

The largest mass (239·A) is evidently but a portion of a much larger mass, but the fractured surfaces do not look very fresh so that the meteorite may have broken at the time of hitting the hill. It is covered by crust over about one-half its superficies. This crust is nearly all dull black, but at one end has adherent to it a number of rather soft white patches which effervesce with dilute acid and probably indicate that the meteorite fell on a limestone formation.

Plates 9 and 11 show the shape of this mass. There are abundant pittings or thumb-marks on the crust; these are seen in Plate 9, which is only half natural size. In Plate 10 a portion of the crust is shown natural size. This shows the groove-like character of some of these pittings. It is evident from the beautiful flow-structures shown by the crust on one side of these grooves that they must have been scooped out of the fused exterior of the aerolite by the air as it rushed over the surface of the meteorite during its rapid flight through the earth's atmosphere.

This flow-structure indicates the orientation of the meteorite in the line of flight during the time in which these grooves were cut out, the molten crust flowing, of course, towards the rear end of the stone. One portion of the crust shows a little slickensiding striation.

The fractured surfaces are of a dark ash-grey colour and where freshest show a few very light-grey chondri usually about $\frac{1}{16}$ inch in diameter. There are also scattered pale yellowish metallic points.

The smaller piece (239·B), though evidently a part of the same fall, does not fit the larger piece anywhere. One side of it, shown in Plate 12, fig. 1, is completely covered with a rather dull black crust, showing groove-like pittings and flow-structures where the molten crust has flowed over the top edge of the side shown. There is also a certain proportion of crust on the top side of the meteorite. This is shown in fig. 2 in which we are looking down on the fragment placed as in fig. 1. The crust on this surface has in places a scoriaceous or cindery appearance. Besides this fig. 2 also shows, in the S. E. corner, the thickness of the crust which is somewhat variable but seems to average about 0·5 mm. The back surface of the fragment as placed in fig. 1 consists entirely of fracture-surfaces, while the base on which it rests is largely covered with a thin dull (in places rather shiny) black coating and is possibly a fracture, produced by the disruption of the meteorite during flight, over which a very thin coating of crust formed before the stone reached the ground. On account of this old fracture-surface it seems probable that this piece and the large mass are portions of two separate sections of the meteorite which were disrupted from one another during flight and reached the ground separately.

239·C and 239·D were received together and consist of a weight of 1,264 grammes of chips. These were separated into 122 larger pieces weighing 878 grammes, of which the largest weighed 25·7 grammes, and some 200 to 300 smaller chips. Many of the chips are bounded entirely by fracture-surfaces, but a certain proportion have a little crust on one side. The fractures are evidently old, being now somewhat rusty, and many of them have on them a little soft buff-grey calcareous matter which is probably of the nature of tufa deposited on them as they lay on the ground. From this it must be concluded either that they were broken off at the time of impact of the meteor with the ground, or, and more probably, that they were broken off by the natives in their curiosity to see what the stone was. In either case they must have been left lying on the ground for a sufficient length of time for surface waters to have deposited on them calcareous tufa derived either from immediately underlying or from neighbouring limestone. Most of the fragments were of the same character as 239·A, but there were a few chips of a fine-grained pale grey rock,

one piece having a layer of nickel-iron attached. Of 14 of these pieces, 12 had crust attached, and the remaining 2 had a secondary crust. In fact, it is evident that these chips are a portion of a similar layer of stone forming part of 239·E, and consequently that the information about the localities, according to which C and D fell on the Sumbáji Hills and E and F on the Michára Hills, is open to some doubt. If meteoritic matter did fall at these two separate places, then the specimens from these two localities must have been mixed before they reached Major Showers.

239·E is not figured here. It is about $6\frac{1}{2}$ inches long by $4\frac{1}{4}$ inches broad and 4 inches high, and is perhaps $\frac{1}{3}$ covered with a dull black smooth crust (which may be called primary crust), whilst there are five fracture planes on which the rock has been re-fused so as to form a thin black, slightly shiny crust. The fresh fracture is of the usual dark grey. The most interesting point about this stone is that at one end there is a layer of much finer grained and much paler (light brownish grey) meteoritic material than forms the main mass of this stone and the whole of all the others except 239·F. This layer is $\frac{3}{8}$ inch thick, $2\frac{1}{2}$ inches long, and 2 inches broad. It is so fine-grained and structureless in appearance that it looks like a very fine-grained limestone at first sight. It is joined to the remainder of the meteorite along a flat surface which has been partly uncovered, owing to the chipping off of pieces of the lighter rock, so as to show signs of a shiny black crust-like layer separating the two portions of the stone. There is also a slight difference in the texture of the crust covering the two portions of the stone. In the fine-grained portion there are areas of yellowish nickel-iron in thin layers up to half an inch across.

239·F, which is also not figured, is about $3\frac{3}{4}$ inches long, 3 inches broad, and $2\frac{1}{2}$ inches deep. Over one-half of it is covered with a black crust, rather shiny in places. On the fracture-surfaces are abundant tiny yellow specks of nickel-iron striking up. At one end is a little of the fine-grained light grey material similar to that in 239·E, but the junction between the light and the dark portions is obscured.

Composition of the meteorite.

Dilute hydrochloric acid applied to a fresh fracture-surface of any of the pieces of this fall gives rise to the emission of a strong smell of sulphuretted hydrogen. Microscope sections indicate that the stone is a rock composed mainly of olivine, enstatite, nickel-iron, an opaque constituent suggesting pyrrhotite by its bronzy lustre, and an opaque black

mineral. Both the latter are probably sulphides. The specific gravity of the large pieces 239·A was roughly determined as 3·60. That of 239·F is 3·55.

IV.—THE DELHI METEORITE (No. 238).

According to a letter, dated 19th February, 1898, from Mr. J. Greson, Inspector of Railway Police, Allahabad, to the Reverend Father Francotte, S.J., of St. Xavier's College, Calcutta, some natives who were working in the fields in the evening of the 18th October, 1897, saw at about 7-30 P.M. a meteor of unusual brilliancy; a few seconds after, a noise similar to thunder was heard, and about the same time two stone-like bodies (each weighing about a pound) were heard to fall. They were black on the outside, but when broken were light blue or greyish.

Unfortunately this occurrence was not brought to our notice till 1903, and it was then impossible to trace these stones, partly on account of a change of the district officials, but no doubt partly due to the reluctance of the owners of the pieces, into which the stones had broken, to admit their possession. Hence the only specimen of this fall in the Geological Survey Museum is a tiny fragment sent with the above-cited letter by Mr. Greson to Father Francotte, who kindly presented it to our collection. It weighs only 0·79 gramme and has a little crust on one side. The fractured surfaces are light grey and show abundant tiny specks, probably of nickel-iron in a whitish matrix through which are scattered brownish and greyish granules. The place of the fall was a village some 5 miles from Delhi near the famous Kutb Minár.

V.—THE HARAIYA METEORITE (No. 237).

This meteorite was recently obtained from Mr. R. B. Reid of Allahabad, and the following is an abstract of the particulars furnished by him :—

It fell in the Basti district (United Provinces), about 14 miles west of the Sadr station in the afternoon during August or September, 1878, and was secured by Mr. Reid, who, on account of an exceptionally violent crash of thunder and brilliant flash of lightning, which he saw from his verandah during a thunderstorm, sent out a messenger who returned three days later with the meteorite. It appears that three people were weeding a field about a mile out of the village close to a

mahua tree. It was raining hard at the time, and according to one of the survivors "suddenly a crashing peal of thunder resounded, he heard a whirring sound above him, like unto a kite descending then, as if a body came down with a thud on the ground." He and the second man were rendered insensible, and on coming to he saw that an old woman, one of the three weeders, was charred and dead. Close by her was a large mark on the ground, where the earth had been splattered up, giving the appearance as if something had entered the ground. The spot was dug up and at a depth of about 5 feet from the surface the meteorite was found buried.

The above account is given for what it is worth. The chief point is that Mr. Reid no longer remembers the name of the village, nor did he record the exact date of the fall, although he is sure of the year. As the large village of Haraiya (latitude 26° 48′ N.—longitude 82° 31½′ E.) is situated in the position indicated (14 miles west of the town of Basti) this name has been attached to the fall. It is just possible that this aerolite is only another portion of the Dandapur fall of 5th September, 1878. This, however, is not very probable (1) because Haraiya and Dandapur (26° 55′—83° 58′) are 88 miles apart, (2) because the Haraiya fall is said to have taken place in a thunderstorm while the sky at Dandapur was comparatively cloudless.

The specimen is a nearly perfect aerolite weighing 1,078·8 grammes. It is almost completely covered with a shiny black crust which has got knocked or peeled off in a few places as can be seen from the photographs of this meteorite (Plates 13 to 15). Plates 13 and 14 show the front side of this meteorite, and it will be seen that the crust exhibits a beautiful series of delicate ridges radiating from about the centre of this side of the stone. They indicate, of course, that this was the front side of the stone when in flight, and were caused by the rapid passage of the air over the molten crust. The symmetry of these radiations is spoilt by the prominent pittings or thumb-marks occupying part of this side. That these finger-like depressions were formed before the radiating flow-lines of the crust is shown by the fact that these lines continue through the pittings and out again on the other side.[1] The other side of the meteorite is shown in

[1] The remarkable likeness of these pittings or depressions to finger-marks is illustrated by the following passage from Mr. Reid's letter giving the details of the fall:—"The meteorite was found buried, apparently not quite hardened, as it has admitted of the finger prints and palm of the hand being impressed on it, when pulled up by the digger."

Plate 15, and although the crust has cracked off over a considerable part of this surface, yet the delicate radiating flow-lines (finer and closer together than on the front side) are well seen. They indicate the flow of the molten crust from the edge towards the centre of this side.

The fracture of this meteorite differs from that of the two preceding in its almost white colour. It shows numerous little dark specks in a white matrix.

VI.—THE ANDHÁRA METEORITE.

On the 2nd December, 1880, a meteoric fall took place at Andhára in the Muzaffarpur district, Bengal, which seems to have escaped notice on the part of students of meteorites. An account of it was given at the time by Major-General A. Cunningham in the Archæological Survey of India Reports, Vol. XVI, pages 32-34 (1883), and as this publication is not generally accessible in geological libraries, I have thought it desirable to reproduce here Cunningham's account of this fall. Some notes on this fall were also given by Mr. H. B. W. Garrick, who brought this fall to my notice, on pages 98 and 99 of the above-cited volume; but as they do not contain anything not in Cunningham's report, they are not repeated here.

"Andhára or Ujyân is a small village on the bank of the Parewâ, or Parwâ Nala, on the bed of the Bâgmati, 4 miles to the west of Sitâmarhi, and 30 miles to the north of Muzaffarpur. Here, on the *amâvasi* of Agrahan (the conjunction or new moon of Agrahayan—2nd December, 1880) at 4 o'clock in the afternoon, a sound like that of a gun was heard, and two Brahmans of the village saw a dark ball fall in a field to the south-west of the village. It is described as having come down almost perpendicularly, but the sound was heard in the west, and a small cloud of dust rose up where it struck the ground. On picking it up it was quite warm and appeared to be white, but it was only covered with dust, and on washing it, its colour became quite black. I heard of its fall a few days afterwards when on my way to Muzaffarpur, and I visited the place on the 30th December.

"My chief object in going to Andhára was to witness the rise of a new worship, which may serve to throw light on the history of several of the *lingams* of Siva, which are very probably only stones that fell from heaven, like the Diana at Ephesus. 'What man is there that

knoweth not how that the city of the Ephesians is a worshipper of the great goddess Diana, and of the image which fell down from Jupiter.'[1]

"Immediately after its fall the meteorite of Andhára became an object of worship. Two Brahmans at once established themselves as its ministering priests, one of them of course belonging to the village, but the other was a wandering Brahman or *Jogi* from Benares. I heard that it had been visited daily by crowds of people, latterly by as many as 500 a day. At the time of my arrival, about 8 o'clock in the morning, there was a continuous stream of people from all quarters. During the forenoon the stream became less continuous, and about midday was intermittent. I saw parties of 5, 10, 15, and 20 still coming from all sides. I counted one party of 23 people. During the early morning there could not have been less than 300 people present between 8 and 10 o'clock, and nearly as many more came before 2 o'clock. I counted roughly 400 persons up to 11 o'clock. On Sundays, they are said to be many more, certainly more than 1,000, and probably not less than 2,000. On the following Sunday, when I was encamped at Kura, 2 miles to the south-west of Parsoni, and 7 miles to the south-south-west of Andhára, the people were flocking to see the meteorite in a continuous stream. I estimated that not less than 4,000 people must have passed my tent; and as there were three other roads as much frequented as the other three sides, there could not have been less than 10,000 visitors on that Sunday.

"The people at Andhára asserted that the offerings made at the shrine amounted to as much as Rs. 20 a day, and that Rs. 400 had been collected up to the time of my visit, that is, in 28 days. The Jogi, however, denied this, and admitted only Rs. 4 or Rs. 5 a day. But as almost everybody gives something, however small, say from one *paisa* to two annas (a two-anna piece was seen by my servants on the 27th) 600 *paisa* or 150 annas, or nearly Rs. 10, would be a minimum daily collection.

"A brick temple had already been begun, and at the time of my visit the walls were about 2 feet high. The votaries crowded in to make their offerings of flowers, sweetmeats, milk, rice, water, bel-leaves, besides money, both silver and copper. Two bel-trees close by had already been stripped of their leaves. After making their offerings the people knelt down in front and with joined hands

[1] Acts of the Apostles, XIX, 35.

muttered some prayers. One old woman, who seemed to be particularly earnest, even clasped the stone.

"When the crowds of votaries had somewhat lessened, I got a good view of the stone. It was about the same size and shape as a common loaf of Indian bread, flattish below, and rounded above, and $4\frac{1}{4}$ inches in height; its colour was apparently quite black. On one side there was a deep indentation as if a piece had been broken off. During the course of the day I heard that the missing piece had been found the day before in a field near the village of Rusâri, half a mile to the west of Andhára. When brought, the two stones were found to fit exactly. After 3 o'clock, when the crowds of votaries had gone off to their homes, I examined the stone quite close. It was quite black, flattish below and rounded above. I did not touch it, but it was measured before me by one of the attendant Brahmans. Its shape was oval, $6\frac{1}{4}$ inches by $4\frac{1}{2}$ in length and breadth, and $4\frac{1}{4}$ inches high. Its weight was said to be about 3 seers, or 6 pounds. The circumference was $16\frac{3}{4}$ inches. By this measurement the diameter is 5·366 inches, and by that of the two diameters the mean is 5·37 inches.

"This new *avatar* of Mahâdeva has received the name *Adbhuta-Náth*, 'the miraculous or wonderful god,' and its fame has spread all over the districts of Tirhût and Champâran."

In response to an enquiry on the subject the Officiating Collector of Muzaffarpur has recently replied that there is no possibility of procuring for the museum any portion of this meteorite, as a temple has been built over the place where the stone fell and a *mela* and fair have been started in connection with the worship of the stone by which means the temple receives a considerable annual income.

VII.—THE KALAMBI, BHÁGUR, JAMKHAIR, AND PIRGANJ METEORITES.

These four Indian aerolites have long been known to science, but until this year (1906) they have not been represented in the Geological Survey collection. We are indebted, for their addition, to the generosity of the Trustees of the British Museum and of the Director of the K. K. Naturhistorisches Hofmuseum, Vienna.

The Kalambi meteorite (No. 243).

Of this meteorite, which fell on the 4th November, 1879, at the village of Kalambi, Wai taluq, Sátára district, two small pieces weighing respectively 6·40 and 4·58 grammes were received during the

present year from the Hofmuseum, Vienna. Judging from "Die Meteoriten in Sammlungen" by Dr. E. A. Wülfing, p. 177, (1897), the original notice of this meteorite has escaped inclusion in the literature of this subject. It is to be found on page *lvi* of the Abstract of the Proceedings of the Bombay Branch of the Royal Asiatic Society which is appended to Vol. XIV of the Journal of that Society, 1880. The village at which the stone fell is probably that marked as Kalambha (17° 49½′—73° 59′) on Standard Sheet No. 201, Bombay Survey. The main mass of the stone seems to be still in the possession of the above Society.

The Bhagur (Dhulia) meteorite (No. 244).

A small fragment, weighing 2·5 grammes, of the meteorite which fell on November 27th, 1877, at Bhágur near Dhulia in the Khandesh district, Bombay Presidency, has recently been presented by the Trustees of the British Museum, to the Geological Survey Museum. The original account of this fall is given in *Jour. Bomb. Branch Roy. Asiatic Soc., XIV*, Abstract of the Society's Proceedings, pp. *iii-vi*, (1878). The main mass, the weight of which is unknown, seems to be buried in the collection of this Society.

The Jamkhair meteorite (No. 245).

A small fragment, weighing 1·7 grammes, of the meteorite which fell on the 5th October, 1866, at Jamkhair, Ahmadnagar district, Bombay Presidency, was also received in 1906 from the British Museum.

The Pirganj meteorite (No. 246).

Of this meteorite which fell on the 29th August, 1882, at Pirganj, Dinajpur district, Eastern Bengal and Assam, (formerly Bengal), a small piece weighing 16·2 grammes has also been received from the British Museum.

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„ 6. Do. do. inverted to show the base of the tetrahedron, natural size.
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8. Do. do. do., end view, natural size.
9. Karkh meteorite (329·A), front view, $\frac{1}{2}$ natural size.
10. Do. do. do., a portion full size to show the pittings and flow markings on the crust.
„ 11. Karkh meteorite (239·A), end view, $\frac{1}{2}$ natural size.
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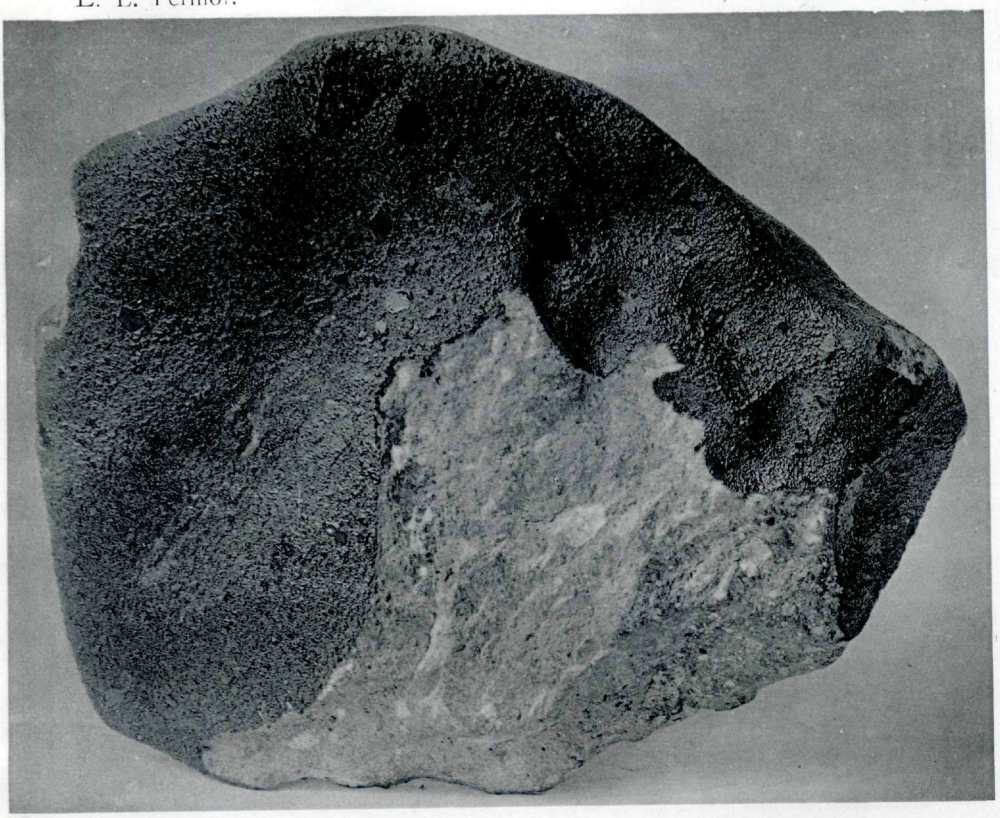
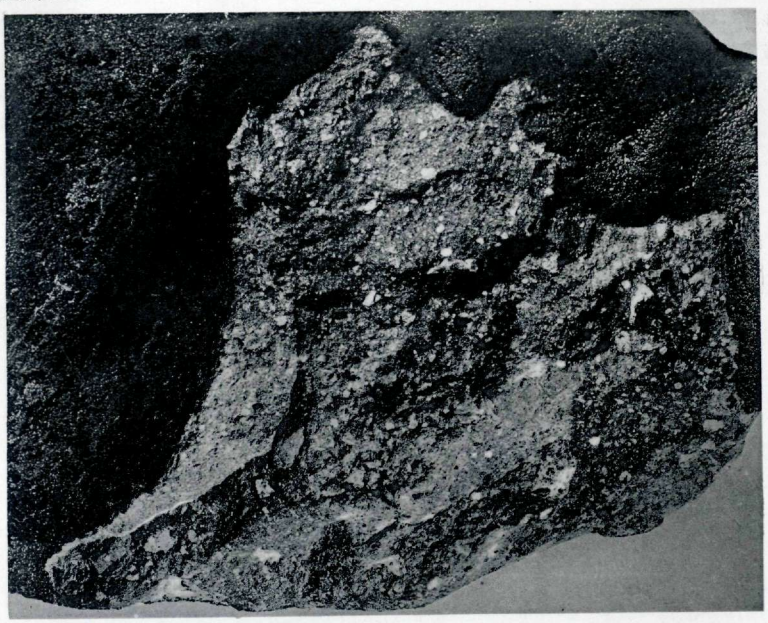
„ 14. Haraiya meteorite, $\frac{3}{4}$ front view showing radiating flow-lines of crust, natural size.
„ 15. Haraiya meteorite, back view showing radiating flow-lines of crust, natural size.

Note.—The titles of plates 14 and 15 have unfortunately been interchanged.



H. B. W. Garrick, Photo. Fig. 1.

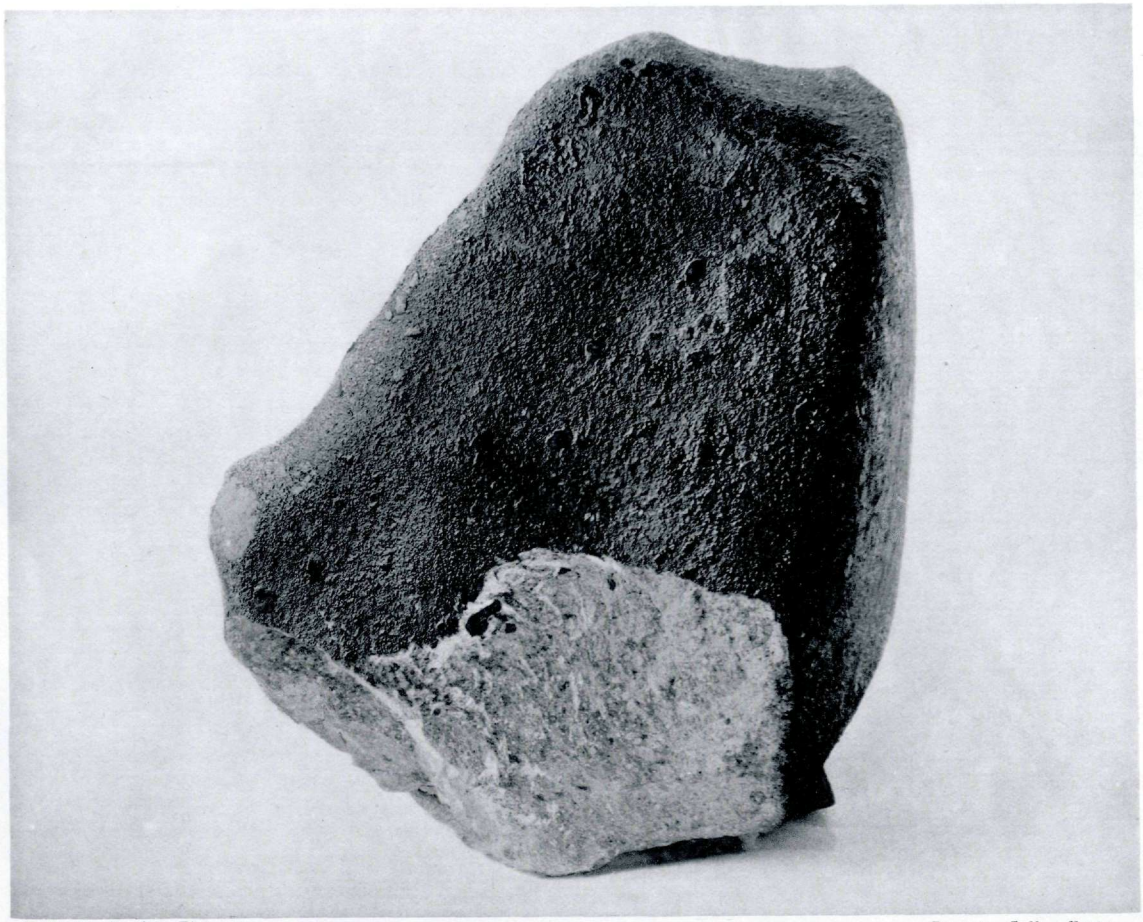


H. B. W. Garrick, Photo. Fig. 2. *Bemrose, Collo., Derby.*

THE BHOLGHATI METEORITE (NO. 241).

Fig. 1—Front view showing the face A—Natural Size.

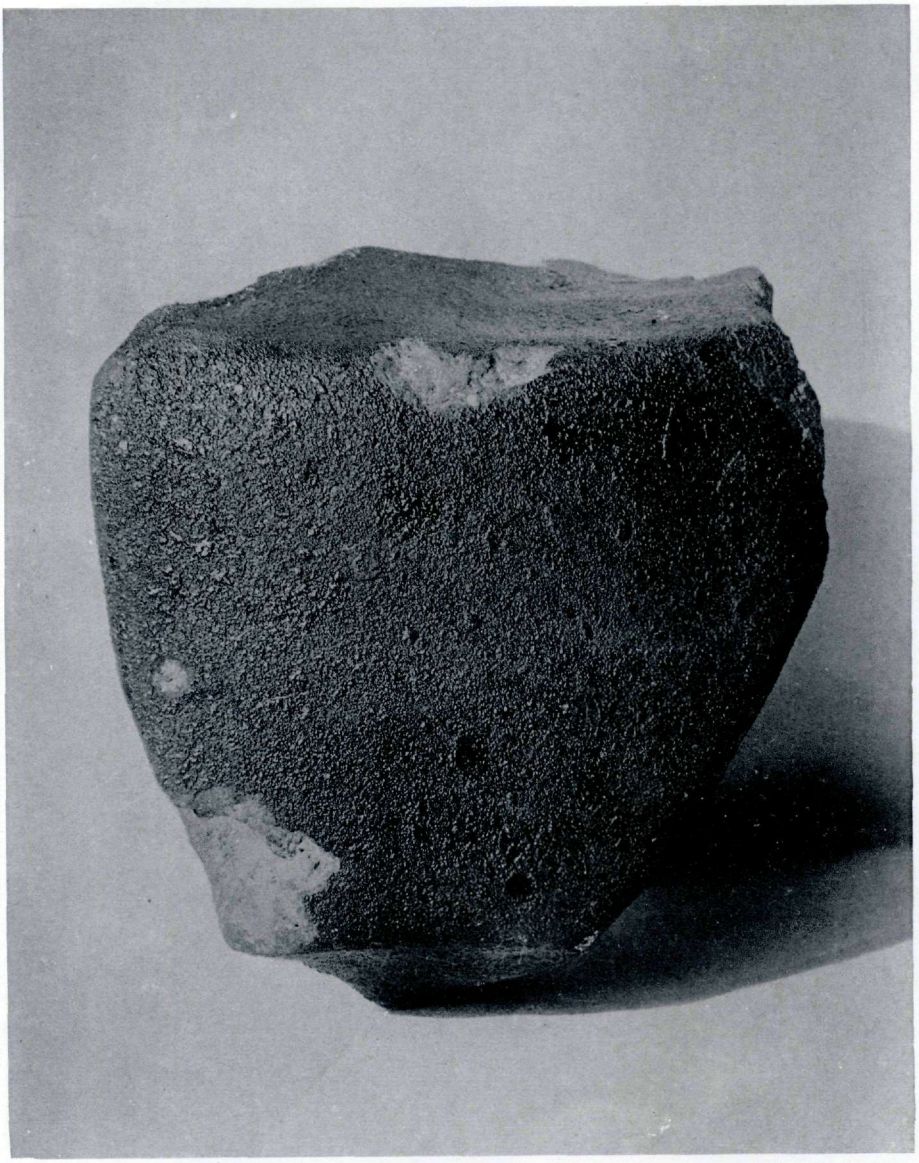
Fig. 2—The fractured part of Fig. 1—(Slightly enlarged, and exposed so as to show the white spots).



H. B. W. Garrick, Photo. *Bemrose, Collo., Derby.*

THE BHOLGHATI METEORITE (NO. 241).

View showing the face C and a little of B (on the right).—Natural Size.



H. B. W. Garrick, Photo. *Bemrose, Collo., Derby.*

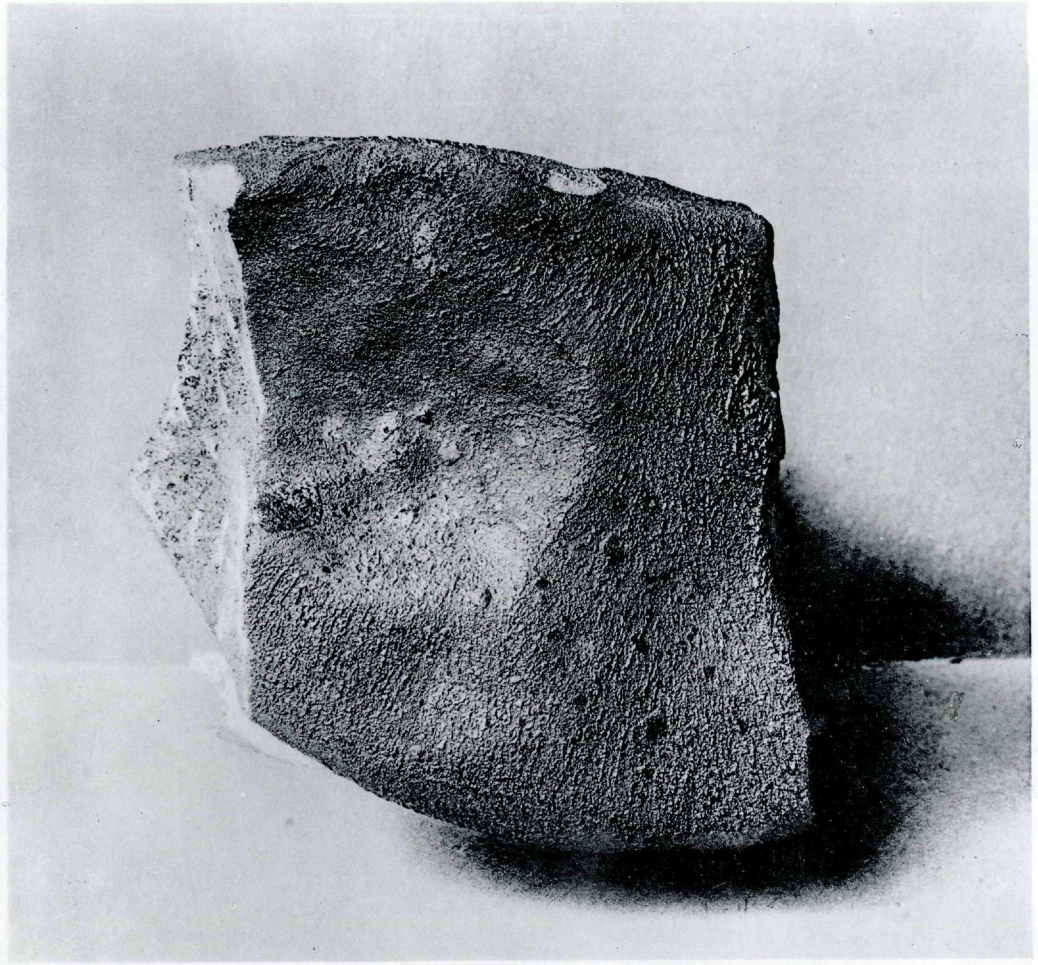
THE BHOLGHATI METEORITE (NO. 241).

Inverted; shows the face B and the base of the tetrahedron.—Natural Size.

H. B. W. Garrick, Photo. *Bemrose, Collo., Derby.*

THE BHOLGHÁTI METEORITE (NO. 241 B).

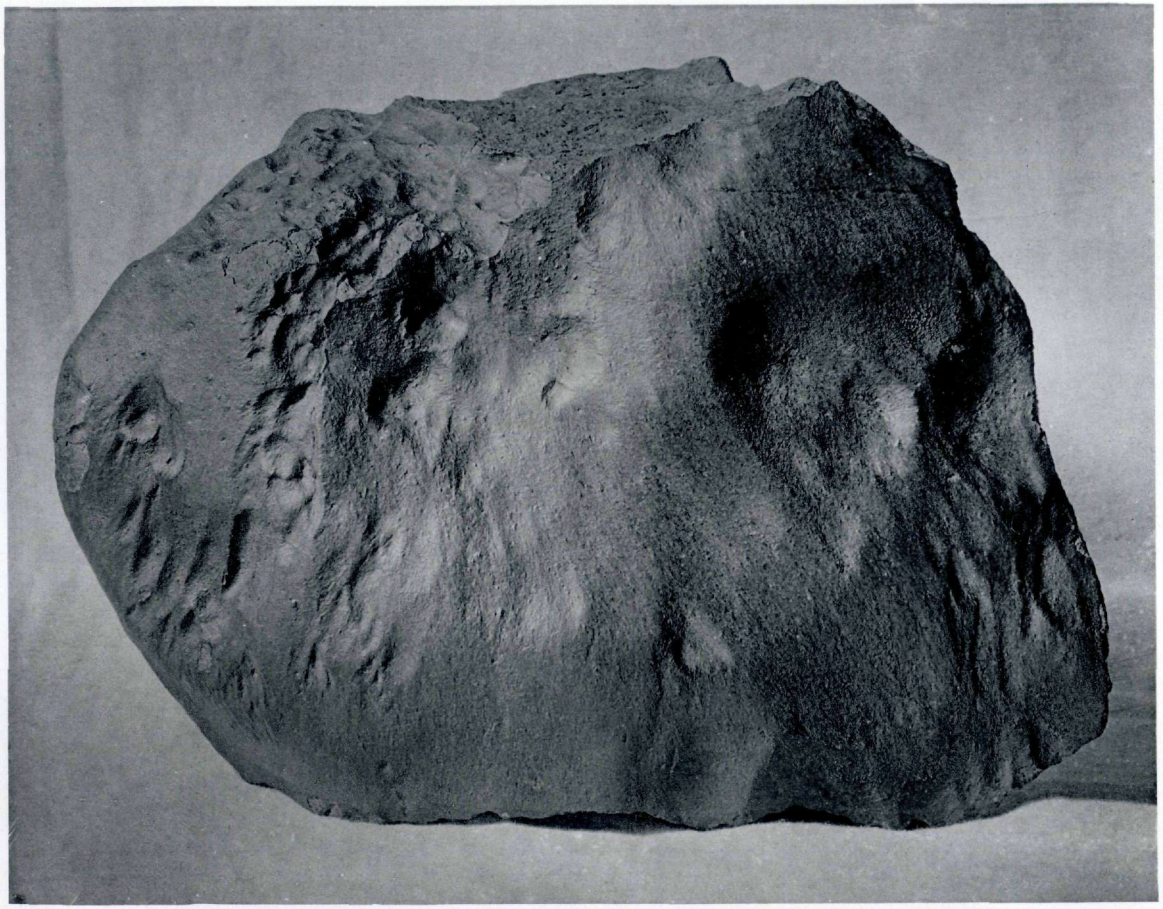
Front view. Natural size.



H. B. W. Garrick, Photo. *Bemrose, Collo., Derby.*

THE BHOLGHÁTI METEORITE (NO. 241 B).

End view of meteorite resting on its front face. Natural size.



H. B. W. Garrick, Photo. *Bemrose, Collo., Derby*

THE KARKH METEORITE (NO. 239 A). LARGE PIECE. HALF NATURAL SIZE.

H. B. W. Garrick, Photo. *Bemrose, Collo., Derby.*

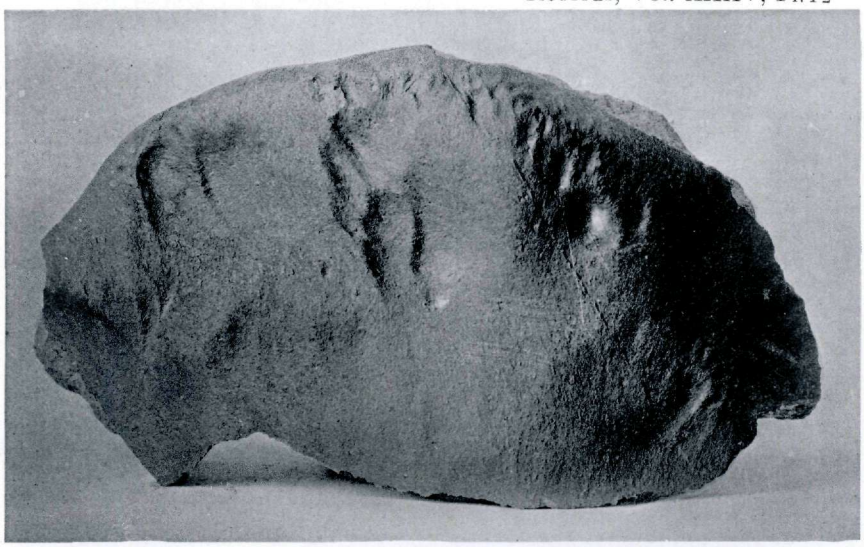
THE KARKH METEORITE (NO. 239 A).

View of part of large piece showing pittings and flow-markings of crust. Natural Size.

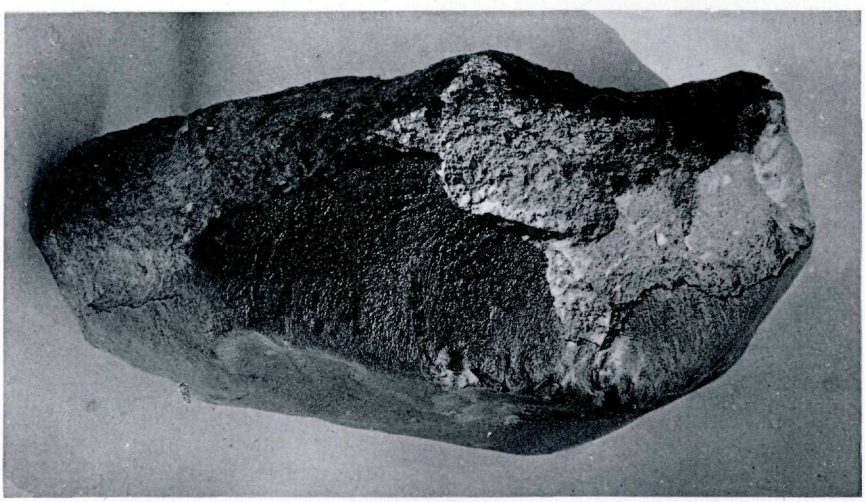
H. B. W. Garrick, Photo. *Benrose, Collo., Derby*

THE KARKH METEORITE (NO. 239 A).

Large piece. View from left hand end. Half Natural Size.



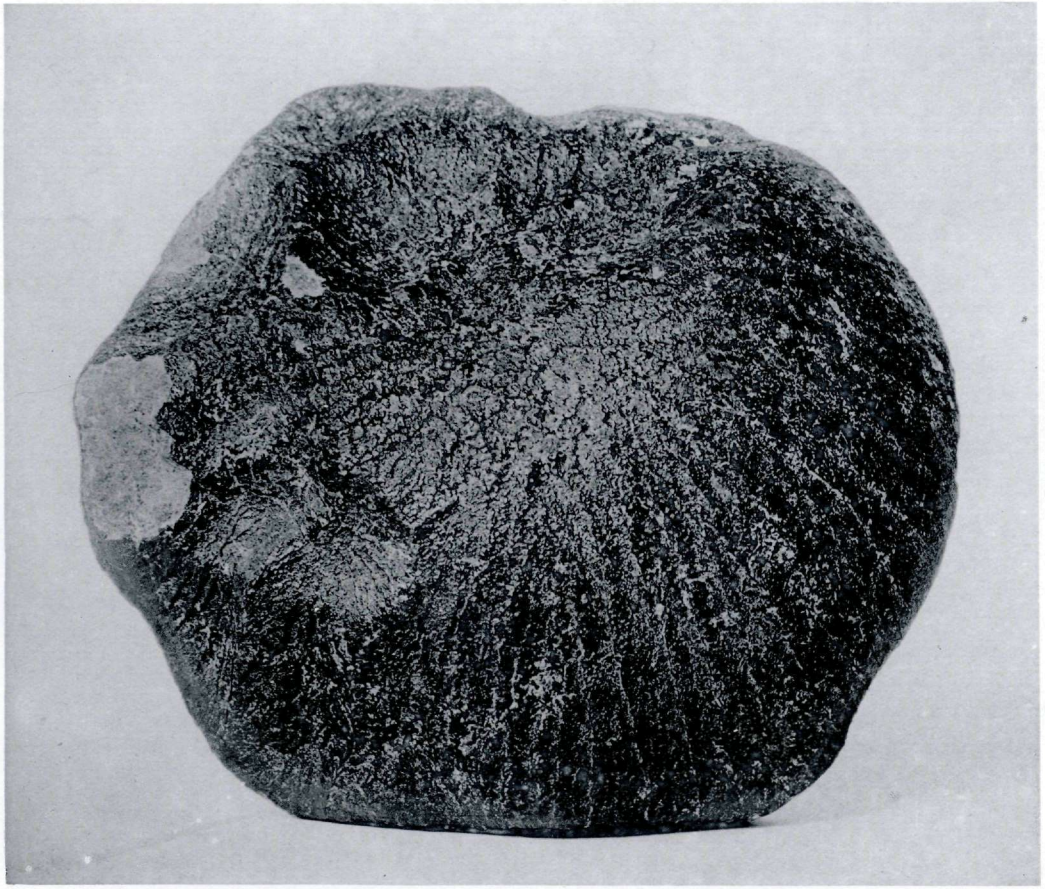
H. B. W. Garrick, Photo. Fig. 1



H. B. W. Garrick, Photo. Fig. 2. *Bemrose, Collo., Derby.*

THE KARKH METEORITE (NO. 239 B). SMALL PIECE. HALF NATURAL SIZE.

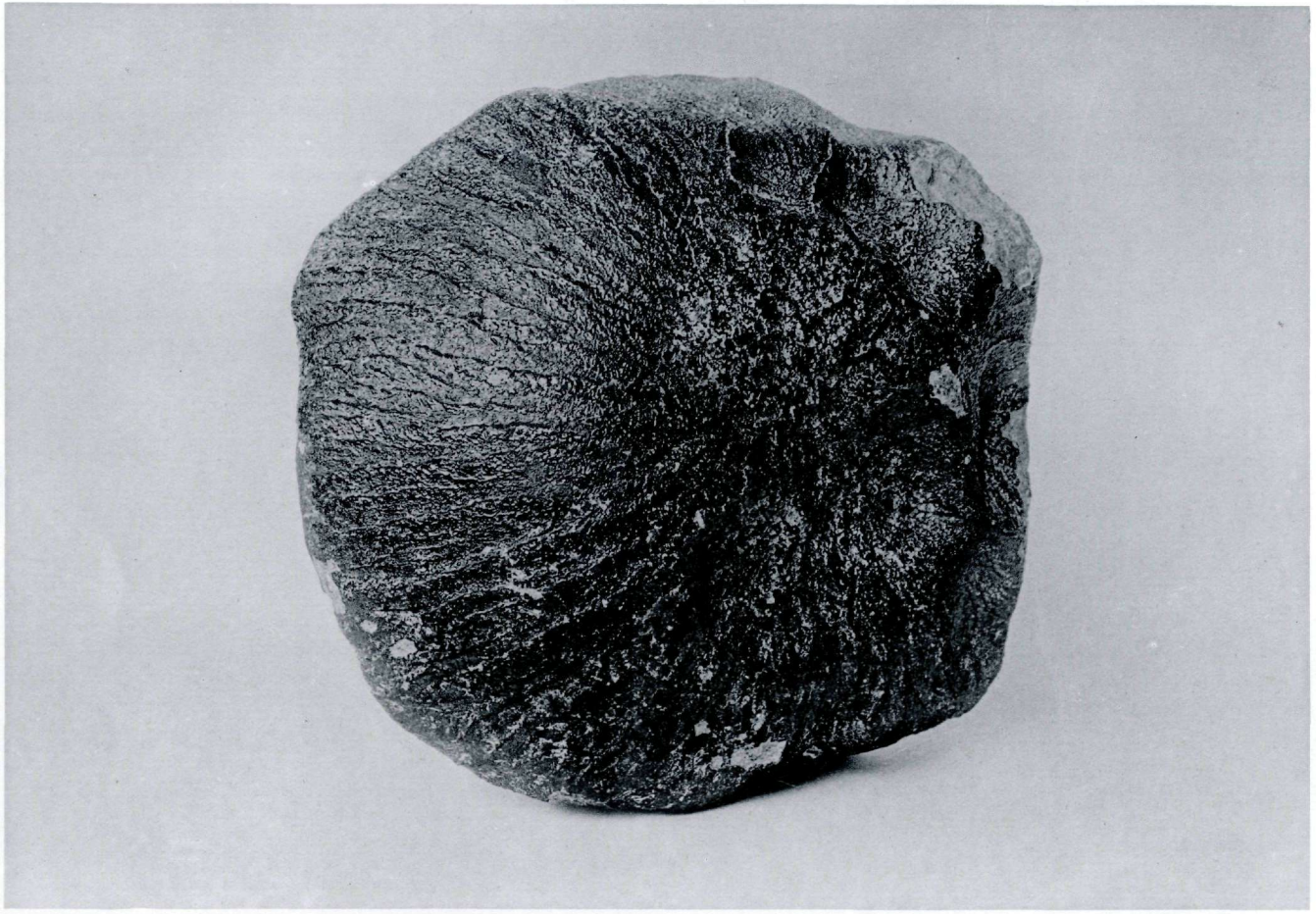
Fig. 1—Front view showing pittings. Fig. 2—View from above showing thickness of crust.



H. B. W. Garrick, Photo. *Benrose, Collo., Derby.*

THE HARAIYA METEORITE (NO. 237). FRONT VIEW. NATURAL SIZE.

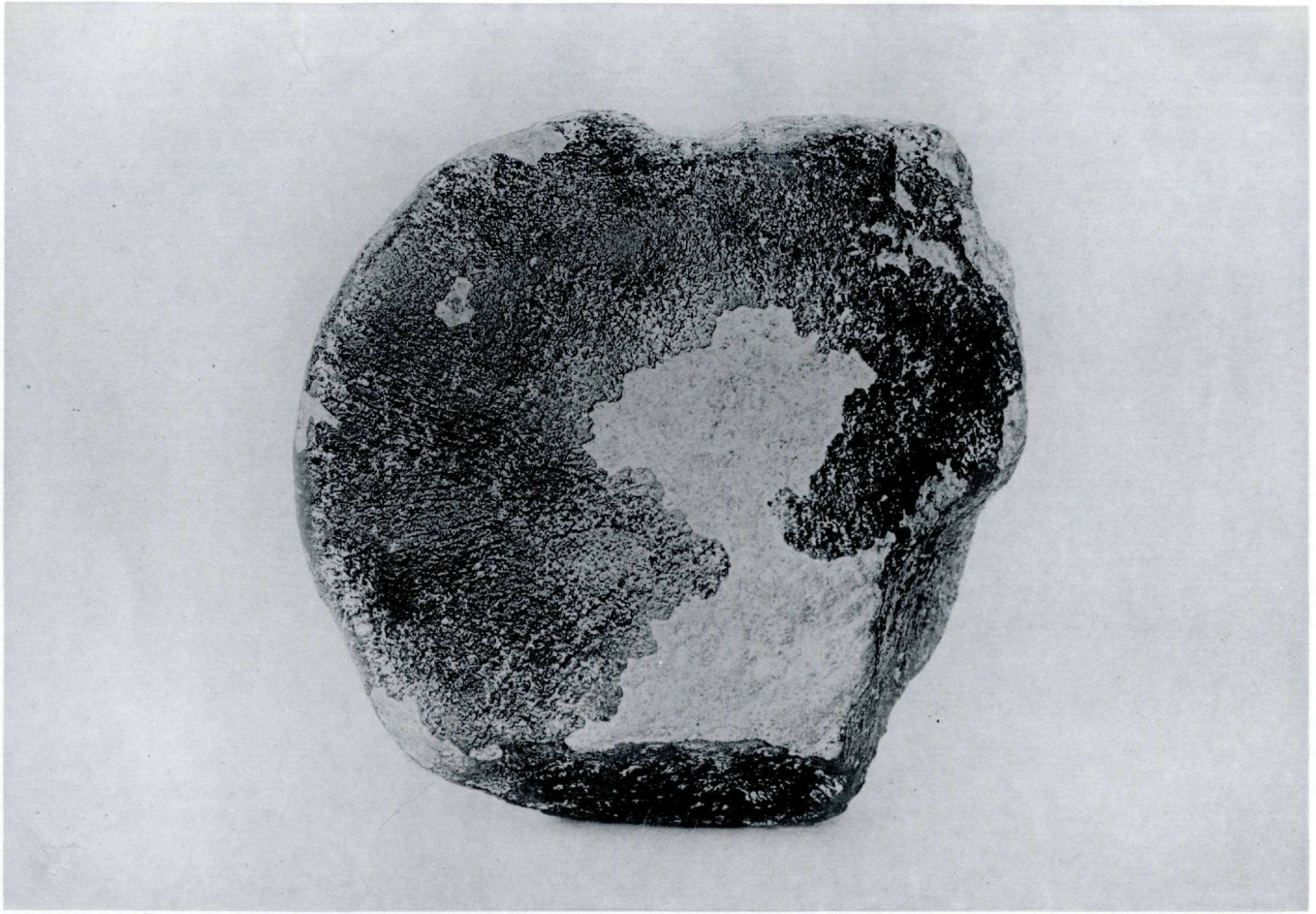
Shows pittings and radiated flow-lines of crust.



H. B. W. Garrick, Photo. *Bemrose, Collo., Derby.*

THE HARAIYA METEORITE (NO. 237). BACK VIEW. NATURAL SIZE.

Shows radiating flow-lines of crust.



H. B. W. Garrick, Photo *Benrose, Colle., Derby.*

THE HARAIYA METEORITE (NO. 237). THREE-QUARTER VIEW OF FRONT SIDE. NATURAL SIZE.

Shows radiating flow-lines of crust.