NOTE ON THE METEORIC SHOWER OF THE 22ND OCTOBER 1903, AT DOKACHI AND NEIGHBOURHOOD, DACCA DISTRICT, BENGAL.

BY

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

ASSISTANT SUPERINTENDENT, GEOLOGICAL SURVEY OF INDIA.

(With Plates 1—3.)

[*From the Records of the Geological Survey of India, Vol. XXXV, Part 1, 1907.*]

G. I. C. P. O.—No. 1 D. G. Survey—14-6-07.

[FROM THE RECORDS, GEOLOGICAL SURVEY OF INDIA,
VOL. XXXV, PART 1, 1907.]

NOTE ON THE METEORIC SHOWER OF THE 22ND OCTOBER 1903, AT DOKACHI AND NEIGHBOURHOOD, DACCA DISTRICT, BENGAL.

BY L. LEIGH FERMOR, A.R.S.M., B.SC., F.G.S., *Assistant Superintendent, Geological Survey of India.* (With Plates 1—3.)

The meteoric phenomena.

ON the evening of the 22nd October 1903, at about 7 o'clock local time, an exceptionally bright meteor was seen in Calcutta above the north-eastern horizon. The following extracts from a letter by Mr. C. Little, published in the "Englishman" of 20th November 1903, indicate the unusual interest and importance of this meteor :—

"Since the publication of my letter about the meteor of the 22nd October in your journal and others, I have received many letters from different parts of Bengal, and not a few from Assam, one from distant Sibsagar. The information given in these letters, some of it with unexpected precision as the result of careful measurements made the following day, is sufficient to indicate with fair accuracy the path of the meteor from the time it began to glow dimly as it entered the very attenuated atmosphere at a distance of 120 to 150 miles from the earth's surface until the remnant of it dissipated in the intense heat caused by the thicker atmosphere at a distance of ten or twenty miles from the earth's surface."

The following was the track provisionally adopted from the information obtained :—

"If a line be drawn from Faridpur to a point about 150 miles vertically above Comilla, that line will give with fair accuracy the path of the meteor. It began to glow faintly before it was vertically over Daudkhandi and in two or three seconds after that about the time it was over the water it became brightly illuminated. It then attracted attention over a wide area, including the whole of Bengal and Assam. It must have been seen in Upper Burma over the north

of the Bay of Bengal and over a considerable portion of Central India. Information has reached me from Orissa, Chota Nágpur, Tirhoot, the Darjeeling Hills, and, as already mentioned, Sibsagar, and I may still hear from Burma. The angular elevations reported to me from various more or less distant places show that when the meteor began to attract general attention it must have been at a height of 100 miles, and that during the subsequent 15 seconds it descended at a diminishing speed to within 10 or 20 miles. It then broke up."

"The excitement in East Bengal was great, the intense light and loud sounds resembling the reports of cannon were observed over a wide area, and when it is remembered that in such an unusual occurrence experience is of little assistance, it is not surprising that most people should have thought that something terrible was happening in their own immediate neighbourhood."

As the result of inquiries initiated by the Geological Survey of India, it was found that a regular shower of meteoric stones had fallen about 150 miles north-east of Calcutta in the Munshiganj sub-division of the Dacca district. The most interesting points, therefore, in connection with this meteor are—(1) the great height at which it became visible, (2) the steeply inclined path, and (3) the shower of stones which fell in the above-mentioned area.

The collection of specimens.

Mr. J. T. Rankin, Collector of Dacca, kindly interested himself in the matter and collected as many of these stones —14 in all—as could be obtained, and forwarded them to the Geological Survey, together with a certain amount of information relative to the circumstances of their fall.

Three of the largest specimens obtained—A 1, A 2, and A 3—were collected at Dokáchi and forwarded by Raja Srinath Roy of Bhagyakul, who generously presented two of them to the Geological Museum. During the past year (1906) Mr. H. E. Stapleton, Inspector of Schools, Dacca Division, has, while touring in this part of India, made exhaustive enquiries amongst the villagers, which have resulted in the acquirement by him of 7 stones, namely, Nos. C 7, F 4 to F 7, H and J. These are at present deposited with the Geological Survey and will be afterwards presented to the Oxford Museum.

The locus of the fall.

The following are the villages within which stones are recorded to have fallen: Bangáon, Bibandi, Dakhin Paikshar, Dokáchi, Háriya, Kolapára, Kukutiya, Munshiya

and Rána. They lie in the Srinagar thána, through whose Sub-Inspector of Police Mr. Rankin obtained most of the specimens.

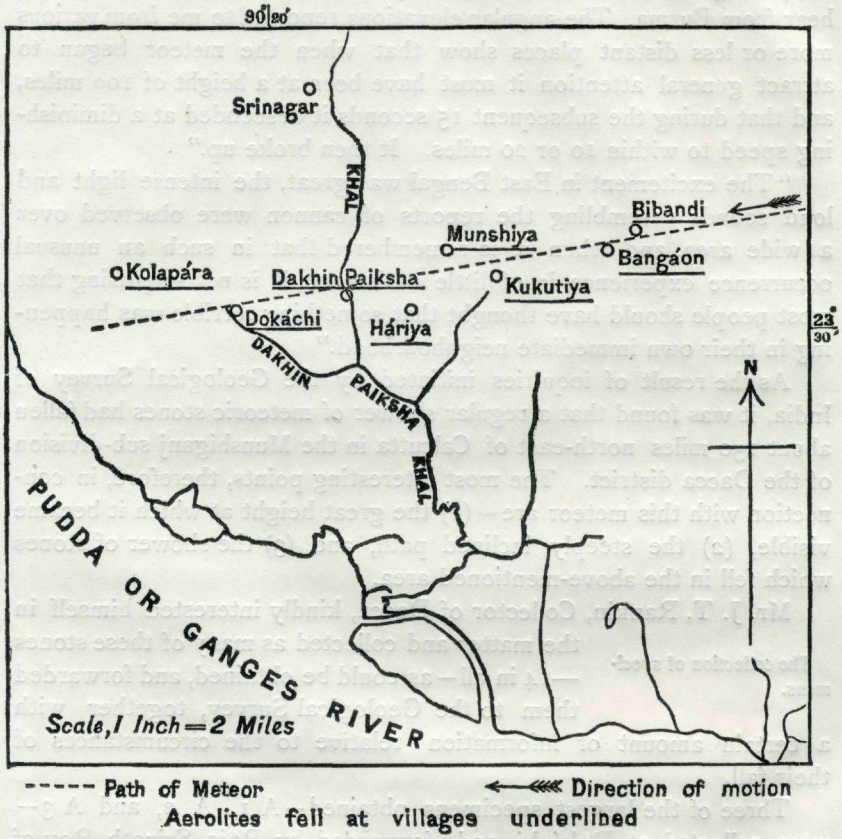


FIG. 2.—Sketch-map of the area of the Dokáchi fall.

As will be seen from the accompanying sketch-map (fig. 2), these villages lie more or less in a straight line, which stretches west by a little south from Bibandi[1] on the east, to Kolapára (Konapara on the old 1-inch map of this area) about two miles from the left bank of the Ganges on the west—a total distance of 6 miles. No stones are known to have fallen in the Faridpur district on the opposite bank; and

[1] Since this woodcut was prepared, Mr. Stapleton has obtained a specimen from Rána which lies about half a mile south-east of Bibandi.

although it is improbable that any so fell, it is possible that some of the aërolites found a resting-place at the bottom of the Ganges.[1]

Phenomena attending the fall.

Raja Srinath Roy, who was an eye-witness of the fall, relates that after a few streaks of light—perhaps due to some smaller fragments accompanying the main mass of the meteorite—and a noise as of cannons "came a streak of blue light and the meteorite burst, apparently straight over the village of Dokáchi, with a dazzling light that lit up all the surrounding villages." The morning after the fall the Raja sent men to Dokáchi, where they collected a basketful of small fragments, which he, not knowing the scientific value of these objects, allowed to be carried away, keeping only the three large fragments previously mentioned. These three weigh in the aggregate 2,360 grammes out of a total weight of 3,838 grammes received. The greater portion of the meteorite, therefore, seems to have fallen at Dokáchi, in consequence of which it is proposed to attach the name of this village to the fall. Dokáchi is 17 miles south-south-west of Dacca; its bearings are 23° 30′ N. latitude and 90° 20′ E. longitude.

In a letter from Mr. H. F. T. Maguire, Deputy Collector in Charge, Dacca, it is stated that the Sub-Inspector of Police of Srinagar reported "that all the fragments were found cold when picked up on the following morning, that a thundering sound in the distant horizon, lasting about ½ a minute, was heard a little after the disappearance of the flashing light, and that the largest of the 4 fragments received by him[2] . . . is said to have been found ¾ of an inch under the earth and that it carried away along with it a branch of a tree as thick as the middle finger of a man and also a portion of the bark of a tree with which it came in contact."

Weights of the specimens obtained.

The weights of the various fragments obtained are shown in the following table, where the numbers given in the third column are those assigned to the various specimens in the Geological Survey register:—

[1] From the considerations put forward on page 74 it will be seen that if any fragments fell into the Ganges, they were probably of still larger size than those of Dokáchi and Kolapára, and that, following the same line of argument, had any fallen in the Faridpur district, they would have been so large that they could scarcely have escaped detection.

[2] No. 240 B, from Kolapára. The other three referred to are 240 C 2, 240 C 3, and 243 C 5 which fell at Dakhin Paiksha. Only four fragments had been recovered when this letter was written.

TABLE I.—*Weights of the Aërolites.*

Village.	Where found.	Registered number of specimen.	Weight in grammes.	Total weight received from each village.	Specific gravity.
A.—Dokáchi .	See above	240 A 1	1570·99		3·62
		240 A 2	594·04		3·62
		240 A 3	195·35	2360·38	
B.—Kolapára .	House of Monohari Mandal .	240 B	627·39	627·39	3·65
C.—Dakhin .	House of Shaikh Ibrahim .	240 C 1	80·90		
Paiksha[1] .	Picked up in village . .	240 C 2	37·84		
	Do. do. . .	240 C 3	28·93		
	House of Safar Ali Mirdha .	240 C 4	28·51		
	Picked up in village . .	240 C 5	25·17		
	House of Ruponanda Mandal[2]	240 C 6	15·76		
	Picked up in village[3] . .	240 C 7	486·18	703·29	
D.—Kukutiya .	House of Jagir Khan . .	240 D	29·98	29·98	
E.—Munshiya[4].	House of Taripulla . .	240 E	6·74	6·74	

[1] Stones also fell one in each of the houses of Rupchand Kuri, Jamiruddin, Sib Chandra Bachor, Nayan Khan, and Kali Charan Barar, but could not be obtained.

[2] It is doubtful whether the specimen received was this or the one which fell in the house of Rupchand Kuri. C 4 and C 6 fit together along a fractured surface which is undoubtedly artificial; hence they could not have been found in two different houses as reported.

[3] This stone was recently (1906) obtained for Mr. Stapleton by Rajendra Mandal, a *namasudra* of Satghoria, from an aunt of his at Dakhin Paiksha. It was for some time worshipped, and traces of the *sindur* or vermilion paint with which it was smeared are still left on the specimen.

[4] Another piece is said to have fallen in the house of Kadir Munshi. That received was broken into four fragments.

TABLE I.—*Weights of the Aërolites*—contd.

Village.	Where found.	Registered number of specimen.	Weight in grammes.	Total weight received from each village.	Specific gravity.
F.—Bibandi [1] .	House of Khas Mahmud .	240 F 1	5·29		
	Do. Shaikh Safar Ali .	240 F 2	2·33		
	Do. Ambica Charan Japadar.	240 F 3[2]	0·73		
	Do. Harish Chandra Mullick.	240 F 4	9·03		
	Do. do. .	240 F 5	1·97		
	Do. do. .	240 F 6	1·76		
	Do. do. .	240 F 7	1·32	22·43	
G.—Bangáon .	House of Shaikh Roshan .	240 G 1	2·88		
	Do. Shaikh Charu .	240 G 2	1·38	4·26	
H.—Háriya [3] .	House of Mehari Mollah .	240 H	66·18	66·18	
J.—Rána [4] .	Picked up in village . .	240 J	17·79	17·79	

Total weight received = 3838·44 grammes.

The number of aërolites.

Although but 24 fragments of this fall have reached the Geological Survey, it is clear that the number of stones found in the various villages named above must have been at a minimum almost a hundred; and if the open spaces between the villages from which no stones have been reported be considered, it is evident that the number of aërolites

[1] Here also "about 25 pieces as black as coal are said to have fallen like hailstones on the tin sheds in the house of one Haris Chandra Mullick, but they have all been taken to Tipperah" and "it is said that about 15 or 16 pieces had fallen in the house of one Ananda Chandra Chakravarti, of which 4 pieces were found and taken by others." Mr. Stapleton has recently (1906) obtained 4 pieces (F 4 to F 7), which were given to his circle-pundit by the villagers, who said that they had picked them up after they rebounded from the corrugated iron roof of the house of Harish Chandra Mullick, who is now dead. Mr. Stapleton has, however, been unable to trace the 25 pieces which were taken to Comilla in Tipperah.

[2] Two pieces fitting together.

[3] This piece was recently (1906) obtained by Mr. Stapleton from the aunt of Mehari Mollah of Háriya and is one of the three pieces reported by the police to have fallen on his house.

[4] This was obtained by Mr. Stapleton in November 1905 from a writer-constable of Rána, who had himself picked it up at Rána.

which reached the earth's surface must have been numbered by the hundred.

The distribution of the meteoritic fragments along the line of fall.

In Table II the villages are arranged in order from west to east along the line of flight. It will be seen from the second column that the total weight in grammes of the meteorite recovered from each village evidently depends roughly on the position of the village. On grouping the villages into pairs this relation becomes clearer and it is seen that the total weight recovered from each pair, as shown by the third column of the following table, is greater the nearer is the pair of villages situated along the line of flight to the Kolapára end :—

TABLE II.

	Villages in order from west to east.	Total weight of meteorite received from each village.	Total weight of meteorite received from each pair of villages.
	Kolapára	627·39	2987·77
	Dokáchi	2360·38	
Direction of flight.	Dakhin Paiksha	703·29	769·47
	Háriva	66·18	
	Munshiya	6·74	36·72
	Kukutiya	29·98	
	Bangáon	4·26	26·69
	Bibandi	22·43	
	Rána	17·79	17·79

It is interesting that what is evidently but a portion of the total fall should indicate what one would *à priori* expect, namely, that after the break-up of the primitive meteoritic body, the fragments of greater mass, and consequently, on the average, those possessing the greater momentum, being better able to overcome the resistance of the atmosphere, travelled further in the original direction of motion

of the meteor before reaching the surface of the earth, than those of lesser mass. Without knowing the values of the kinetic energy per unit mass of the primitive meteor just before disruption and of the kinetic energy per unit mass imparted to the fragments at the time of disruption, it is impossible to say whether any fragment was carried backwards so as to reach the earth at a point east of that over which the disruption took place. Consequently we cannot say whether the disruption took place at a point immediately over or to the east of Bibandi (see map, fig. 1), or whether it occurred over some point intermediate between Bibandi and Dokáchi. In the latter eventuality the point of disruption was no doubt much nearer the eastern than the western end of the line joining Bibandi to Dokáchi.

Description of the specimens.

The three plates accompanying this note are from photographs taken by Mr. Vredenburg, and show one or more views of each of the fragments received.[1]

Crust.

The majority of the aërolites are more or less completely covered with a dull to slightly glossy crust varying in colour from brownish-black to black. Numbers 240 A 1 and 240 A 3 each have a few small patches of greyish-white and of rusty colour superposed upon the black crust. The crust of 240 A 2 and 240 F 1 is complete, so that each of these is a perfect aërolite; of that of numbers 240 A 1, 240 A 3, 240 B, 240 C 1, 240 C 2, 240 C 7, 240 F 2, 240 F 4 to 240 F 7,[2] 240 G 1, 240 G 2, and 240 H only small portions are lacking; whilst the remainder have lost a fair proportion of their crust. This is usually comparatively smooth, but often exhibits numerous small pimples and ridges of a shining black colour; they impart a slight polish to those stones on which they occur in any abundance, as in the Kolapára specimen, 240 B. With a lens it is seen that the space between the elevations on the surface of this stone is minutely granulated.

Pittings.

"Pittings" or "thumb marks" are well represented in some of the stones—especially in the Dokáchi and Dakhin Paiksha specimens, 240 A 1 and 240 C 1, respectively. Those of 240 A 1 are well shown in Plate 1.

[1] Except the seven obtained by Mr. Stapleton after these plates had been prepared.

[2] 240 F 6 is practically a perfect aërolite although it only weighs 1·76 grammes.

Slickensiding.

Good examples of "slickensiding" are seen on one surface of 240 A 2 (see Plate 1), in 240 C 6, and to a small extent in 240 C 4. The slickensided surface of 240 C 6 is polished and somewhat striated and has a metallic lustre. It is really one side of a fracture—made by human agency since the fall—which has followed a thin black veinlet traversing the specimen. When examined with a lens, the shining appearance is seen to be due to a thin, more or less continuous, layer of metallic aspect—perhaps nickeliferous iron—forming the vein. The slickensided area of 240 A 2 was possibly caused by a fragment splitting off during flight, as it has not the appearance of being due to a blow.

Fracture during flight.

At one end of the Kukutiya stone, 240 D, is a concave fractured surface (see Plate 3) which must have been produced during the flight of the aërolite while it was still travelling with considerable speed; for this surface shows a partially formed new crust of younger age than that covering the rest of the stone, indicating that it was subjected to partial fusion posterior to fracture.

Character of the fractures.

Some of the specimens show fractures which have every appearance of being quite fresh, and which were no doubt made by the people by whom they were found. The colour of these fractures is pale ash-grey, and examined with a lens, the stone is seen to contain darkish-grey, more or less rounded bodies, which are presumably chondri, and are set in a grey and white matrix. There are also abundant scattered yellowish-white metallic points and granules of metal—presumably nickeliferous iron. Several of the specimens show one or more black veins as thin as a sheet of paper, which, when fractured, show the "metallic" slickensided surfaces referred to above.

Specific gravity.

The value of the specific gravity was determined as 3·63, this being the mean of the three values shown in Table I. The stones are so porous that at least 2 days' soaking is necessary to obtain even an approximately correct value. Since soaking in water for this length of line caused the specimens to rust, it was not considered desirable to determine the value of this constant for them all.

No chemical or microscopic investigation of this meteorite has been attempted, as the object of this note is merely to put on

record, while the specimens are all together, a short account of the circumstances attending the fall, together with a description of the stones, as far as their external characteristics go.

Distribution of the specimens.

Since writing the above, some of the fragments of this meteorite have been presented as follows:—

(1) 240 A 2 and 240 C 4 to the British Museum.
(2) 240 C 1 to the Museum d'Histoire Naturelle, Paris.
(3) 240 C 2 to His Royal Highness Prince Edward of York.
(4) 240 C 3 to the K. K. Naturhistorisches Hofmuseum, Vienna.
(5) 240 A 3 was presented by the Raja Srinath Roy of Bhagyakul to Mrs. Goodburn of Shillong. This specimen has lately been taken to England.

The seven specimens—240 C 7, 240 F 4 to 240 F 7, 240 H, 240 J—obtained by Mr. Stapleton, will be presented by him to the Oxford Museum.

The Kolapára specimen—240 B—has been sliced by the late Professor Ward, who retained a slice weighing 193 grammes, while the remaining five slices, weighing in all 396 grammes (38 grammes having been lost on sectioning), together with the ten other pieces not mentioned above, are still in the possession of the Geological Survey of India.

The present distribution of this meteorite is therefore as follows:—

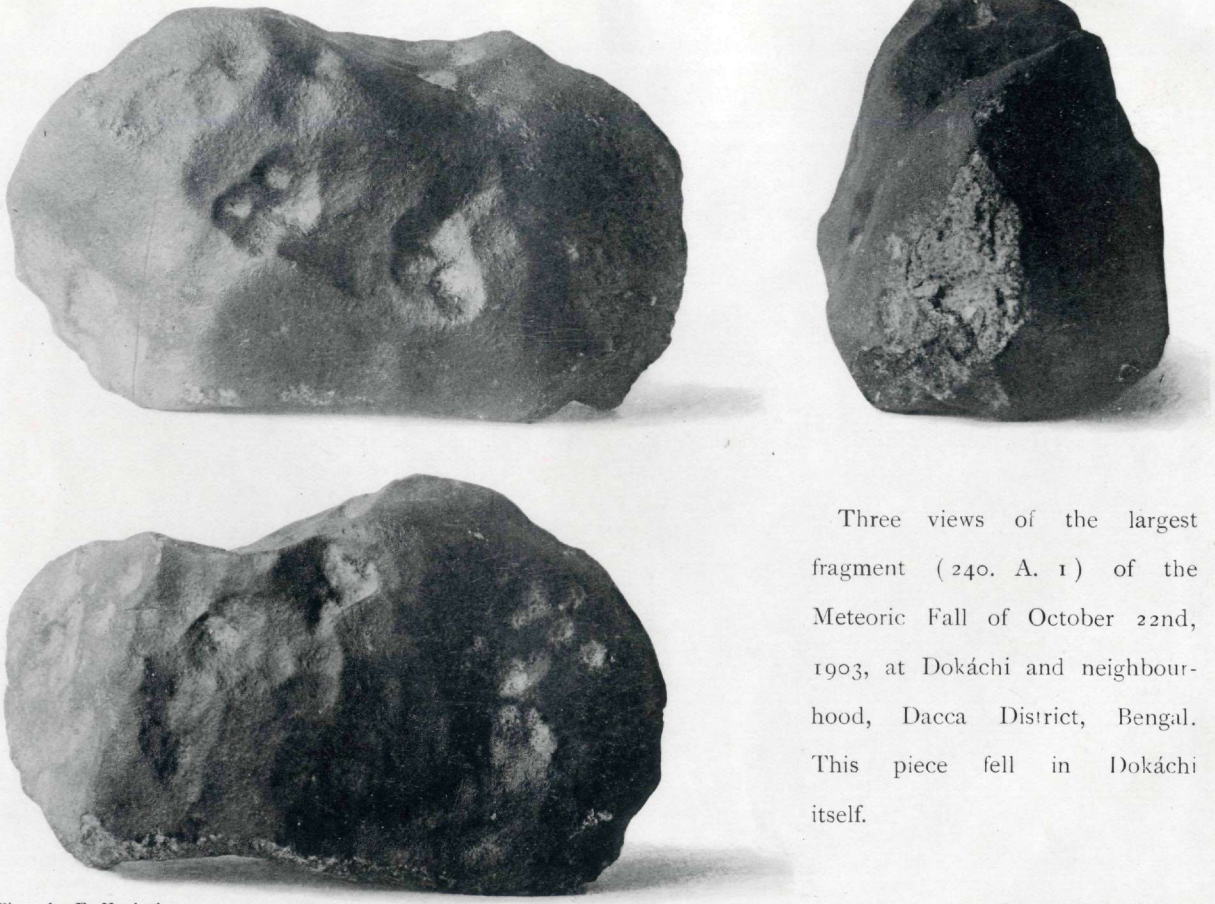
	Grammes.
Geological Survey of India	2057·35
British Museum	622·55
Oxford Museum	584·23
Mrs. Goodburn	195·35
Professor Ward	193·
Paris Museum	10·90
H. R. H. Prince Edward of York	37·84
Vienna Museum	28·93
	3800·15
Less on cutting	38·3
	3838·45

It is to be hoped that one of the possessors of parts of this fall will supplement this paper by making a chemical and mineralogical examination of this interesting meteorite.

LIST OF PLATES.

L. L. Fermor.

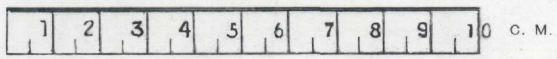
Records, Vol. XXXV, Pl. 1



Three views of the largest fragment (240. A. 1) of the Meteoric Fall of October 22nd, 1903, at Dokáchi and neighbourhood, Dacca District, Bengal. This piece fell in Dokáchi itself.

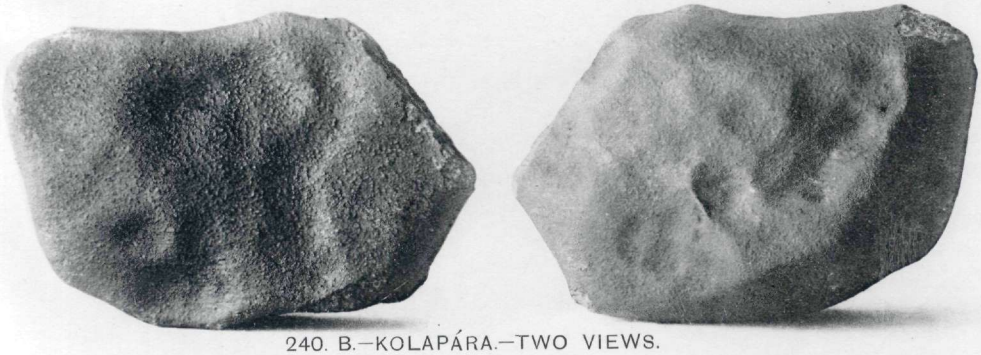
Photo by E. Vredenburg.

Bemrose, Collo., Derby.

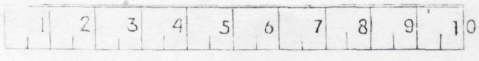


240. A. 2.—DOKÁCHI.—TWO VIEWS.

240. A. 3.—DOKÁCHI.—THREE VIEWS.

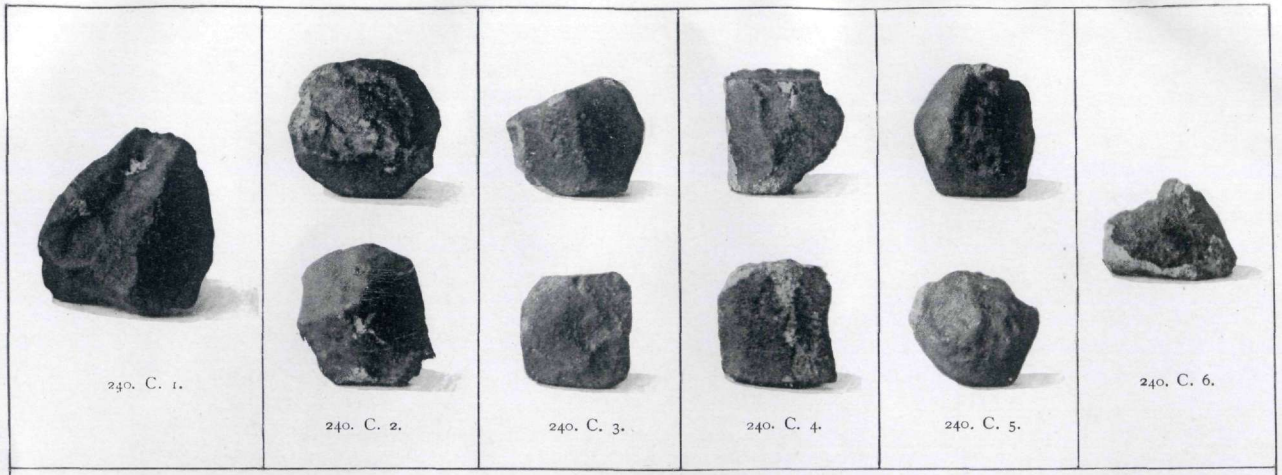


240. B.—KOLAPÁRA.—TWO VIEWS.



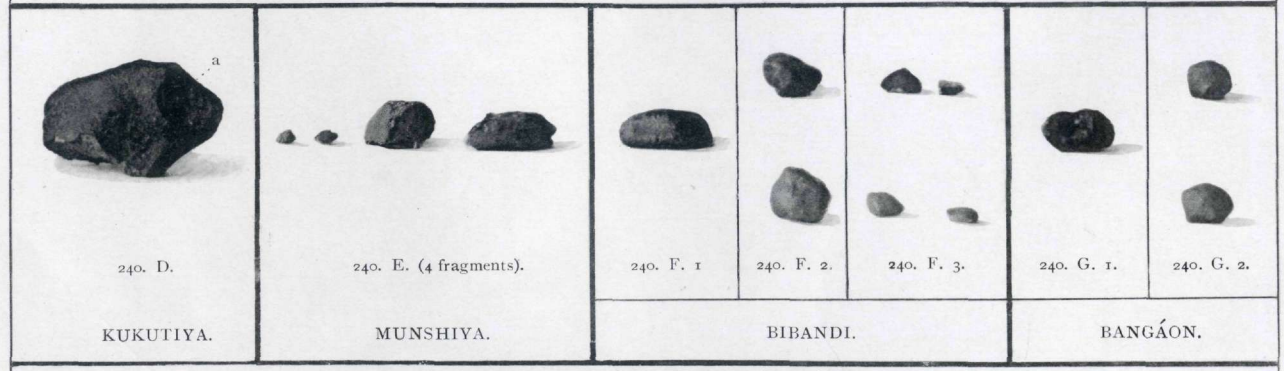
Photo, by E. Vredenburg. *Bemrose, Collo., Derby.*

3 STONES FROM THE METEORIC FALL OF DOKÁCHI, DACCA DISTRICT, BENGAL.



240. C. 1. 240. C. 2. 240. C. 3. 240. C. 4. 240. C. 5. 240. C. 6.

DAKHIN PAIKSHA.



240. D. 240. E. (4 fragments). 240. F. 1 240. F. 2. 240. F. 3. 240. G. 1. 240. G. 2.

KUKUTIYA. MUNSHIYA. BIBANDI. BANGÁON.

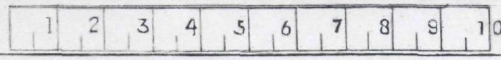


Photo by E. Vredenburg. *Bemrose, Collo., Derby.*

13 STONES FROM THE METEORIC FALL OF DOKÁCHI, DACCA DISTRICT, BENGAL.