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DESCRIPTION AND ANALYSIS OF THE BINDA METEORITE.

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(Plates x-xiii.)

History.—This Aerolite fell, probably, on the night of Saturday, 25th May, 1912. On that date a meteor was seen passing over Goulburn and Crookwell, travelling N.E. to S.W. Observers report that the luminous phenomenon was accompanied by a loud noise, a Crookwell resident taking it for the sound of an aeroplane overhead. The meteorite was discovered on 5th June by Alick McCormack on Mr. Fraser's property four miles from Binda (Lat. 34° 18′ S, Long. 149° 25′ E); it is not absolutely certain that the stone found is actually that seen in flight on 25th May, but circumstantial evidence is strongly in favour of this being the case. McCormack was engaged in rabbit trapping, and noticed what he at first took for a newly formed rabbit burrow; on tracing the furrow to its termination he found the meteorite partly embedded in the ground. We may conclude, therefore, that the stone had fallen quite recently, a conclusion strengthened by examination of the meteorite itself, which is in a perfectly fresh condition. The meteorite subsequently passed into the custody of Mrs. A. Gilmartin, proprietress and editress of the "Argyle Liberal" newspaper at Crookwell; it was on exhibition for some time at the office of that paper, and there, unfortunately, it was broken into two pieces, one of which, weighing 5lbs 13½ozs., was presented to the Trustees by Mrs. Gilmartin, the other, weighing 4lbs 6½ozs. being presented to the Technological Museum, Sydney, by the finder. The meteorite is stated to have weighed 12lbs originally, so that about 2lbs weight is unaccounted for.

For the preceding details we are indebted to Mr. James McCormack, whose son discovered the meteorite, to Constable Donnelly, who made enquiries for us at Crookwell, and to Mrs. Gilmartin, in whose paper, the "Argyle Liberal," of 14th June, an account of the find was published.

Physical Characters.—The portion in the Australian Museum collection is represented in Pls. x-xiii; that in the Technological Museum, which was kindly lent to us by Mr. R. T. Baker, Curator, differs in no essential particular from the first. Externally the stone is covered with a fused black crust, which shows distinct lines of flow radiating from the point marked with a cross in Pls. x.-xi. This was evidently the forwardly directed surface of the stone during its flight, or just prior to its reaching the ground. The crust is in two layers, the upper, secondary crust brilliant black and of varying thickness; it is marked by striations due to flow, and by anastomosing and dendritic ridges of fused matter. This outer skin can be peeled off, exposing the second layer, the primary crust, which is dull black and not detachable from the body of the meteorite. The portion of the front surface, between A and B (Pl. x.), is not smooth and rounded like the remainder, but shows a number of "thumb marks," or piezoglyphs, and the dendritic ridges are strongly marked in the hollows; we may suppose that a fracture took place at this part just before the stone came to rest, so that the roughnesses had not become smoothed off by atmospheric friction before the flight came to an end. The two crusts are of no great thickness on the front, the white felspar showing through in places. The posterior surface of the meteorite (Pls. xii.-xiii.) differs considerably in appearance from the front. The upper shining crust is thicker but less regular, and is pitted with numerous small, crater-like depressions, which represent burst bubbles; here and there a rounded unbroken bubble may be seen. This appearance doubtless results from the spattering which took place when the fused substance, flowing backwards, reached the cooler surface in the lee of the moving body. Between C and D (Pl. xii.) a considerable area of the underlying primary crust is exposed, with an island of the secondary crust a little above D. In the top left corner of Pl. xiii. is seen a sort of cascade, formed by the fused matter pouring over the edge.

A fractured surface is in the main ash coloured, with white patches of anorthite and black shining specks of chromite. The pyroxene is light brown in colour; before the blowpipe it is practically infusible, but becomes distinctly magnetic, therefore, it is probably hypersthene bordering on bronzite. Metallic specks are few and inconspicuous. The texture is medium grained.

The two portions measure respectively $6\frac{1}{2}$ inches × 7 inches × 3 inches (front to back) and $6\frac{1}{2}$ inches × $5\frac{1}{2}$ inches × 3 inches (Technological Museum portion).

The specific gravity is 3.25.

Microscopic Characters.—The stone is rather friable, and the section prepared is unduly thick. The only constituents identifiable under the microscope are anorthite, hypersthene, chromite and specks of nickel-iron. The structure is holocrystalline; there is no sign of chondrules.

Chemical characters.—Analysis yielded the following figures:

	%
H_2O (110°C)	0.10
H_2O (110°C+)	nil.
SiO_2	50.50
Al_2O_3	8.84
FeO	15.29
Fe	0.45
FeS	.96
MnO	.51
Cr_2O_3	.75
CaO	6.15
MgO	16.15
BaO	absent
SrO	absent
Na_2O	0.28
K_2O	0.13
NiO, CoO	absent
CuO	minute trace
V_2O_3	0.01
CO_2	absent
P_2O_5	0.03
Cl	absent
SO_3	absent
F	absent
C	0.07
	100.22

56.7860 grams of the finely crushed material passed through a fine sieve yielded .0384 grams of metal, = .067%. A qualitative examination of the metal showed it to consist of metallic iron with a very small amount of nickel. No phosphorus was detected, but may be present, as the quantity of metal treated was probably too small to permit of its detection. The absence of uranium oxide and tin oxide was proved. On treatment of the fine powder for one hour with a boiling solution of pure copper sulphate, .45% of iron was dissolved, which would represent fine particles of the metal which had passed through the sieve. The absence of oxidation products proves that the meteorite is of recent fall.

The "norm" calculated from the percentage composition on the lines laid down by Farrington[1] is as under :—

	%
Orthoclase	0.56
Albite	2.62
Anorthite	22.52
Diopside	6.58
Hypersthene	64.76
Olivine	0.48
Chromite	1.12
Troilite	0.96
Nickel-iron...	0.45
	100.05

This no doubt approximates pretty closely to the actual mineral composition, which is relatively simple, but some re-adjustment may be necessary between the felspar and pyroxene molecules.

Systematic position.—According to Farrington's classification and nomenclature the Binda stone falls into Class IV. with the Mässing, Petersburg, Peramiho and Stannern Meteorites, and would be described as dofemic, persilicic, perpolic, perpyric, permirlic, domiric, magnesiferrous. In Brezina's classification[2] it takes its place in the Eukrite division of the Achondrites.

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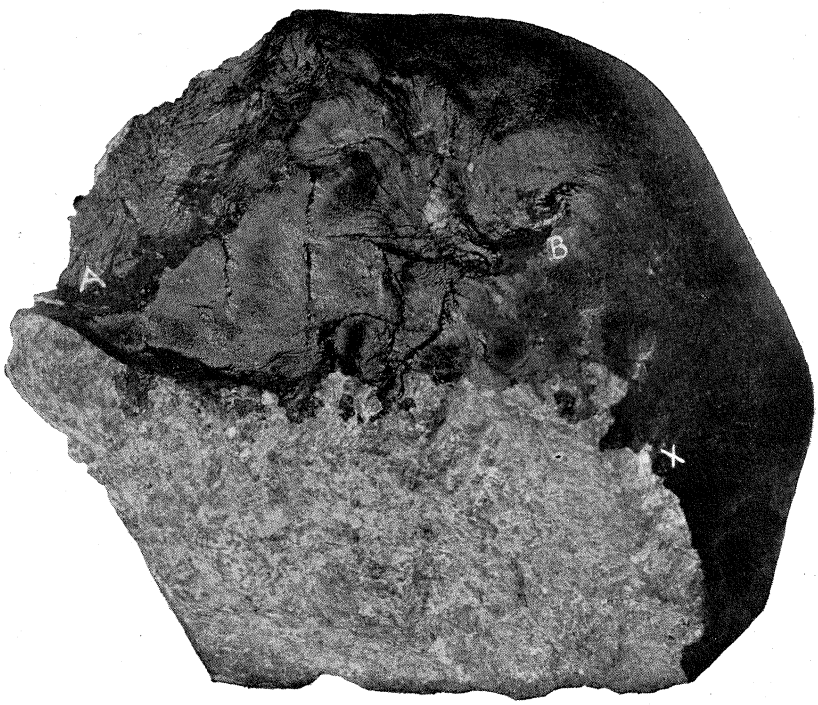
[1] Farrington—Field. Mus. Publication 151, Geol. Ser., iii., 9, 1911,

[2] Ward—Cat. Ward-Coonley Coll. Meteorites, Chicago, 1904, p. 97; Brezina—Proc. Amer. Phil. Soc., xliii., 1904, p. 233.

EXPLANATION OF PLATE X.

Binda Meteorite.

The photograph shows the front of the meteorite, the white cross indicating the point from which the lines of crustal flow radiate. The area between A and B shows the "tertiary" crust, formed just before the stone reached the ground. The rest of the surface is invested with secondary crust. About three-fifths natural size.



H. BARNES, JUNR., photo.,
Austr. Mus.

EXPLANATION OF PLATE XI.

Binda Meteorite.

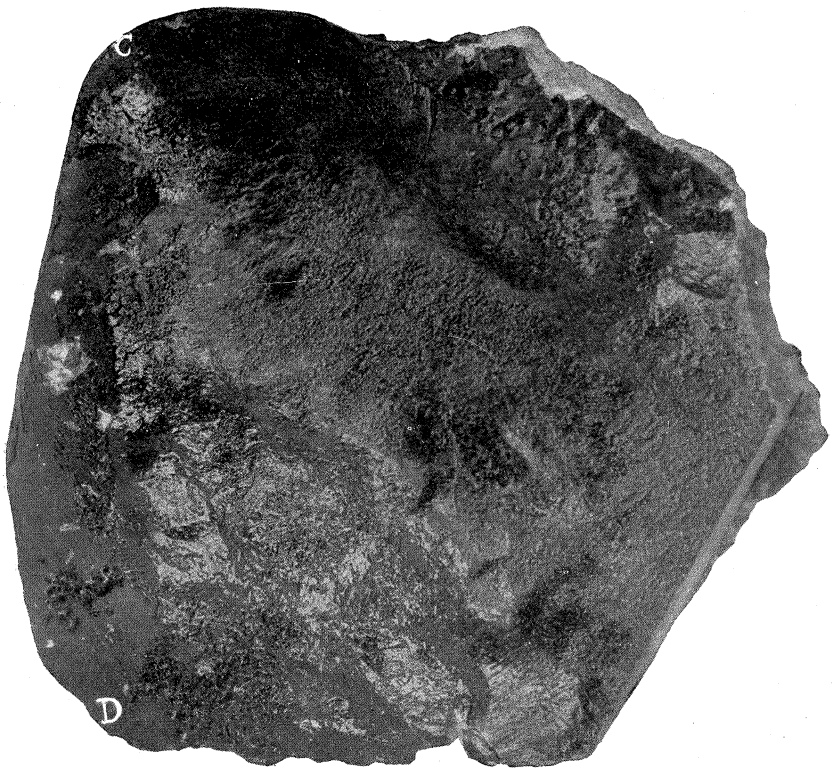
Front showing the ridges of the secondary crust radiating from the spot marked with a cross. About natural size.

H. BARNES, JUNR., photo.,
Austr. Mus.

EXPLANATION OF PLATE XII.

Binda Meteorite.

Rear surface showing the irregular blebby secondary crust on the right; between C and D on the left there is an exposure of the primary crust. About two-thirds natural size.



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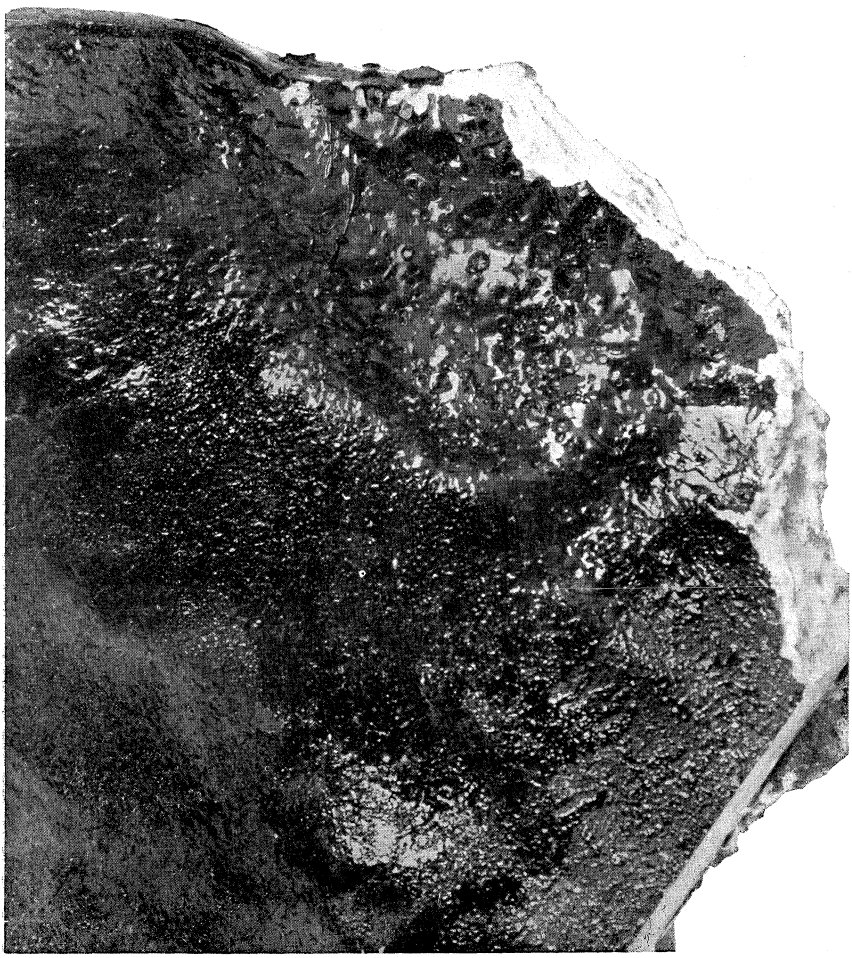
EXPLANATION OF PLATE XIII.

Binda Meteorite.

Rear surface. covered with irregular vesicles and blebs of secondary crust. In the top left corner is an overhanging ridge where the fused crust has cascaded over from the front of the meteorite. About natural size.



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