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AN UNRECORDED METEORITE FROM COOLAC, NEW SOUTH WALES.

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(Plate xx, and Figure 1.)

THROUGH the kindness of Mr. W. E. Williams I was informed that Mr. Noel McMahon, of Coolac, New South Wales possessed an object thought to be a meteorite. On request, Mr. McMahon very generously sent the specimen to the Museum on loan, with permission to cut off a small portion for purposes of investigation.

He stated that his grandfather, Thomas McMahon, found the iron about the year 1874 on his selection known as Happy Valley, about three miles west of Coolac, Parish Bongongolong, County Harden, New South Wales, latitude 34° 58′ S., longitude 148° 7′ 30″ W.

Mr. McMahon believes that his grandfather found it four feet below the surface while prospecting for gold. He further reports that "there is a distinct depression in the ground where I believe the meteorite was found. This would be about twenty yards wide; a dry creek in summer now passes through the depression."

The iron was used by his grandmother as a firestop in an open fireplace for about four or five years, when it was sent to Sydney for analysis. According to Mr. McMahon, the result of the analysis was "that it had been in a fire on this earth". I am unable to discover who reported on the matter or to whom the sample was submitted.

The appearance of the meteorite when received at the Museum was that of a typical iron with broad somewhat shallow "thumb-marks", and roughly pyramidal in shape, measuring 225 mm. by 195 mm. by 180 mm. It weighed 42 lb. 8 oz. (19·28 kg.), and the specific gravity, taken on a portion weighing half a kilogram, is 7·15.

An attempt to cut the iron with an ordinary hacksaw failed, and Luke Muras, Limited, very kindly undertook to cut it. They found considerable difficulty owing to the presence of inclusions, some of which were silicate minerals. Finally, a little more than half a kilogram was cut off.

On polishing a small surface of the meteorite, when first received, no trace of Widmanstätten figures was observed. Later, a surface measuring 75 mm. by 40 mm. (Plate xx, fig. 2) showed only traces of the octahedral structure. Apparently the four or five years that the iron served as a firestop had been sufficient partially to destroy this structure. In the top section of the etched surface remnants of the taenite bands exist to show the octahedral orientation; a small portion of this area has been enlarged somewhat and is shown in

Fig. 1. It will be seen that the granular structure already produced in the kamacite bands has begun to invade the taenite bands. Elsewhere the etched surface shows that the kamacite and taenite bands have been converted completely to a granular mass. The grains are mostly allotriomorphic, more or less of an even size, averaging about three millimetres in diameter. On the left side of the etched surface can be seen numerous inclusions which are made up of graphite,

Fig. 1.—Small portion of the etched surface showing the breaking up of the taenite bands by granulation, which has already affected the kamacite bands. The hatched portion is taenite, the black portions are inclusions, and the dotted lines indicate the boundaries of the grains.

iron carbides, and silicate minerals. These three are generally associated with each other, although the silicates are sometimes found alone surrounded by nickel iron. The silicate grains are very small and can be seen with the unaided eye only after careful search.

According to Berwerth's classification, the iron is an artificial kamacite metabolite (KMe). From the analysis the nickel-iron ratio is over sixteen, and therefore it is likely that it belonged to the broadest octahedrites.

On dissolving forty grammes of drillings in hydrochloric acid the strong smell of hydrocarbons was observed, indicating the presence of carbides. When the meteorite was first received a few filings were dissolved in hydrochloric acid and the characteristic unpleasant odour of hydrocarbons was not noticed. However, two other portions, one a solid piece, gave off this characteristic odour.

The evolution of these hydrocarbons on treatment with acid is of particular interest in New South Wales. During the Great War (1914–1918) large importations of calcium carbide were made from a hitherto untried source. Many of the barrels which contained the calcium carbide also contained carbide of iron, sometimes in lumps weighing several kilograms. Many of these lumps have been picked up and submitted as meteorites. The characteristic smell given off on treatment with acid has been one of the tests confirming their artificial origin.

The residue from the acid solution consisted of carbon, silicate minerals, and bright steel-grey metallic flakes, which were strongly magnetic. The metallic flakes were subsequently dissolved completely in nitric acid, forming a brown solution. They consist of cohenite, with the composition $(Fe_2Ni)_3C$.

The insoluble consists of:

	Grammes.	Weight per cent.
Cohenite	0·3229	0·79
Free carbon	0·0036	0·01
Silicates (by difference)	0·1353	0·33
Total	0·4618	1·13

The total carbon determined on a separate portion weighing 0·9982 grammes was found to be 0·68 per cent. Thus the total combined carbon is 0·67 per cent.

The amount of insoluble appears to vary considerably. In a portion weighing 100 grammes the total insoluble weighed 0·6480 gramme. This would indicate that the carbides, free carbon, and the silicates are irregularly distributed throughout the mass. This is further borne out by their distribution in the polished section.

The combined carbon required for the cohenite is 0·05 per cent., so that other carbides present contain 0·62 per cent. of carbon. The nature of these carbides was not determined.

The silicate mineral consisted of irregular grains, the largest of which was slightly over one millimetre in diameter. The colour of the larger pieces is greyish-white, while the very small grains are colourless. Microscopic examination proved the mineral to be enstatite.

Chemical analysis gave the following result:

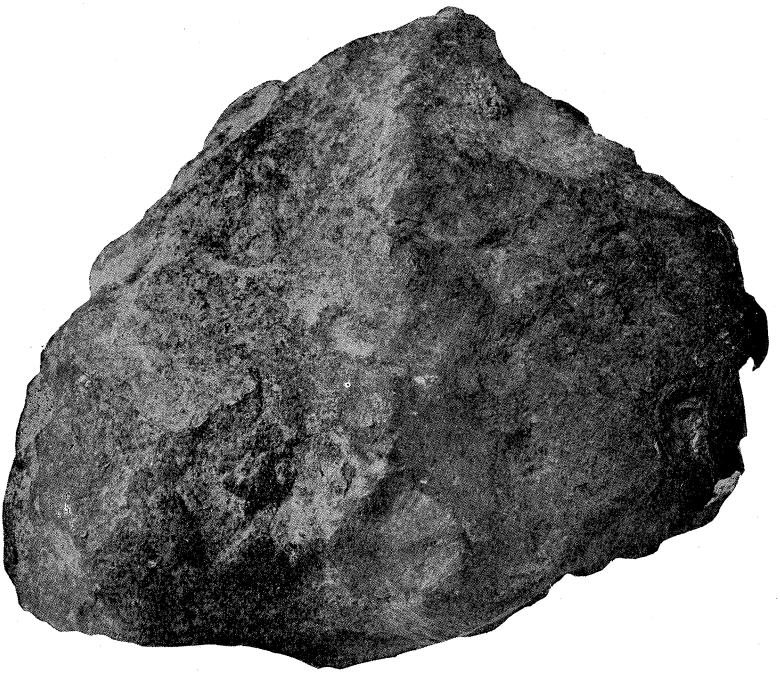
Fe	92·79
Ni	4·72
Co	0·26
S	1·27
P	0·06
C (free)	0·01
C (combined)	0·67
Silicates	0·33
	100·11

Deducting 2·24 per cent. from the total iron required for the monosulphide, the value of n is 19·1. Assuming that the whole of the combined carbon is present as iron carbide, the value of n would be 16·4.

EXPLANATION OF PLATE XX.

Fig. 1.—The Coolac meteorite.

Fig. 2.—An etched surface of the Coolac meteorite. The dark bands on the light upper portion of the area are composed of taenite and cohenite, and clearly indicate the octahedral nature of the iron. The dark parts on the left and lower portions of the area are inclusions of graphite, iron carbides, and silicate minerals.



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G. C. CLUTTON, photo.