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THE NARELLAN METEORITE: A NEW CHONDRITE FROM NEW SOUTH WALES.

By

T. HODGE-SMITH,
Mineralogist, The Australian Museum.

(Plate xxvi.)

This stone fell on the night of April 8, 1928, and was found by the son of Mr. G. J. Richardson on the following morning. Unfortunately Mr. Richardson was taken seriously ill just after the finding of the stone, and in consequence its existence was not made known until some nine months later. After such a lapse of time it was impossible to obtain any reliable information from other observers. Mr. Richardson has supplied the following notes, which appeared in the *Sydney Sun* of January 1, 1929:

"I was standing at the door of my cottage at about 7.15 p.m. on April 8 [1928], and the purring noise overhead like rushing wind and aeroplane engines led me to believe that a 'plane was flying overhead on the Sydney to Melbourne route. I walked out into a paddock to try to get a view of what I believed to be a 'plane when suddenly the air began to vibrate and I thought I felt a slight concussion. Simultaneously a pony grazing near me tossed up her head and galloped away. I remember a heavy thud and a slight tremble in the ground as I stumbled back into the house.'

"Mr. Richardson explained that he was called outside by some children to see the illuminations in the sky. He arrived too late to see the display but stood at the door for a while. Fully ten minutes elapsed between the time he was called out until the weird sounds began overhead.

". . . In the morning he (Mr. Richardson's son) found the meteorite. It was buried about six inches into the rocky ground within eight feet of the spot where his father was standing the previous night."

In an official letter from Mr. Richardson he further stated that "the light display was seen by many people, and some of my friends had a fine view of it at Port Kembla, but I did not see any light given off by this piece when it struck the earth."

No report of a "falling star" was received from Sydney, which is about thirty-eight miles north of Narellan, the only reports being received from the south coast. Port Kembla is about thirty-one miles S. 20° E. from the spot where the stone fell. From this evidence it would appear that the stone travelled from the S.S.E.

The locality is latitude 34° 3' South, longitude 150° 41' 20" East.

The weight of the stone was 367.5 grammes. It was cut into two portions weighing 189.2 grammes and 146.8 grammes, the remaining 31.7 grammes being used in making micro-slides and chemical analyses, or lost through cutting. The specific gravity is 3.45.

The outer skin is black tinged with vandyke brown, and the lustre is almost dull. There is a distinct line of demarcation between the skin and the unaltered

portion of the stone; the depth of skin reaches a maximum of 0.4 mm. There appears to be a complete absence of lines of flowage, although the skin is somewhat vesicular and the surface in consequence characteristically pitted. The numerous pits are so small as to be indistinguishable with the unaided eye, but are clearly seen with an ordinary pocket lens.

The general shape of the stone is approximately that of an elongated three-sided pyramid with the apex cut off and the base drawn out to an edge. The measurements of the base are 4.5 cm. by 5.5 cm. by 6 cm., while the height is 9 cm.

The colour of the cut surface is mottled grey. The chondrules can be distinguished, and the nickel-iron is fairly evenly distributed, while a few small nodules of troilite stand out conspicuously.

Under the microscope the chondrules are seen to be somewhat scarce and to consist of radiating enstatite. The ground-mass consists of olivine and enstatite, with a little felspar with a refractive index higher than Canada balsam. In addition nickel-iron and troilite occur in small irregular grains distributed throughout the mass. The former shows a tendency in some cases to be arranged in narrow parallel zones. The composition of the felspar is $Ab_{70}An_{30}$, according to the analysis. A partial analysis of the soluble part of the unattracted portion is as follows:

SiO	31.49
MgO	24.44
FeO	27.16

The composition of the olivine is therefore approximately $3Mg_2SiO_4, 2Fe_2SiO_4$.

For the purpose of analysis a portion weighing approximately 11.5 grammes was used. After grinding, the metallic portion was separated from the powder by means of a small electric magnet, specially constructed for the purpose. The attracted portion weighed 1.0555 grammes, and the unattracted 10.3433 grammes.

The result of the analysis is as follows:

Constituent.	Attracted.	Unattracted.	Bulk Analysis.	Molecular Ratio.
SiO ₂	1.73	41.92	38.45	.641
Al ₂ O ₃		2.41	2.20	.022
Fe ₂ O ₃		3.76	3.41	.021
FeO	1.30*	14.41	13.36	.185
CaO	abs.	1.71	1.56	.028
MgO	1.61	22.95	21.11	.528
K ₂ O		0.27	0.24	.002
Na ₂ O		0.66	0.60	.010
Cr ₂ O ₃		0.49	0.44	.003
P ₂ O ₅	abs.	0.46	0.41	.003
TiO ₂		0.15	0.13	.002
MnO		0.53	0.48	.006
H ₂ O		0.03	0.02	
FeS	1.42	7.83	7.28	
Fe	76.01	1.65	8.58	
Ni	10.30		1.21	
Co	0.24	0.29	0.02	
Insoluble	7.13			
	99.75	99.52	99.50	

* Calculated to satisfy SiO₂ in olivine molecule.

The following is the mineral constitution, calculated from the bulk analysis:

Orthoclase	1.11
Albite	5.24
Anorthite	2.78
Felspar	9.13
CaO.SiO ₂	0.93
MgO.SiO ₂	31.80
FeO.SiO ₂	7.39
Bronzite	40.12
2MgO.SiO ₂	14.70
2FeO.SiO ₂	12.65
Olivine	27.35
Apatite	1.01
Chromite	0.67
Ilmenite	0.30
Troilite	7.28
Iron	8.58
Nickel	1.21
Cobalt	0.02
Nickel-iron	9.81
Fe ₂ O ₃ , etc.	3.91
		99.58

The ratio of iron to nickel is 6.9, and the ratio of MgO to FeO in the magnesium silicates is 2.9. Thus the stone belongs to Group 3 (Barota type) of the Chondrites, according to Prior's classification.¹ It would appear to be a white chondrite (CW) of Brezina's classification.²

EXPLANATION OF PLATE XXVI.

THE NARELLAN METEORITE.

Fig. 1.—Side view, showing the characteristic black skin; natural size.

Fig. 2.—End view, showing the pitting of the skin; natural size.

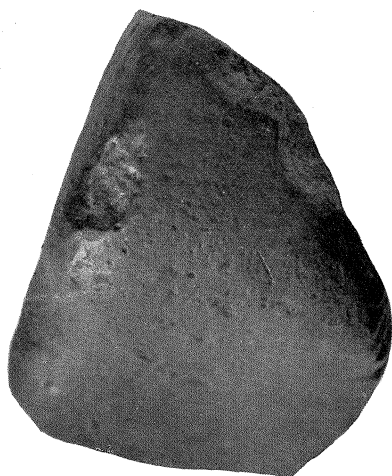
Fig. 3.—Section cut through the stone, showing the distribution of the nickel-iron, and the chondritic nature of the stone. The black patches are troilite, which is present in nearly the same quantity as the iron. Natural size.

¹ Prior.—Mineralogical Magazine, xviii, 1919, pp. 26-44.

² Brezina.—Annalen. des K.K. naturhist. Hofmuseums, x, 1895, pp. 232-307.



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G. C. CLUTTON, photo.



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