# *Three South African meteorites: Vaalbult, Witklip, and Queens Mercy.*

(With Plate III.)

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*Meteoric Iron of Vaalbult farm, Prieska Division, Cape Province.*

A SMALL portion (B.M. 1921, 274) of the Vaalbult meteoric iron, weighing about 184 grams, was kindly placed at the disposal of the writer for examination by the late Dr. L. Peringuey, Director of the South African Museum, Cape Town. According to information received from him, this meteorite is known as the 'Vaalbult' siderite, and was presented to the South African Museum on April 22, 1918, by Mr. S. Grove, Member of the Provincial Council of the Cape for the Prieska Division, who obtained it from Mr. Japie Greeff, the owner of the farm on which it was found, probably early in the same year. The original mass weighed about 26 lb. and was very deeply and broadly pitted. In external appearance it is somewhat similar to the large (1,210 lb.) Ratteldraai iron from the Kenhardt Division, more than 60 miles distant, found in 1909. A cast of the iron sent by Dr. Peringuey shows that it is of very irregular shape. On one side are large (4 to 5 inches long and 2 to 3 inches broad) cavernous depressions of roughly oval outline. Other surfaces are smoother but show two or three deep holes, with circular outlines up to 1 inch across, which may possibly have been originally occupied by troilite nodules.

Etching of a polished surface showed that the iron is a coarse to coarsest octahedrite, the kamacite bands having a breadth of from 2 to 4 mm. Taenite bands bordering the kamacite are very narrow but distinctly visible. The arrangement of the kamacite bands is regular in parts where the breadth is about 2 mm., but irregular in others where

the bands are broader, and the structure generally is interrupted by rounded grains with no definite orientation. Plessite is practically absent. The small specimen under examination was comparatively free from inclusions, only one lenticular patch, 8 mm. long, of schreibersite being observed. Examination of the etched polished face under the microscope by reflected light obtained from a Watson-Conrady illuminator showed that schreibersite marks the boundaries between plates and grains of kamacite to as large an extent as taenite. Schreibersite (rhabdite) is seen also as minute square and rhomb-shaped sections scattered plentifully over the polished surface. The larger and irregular plates of kamacite show well-marked Neumann lines. The structure is coarser than the Ratteldraai iron; it is about as coarse as the Karee Kloof iron,[1] but shows, in accordance with its lower percentage of nickel, less taenite.

Chemical analysis of a portion of the iron apparently free from inclusions and weighing 6·7788 grams, gave the following results:

| Fe. | Ni. | Co. | Cu. | P. | S. | Insol. | Total. | Sp. gr. |
|---|---|---|---|---|---|---|---|---|
| 92·18 | 6·99 | 0·68 | 0·02 | 0·19 | trace | 0·02 | 100·08 | 7·62 |

In the analysis, the iron was separated from the nickel by a double precipitation with sodium acetate followed by a double precipitation with ammonia. The insoluble consisted of a little carbonaceous matter, angular chips of quartz nd a little felspar), and a few very minute spherical bodies like chondrules, some opaque milk-white and others black; no isotropic grains or cliftonite were detected. One chip of felspar showed twin-lamellae giving extinctions of about 12°.

The Vaalbult iron is a coarse octahedrite having a percentage of nickel of about 7 and a ratio of iron to nickel of about 13.

*Meteoric stone of Witklip, Carolina District, Transvaal.*

A small fragment weighing 3½ grams was presented to the Museum collection by the late Dr. L. Peringuey. According to an account of the fall of this stone given in Circular No. 44, January 17, 1919, of the Union Observatory, Cape Town, on the morning of May 26, 1918, at about 9.40 a.m., a large meteor passed over the town of Barberton in the eastern Transvaal. Observers near that town heard a loud explosion and some saw a bright flash near the zenith. An observer near Amsterdam, about 54 miles SW. of Barberton, also saw the flash, but

[1] G. T. Prior, Min. Mag., 1923, vol. 20, pp. 134–137.

heard no report. The meteorite left a 'cloudy trail' in the sky which persisted for about half an hour. On August 10, 1918, four or five fragments of a stony meteorite, weighing together about 22 grams, and stated to have fallen on the farm of Witklip, Carolina District, Transvaal, on May 26, 1918, were received by the Union Observatory, through the editor of 'De Volkstem', Pretoria, and were chemically examined by Dr. J. Moir of the Government Chemical Laboratory.

The fragment (B.M. 1921, 275) sent to the British Museum by Dr. Peringuey shows no crust. This, according to Dr. J. Moir, is 'deep brown-olive in colour and is very thin—not much over $\frac{1}{10}$ mm. on the whole'. The interior of the stone is grey in colour, somewhat friable and shows some well-defined spherical chondrules and clear-cut cavities from which chondrules have broken away. On a cut surface, strings and grains of nickel-iron are fairly plentiful and troilite is present in smaller amount. A micro-section under the microscope shows nickel-iron and troilite, orthorhombic pyroxene polarizing in greys, olivine clear and colourless, and twinned clinobronzite in a tufaceous matrix of small grains of the same minerals. Chondrules are fairly abundant, some of which have clearly marked circular sections, but most are ill defined and pass gradually into the matrix. They are of the usual types, some barred with alternating orthorhombic pyroxene and deep-brown glass with a rim of pyroxene in optical continuity with the bars, and some are of the porphyritic type showing well-defined olivine in a dark base which under a high power is seen to consist mainly of fibrous pyroxene having a high extinction-angle. Felspathic material and maskelynite are present in only small amount; no merrillite was detected.

The Witklip meteoric stone is a grey chondrite and, as it somewhat closely resembles that from Cronstad and contains a fairly high percentage of nickel-iron, it is in all probability a bronzite-chondrite.

### *Meteoric Stone of Queens Mercy, Matatiele, Griqualand East, Cape Province.*

Fragments of the Queens Mercy meteorite were kindly placed at my disposal for examination by Dr. A. W. Rogers, Director of the Geological Survey of South Africa, Mr. E. Warren, Director of the Natal Museum at Pietermaritzburg, and Mr. E. C. Chubb, Curator of the Durban Museum.

Of this meteorite two stones at least and probably more fell at about

8 p.m. on April 30, 1925, after appearance of a bright light and a loud detonation. The largest stone, according to an account by Mr. A. J. R. Atkin, fell 'at 8.15 p.m.' at Queens Mercy about 20 miles from Matatiele, Cape Province. There was a loud noise and a bright light, and the natives fled to the bush and found the meteoric stone next morning near a hut. It was a large stone measuring about $18 \times 12 \times 9$ inches and projecting about one foot above the ground. As the medicine-man said that if used as a talisman good luck would come to the wearers, the stone was broken up and distributed in small pieces as 'muti', and only a few fragments, two, however, weighing over 6 lb. each, appear to have been recovered. The smaller nearly complete stone was obtained from Chief Jeremiah Moshesh and handed over to Mr. Warren by Mr. G. Pyke, Postmaster of Matatiele. According to Mr. Pyke's account it fell 'at 7.55 p.m. and fell from east to west. I saw it and also saw it break up. There was a bright light like a motor head-light. After it burst I heard a noise exactly like thunder which lasted about three seconds (I walked a distance of about 100 yards between the bursting and the noise). It fell about 15 miles from here (Matatiele) and over a radius of about 5 miles, just under, or within five miles of the Drakensberg range.' The time of fall, 7.55 p.m., was given by Mr. Pyke, as he 'happened to be coming out of our public library at the time and had just looked at the clock on passing out of the door'.

Of the specimens of this meteorite now in the British Museum collection, the uncrusted fragments weighing about 50 grams (B.M. 1925, 1038) from Dr. Rogers, and a crusted piece weighing 30 grams (B.M. 1926, 219) from Mr. Chubb, came from the larger stone, a crusted piece weighing 52 grams (B.M. 1926, 180) from the small stone. The fragments from the large stone show curious slickensided surfaces with the iron streaked and flattened out in patches probably along the veins. In thin section under the microscope some displacement along the veins is also seen to have taken place. The small complete stone weighed about 950 grams. As seen in outline in the photographs (Plate III, figs. 1 and 2) it is roughly of lozenge shape. Four fairly smooth faces meet in rounded edges (fig. 1) and show only one or two 'thumb-marks', and four other faces have more uneven surfaces (fig. 2) with rather more 'thumb-marks'. The crust, which is about $\frac{1}{2}$ mm. thick, is rough with small pimples, probably of fused iron, and shows a few slightly raised ridges of fused material, but no definite lines of flow are to be distinguished, though there is a glassy thickening on some of the edges

of the stone and adhering flakes of fused material on the less smooth faces. A smooth cut surface shows the stone to be of grey colour and traversed by numerous thin black veins or cracks. Grains of iron are thickly distributed and one piece of troilite 4 mm. long is to be seen. Only a few chondrules of fairly definite circular outline and surrounded by a ring of iron-grains are visible.

In thin section under the microscope the stone presents no unusual characters, but resembles very closely the Witklip and Cronstad stones. Chondrules are mostly ill defined and fragmental, so that the stone has the appearance of being made up largely of these bodies partly re-absorbed, and even one or two fairly sharply defined crystals of olivine and pyroxene may have been originally included in chondrules. Polysomatic porphyritic olivine chondrules are indeed the most common; in some, the porphyritic olivines are enclosed in brown glass, in others in what appears to be fibrous pyroxene black with inclusions. Chondrules of fibrous pyroxene and the barred type are not common. One or two chondrules consist of grains of fairly uniform size of both olivine and pyroxene with a little interstitial felspar. Only a little interstitial felspar and no maskelynite was seen. Troilite is present in comparatively small amount in quite small grains associated with the much more abundant nickel-iron. The pyroxenes are mostly of bronzite giving straight extinction.

A partial chemical analysis was made, by the methods described in previous papers, on about 11 grams of the material sent by Dr. Rogers. The attracted material weighed 2·7152 grams, and the unattracted 8·3940. The proportion of insoluble to soluble material in the unattracted material, as determined on 3·4994 grams, was 1·8445 : 1·6549 grams. The result of the analysis was as follows:

| Fe (+Co) by diff. | Ni. | FeS.[1] | Insol. silicate. | Soluble silicate. | Total. |
|---|---|---|---|---|---|
| (14·26) | 1·35 | 5·42 | 44·48 | 34·49 | 100·00 |

The result of a quantitative analysis of the insoluble silicate (pyroxene) of the unattracted material weighing 0·5172 grams was as follows:

| $SiO_2$. | $Al_2O_3$. | $Cr_2O_3$. | FeO. | MnO. | CaO. | MgO. | $Na_2O$ and loss. | Total. |
|---|---|---|---|---|---|---|---|---|
| 53·98 | 4·78 | 0·36 | 9·28 | trace | 2·03 | 25·19 | (4·38) | 100·00 |

From these results the ratio Fe : Ni is about $10\frac{1}{2}$, and MgO : FeO about 5. The composition of the stone can therefore be expressed by

[1] From determination of sulphur, S = 1·98 per cent.

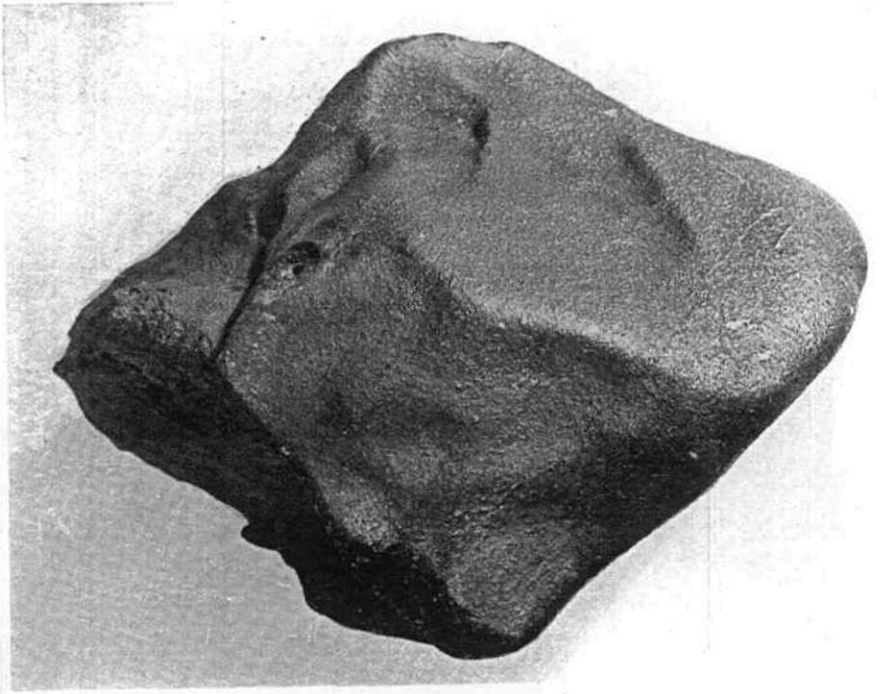

FIG. 1

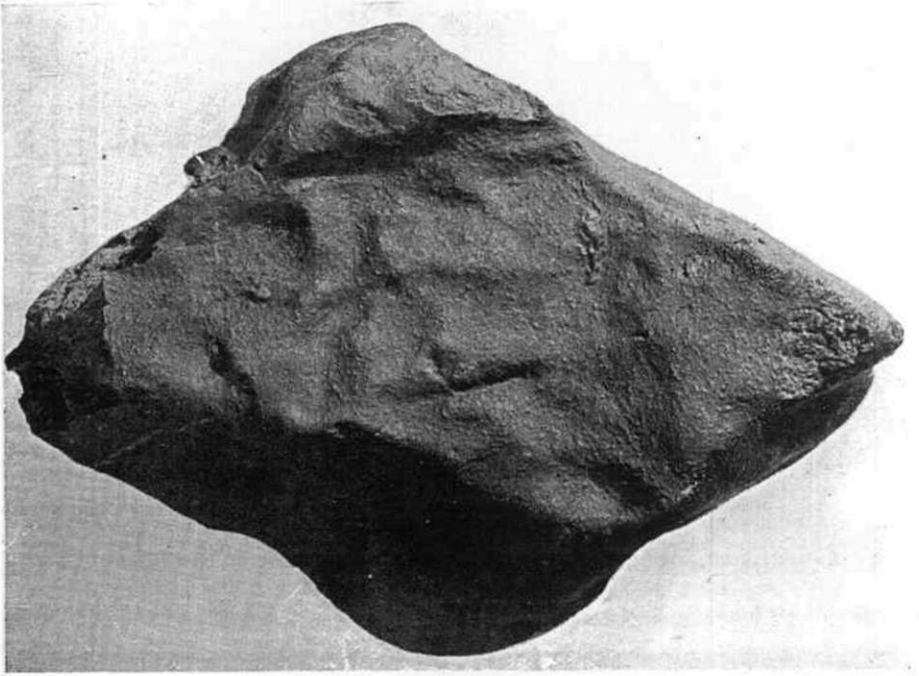

FIG. 2

G. T. PRIOR: THE QUEENS MERCY (SOUTH AFRICA) METEORITE.