The History of the Hoba Meteorite

Part I: Nature and Discovery

P E Spargo

Department of Physics, University of Cape Town,
Rondebosch 7701, South Africa
peter@spargo.wcape.school.za

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Introduction: The Meteorite

The Hoba Meteorite[1] is, by any standards, a most extraordinary object. The largest known single meteorite in the world[2], it is situated in northern Namibia on the farm Hoba West. Located at 19º 35.5' S, 17° 56.0' E, it lies some 20km west of Grootfontein and 65km south east of the noted mining town of Tsumeb. Amazingly rectangular in shape, with sides *c.* 3m x 3m x 1m, it has been calculated[3] to weigh some 61 000kg and is estimated to have landed less than 80 000 years ago (McCorkell *et al*, 1968). It is classified as a Group IVB meteorite, a small group of only 13 Ni-Fe meteorites which has recently been shown to be 4 527 ± 29 million years old (Smoliar, 1996).

[1] The term ***meteoroid*** is used to describe a natural object of up to *c.*100m in diameter that is orbiting in space (though the vast majority of them are microscopic in size) while the term ***meteor*** is used to describe the visual phenomenon associated with the passage of a meteoroid through the Earth's atmosphere – frequently popularly referred to as a "shooting star". A ***meteorite*** is a recovered fragment of a meteoroid that has survived its passage through the Earth's atmosphere. These vary in mass from a fraction of a gram to the Hoba meteorite at some 61 tons.

[2] The second largest is the Cape York meteorite, discovered by the American explorer Admiral Peary in Greenland and brought to the American Museum of Natural History in New York in 1897 (R. E. Peary, *'Great Ice' ... and an Account of the Discovery and Bringing Home of the 'Saviksue' or Great Cape York Meteorite*, London, 1898, vol.2.). In a most resourceful act, in 1958 the Museum persuaded the Toledo Scale Co. to lend it one of the company's large truck scales in order to weigh the meteorite. The result was 30 875kg (Mason, 1996, 5). As this is about half the weight of the Hoba meteorite, the chances of the latter being so weighed are presumably very slim! The third largest meteorite is at Bacubirito, in Mexico (27 t) (Lapaz, 1973, 380) while the fourth is at Mbosi in Tanzania (25-27 t) (Grantham & Oates, 1931).

[3] Since its discovery in 1920 the mass of the Hoba meteorite has been variously estimated to be anything from 40 to 100 t. During his meticulous inspection of the meteorite in 1929 the eminent British mineralogist L. J. Spencer of the British Museum measured its upper surface as 2.95m by 2.84m, with the thickness at the four corners being 1.22m, 1.11m, 0.75m and 0.55m. – i.e. an average thickness of 0.91m (Spencer, 1932-1934, 7). Knowing these dimensions, as well as the elemental composition of the meteorite it is a simple matter to calculate its mass with reasonable precision. Assuming a trapezoidal shape (i.e. having a plane lower surface) the meteorite has a total volume of 7.59m^3 and weighs 61.1 t. This is made up of Fe (6.28m^3) weighing 49.44 t, Ni (1.25m^3) weighing 11.12 t and Co (0.058m^3) weighing 0.515 t, with the numerous other minor elements making up the remaining 0.03m^3.

The meteorite was discovered in 1920-21 lying horizontally in flat, grassy thornbush terrain with one of its large sides almost flush with the ground. Astonishingly, it was not surrounded by a crater, a depression, or any other sign of impact. It is embedded in white calcrete (i.e. limestone) of the Kalahari Group, which in turn is underlain by granite.

Since its discovery it has been an ongoing target for curio-seekers, etc. Various pieces have been removed either by sawing, chiselling or using some form of gas torch. The amount removed is of course unknown but inspection of the meteorite shows at once that it cannot be very large in relation to the total mass of the meteorite. This is borne out by the fact that a recent listing of the 18 pieces of the meteorite in collections around the world adds up to only 24.96kg (Grady, 2000, 240). In March 1955 it was declared a National Monument by the (then) South West African Administration.

Realising its great intrinsic importance, as well as being dismayed by the ongoing vandalism which the meteorite has suffered since its discovery, in the mid-l980s Rössing Uranium Limited, the large Namibian-based mining company, took the initiative and, together with the National Monuments Council of Namibia, devised a plan both to preserve the meteorite from further damage and to develop it as an educational and tourist site. The area immediately around the meteorite, which had been excavated to its lower surface in the form of a circular trench in the 1920s, was therefore surrounded by an attractive stepped amphitheatre built of local stone.

The country now known as Namibia is vast in extent, sparsely populated, richly endowed with minerals and of quite breathtaking natural beauty. From 1884 it was a German protectorate, when it was known as Deutsch-Südwestafrika. However, shortly after the outbreak of the First World War in 1914 the territory was invaded and captured by South African troops under General Louis Botha. In 1920, now known as South-West Africa, the League of Nations assigned it to the Union of South Africa as a mandated territory. This situation continued until 1946 when a decision by the recently-established United Nations attempted to place the territory under UN trusteeship. This was strongly resisted over a long period by the South African Government, which claimed it as part of South Africa, but in 1990 the territory finally became independent under the name it has since borne, Namibia.

As most of the events concerning the Hoba meteorite which are described in this and succeeding articles took place during the period of the League of Nations mandate, it is an interesting question in international law as to who the rightful 'owner' of the meteorite was in those years and whether anybody had the right to move it to South Africa, as was proposed. An added complication is that the League of Nations had in fact effectively ceased to exist well before the founding of the United Nations in 1946!

An excellent educational display was added, together with toilets and, given the climate in the area, a very welcome supply of fresh water (Anon, 1988). (See cover picture)

Apart from its great size, mass and almost rectangular shape, a notable feature of the meteorite is the remarkable flatness of its bounding surfaces. These surfaces, like those of virtually all meteorites, are covered in shallow pits and scallops as a result of the high-temperature ablation that occurred during its high-speed passage through the earth's atmosphere. They also show slight signs of corrosion. A survey of the literature on meteorites shows that its smooth, near-rectangular shape is unique amongst meteorites anywhere in the world.

The meteorite is separated from the surrounding calcrete by a layer about 30cm in thickness of laminated 'iron-shale', a product of the interaction between the meteorite and the calcrete. This meterial is dark brown-black in colour, magnetic, and the laminations follow the contours of the meteorite, i.e. they are horizontal below the meteorite and vertical along its sides.

Classified as a nickel-rich ataxite, the Hoba meteorite has a composition of 82.34% iron, 16.44% nickel and 0.78% cobalt, with the remaining 0.04% consisting of a number of other elements such as carbon, sulphur, chromium, copper, zinc, gallium, germanium and iridium in varying but small concentrations (McCorkell, 1968).

Discovery of the Meteorite

Although in the absence of written records we of course cannot be sure, it is almost inconceivable that the !Kung San, the original people who inhabited much of Southern Africa, were not aware of the existence of the Hoba meteorite. It is tantalising to conjecture what mystical properties they may have ascribed to it.

Although in 1920-21 the farm Hoba West was occupied by a Mr Michael J. Hanssen, the credit for the discovery of the meteorite in 1920 must go to a Mr Jacobus Hermanus Brits (Fig. 1) who was living on the farm at that time. In October 1954,

Fig. 1. Mr. Jacobus Hermanus Brits, the discoverer of the Hoba meteorite, and his family. Probably taken in the 1920s. Image source: Alte Fort Museum, Grootfontein.

then aged 75, he described his discovery of the meteorite in a statement that, including as it does the account of the hunter stumbling across a great discovery, has a pleasing touch of the romantic in it (Brits, J. H., 1954). His words have an undoubted ring of truth about them and there would therefore seem to be no reason to doubt their authenticity. Mr Brits's statement (Brits, 1954), which has not hitherto been published, reads as follows:

> DECLARATION BY MR JACOBUS HERMANUS BRITS
>
> I was born on 23 April 1879 and am at present working in Outjo.
>
> From 1920, or perhaps a little earlier, I was living on the farm Hoba. During the winter some two years later I was out hunting. I saw this strange rock, sat on it and examined it. Only the upper surface was visible.
>
> While I was sitting on the rock it struck me that this rock was black whereas everything around it was limestone. I took my knife, scraped it and discovered that it was shiny. I then went and fetched a chisel, cut off a piece and took it to the S.W.A. Company in Grootfontein. The Manager took it, examined it, and identified it as a meteorite.
>
> Mrs Brits then partially excavated the meteorite and the Manager came to have another look at it. It is estimated [to weigh] 80 tons.
>
> (Signed) J.H.BRITS OUTJO, 2/10/1954."

Mrs Brits, no doubt fulfilling the traditional role of a farmer's wife of the period, was clearly no stranger to hard manual work!

The piece of the meteorite that Mr Brits had chiselled off the huge meteorite – and given its extraordinary toughness this was in itself no mean feat – had obviously been assayed by the Company, for in a letter of 26 May 1921 to the London office of the company, Mr T. Tönesen, General manager in Grootfontein of the South West Africa Company[4], reported that:

> On the farm Hoba-West, about 20 kilometres to the west of Grootfontein, there is a meteorite, which is about 2.5 by 2.5 metres on the surface and may have a thickness of probably 2 metres (only 1 metre has been exposed). Accordingly the weight would be 87 tons, but is safer to say 60 tons. The assay shows 81.29% iron and 17.49% nickel. The nickel content will probably amount to 10 tons. The stuff is very ductile, precluding blasting. We shall try a saw and eventually an oxy-acetylene flame (Spencer, 1932, 2).

[4] The South West African Company Ltd. was an Anglo-German Company established in 1892 to develop extensive land holdings in Damaraland. Its German association ended after World War I when, in 1920, South West Africa became a mandated territory of the Union of South Africa. Its head office was in London while its South West African head office was in Grootfontein. In the early 1970s it was taken over by the South African mining group Goldfields of South Africa Ltd, being renamed Gold Fields Namibia.

Following this, the first known mention in writing of the meteorite, Mr Hanssen, now claiming to be the discoverer of the meteorite(!), wrote to the Director of the 'Pretoria Museum' (no doubt the Transvaal Museum) on 17 September 1921 as follows:

> I have discovered on my farm a huge Meteorite, being in size 39 inches thick and over three yards by three yards., the upper dimension which is almost square, it lies level with the ground and I have digged a trench round it to find its thickness.
>
> I will be glad if you could tell me whether you have any interest in such meteorites, it is of solid metal about 20% Nickel and 80% Steel or Iron.
>
> Could you perhaps give me the size of the largest ones found in Africa and if it is of any value.
>
> If you have no interest in such, then I will be glad if you can give me the address in Europe or America of Institutions that are interested in "Meteorites".
>
> Thanking you in anticipation for the information (Hanssen 1921).

The Transvaal Museum had, very sensibly, forwarded the letter to the South African Geological Survey, also in Pretoria. The Director of the Survey, Dr A W Rogers, adopting a somewhat patronising tone as though he were replying to a simple farmer, replied to Hanssen, on 19 October 1921:

> Your letter of Sept 17th addressed to the Director of the Transvaal Museum has been handed to me.
>
> The largest single piece of a meteorite so far discovered in Africa weighs rather over 2,000 lbs (found in the Uniondale Division),[6] but the total weight of the Gibeon fall is about 15 tons.[7] The weight of the nickel-iron on your farm must be over 45 tons.
>
> The value of these meteorites is indefinite; some of the stones (i.e. those made partly or wholly of stony matter as distinct from metal) are of considerable value, but they are very uncommon, and they disintegrate on the ground much more rapidly than the nickel-irons. The actual value of a meteorite depends upon what museums will give, and of course upon facilities of transport. One cannot quote a price as one can for sheep or cattle.

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6 The meteorite referred to here was discovered in 1903 in the Kouga Mountains, some 80km east of Uniondale in the Eastern Cape. Weighing 1 173kg and now known as the Kouga Meteorite, it is on display in the Iziko South African Museum in Cape Town. In spite of being much smaller than the Hoba meteorite it is nevertheless an impressive object.

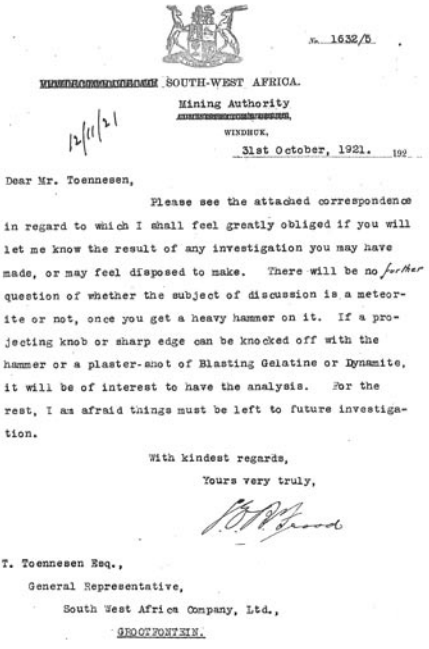
7 A small town in Namibia between Keetmanshoop and Mariental, Gibeon is the approximate centre of one of the most celebrated meteor showers anywhere in the world. From the initial discovery of one meteorite in 1836 very large numbers arising from the shower have been found distributed over a large, roughly elliptical area. These range from a huge 12 613kg mass in the Museum in Windhoek to large numbers of medium, small and very small fragments. Chemical analysis shows that these all arise from the same meteoroid, as a result of its disintegration in the upper atmosphere during its plunge to earth. This must have truly been a memorable sight (for further details, see Grady, 2000, 214).

> I hope an officer of the Mines Department will be able to visit your farm and look at the meteorite (Rogers, 19 October 1921).

On a lighter note it is worth recording at this point that an official of the Central Mining and Investment Corporation in Johannesburg named Mellor on 5 October wrote to C. G. Courtney Clarke of the South West Africa Company, with the suggestion that "…the shape appears most unusual, and both that and the composition of the metal suggest an armour-plate from some giant armed aeroplane. It will be interesting to hear more about the find." Clearly Mr Mellor was a lateral – or perhaps in this case one might call him a vertical – thinker (Mellor, 5 October 1921).

Meanwhile, the following day Rogers wrote to G. E. B. Frood, Inspector of Mines, 'Windhuk' (the original German spelling), with the request that

> ... could you look at the supposed meteorite yourself, or get some one who knows a meteorite when he sees one? The first thing is to be sure that there is no mistake. … It would be very good to have the meteorite preserved in a Museum: transport will be difficult, and cutting the nickel-irons is not easy, though the oxy-acetylene flame would perhaps do it more easily than a mechanical saw. … The Minister was considerably interested and hoped that we shall be able to get the meteorite or a large bit of it safely to Pretoria (Rogers, 20 October 1921).



No. 1632/5.

SOUTH-WEST AFRICA.

Mining Authority

WINDHUK,

31st October, 1921. 192

12/11/21

Dear Mr. Toennesen,

Please see the attached correspondence in regard to which I shall feel greatly obliged if you will let me know the result of any investigation you may have made, or may feel disposed to make. There will be no further question of whether the subject of discussion is a meteorite or not, once you get a heavy hammer on it. If a projecting knob or sharp edge can be knocked off with the hammer or a plaster-shot of Blasting Gelatine or Dynamite, it will be of interest to have the analysis. For the rest, I am afraid things must be left to future investigation.

With kindest regards,

Yours very truly,

T. Toennesen Esq.,
General Representative,
South West Africa Company, Ltd.,
GROOTFONTEIN.

Fig. 2. The original letter (shortened for ease of publication) from Mr G. E. B. Frood, Inspector of Mines, South West African Administration, to Mr T. Tönesen, of the South West Africa Company, Grootfontein. Source: Alte Fort Museum, Grootfontein.

From this it would appear that Rogers was either hoping to transport the whole meteorite to South Africa but was deterred by the fact that, in a memorable understatement, 'transport will be difficult' or, in an astonishing piece of scientific and cultural vandalism, was hoping to cut up the meteorite and move it to a museum in pieces. Also, choosing to ignoring the fact that the meteorite had been discovered outside the Union and that a South African museum might have no legal right to it, Rogers,

clearly anxious to acquire the meteorite, continues:

> You will see from my answer to Mr Hanssen that I could not say much about price; if he demands much we shall not be able to get the meteorite. I suppose that it really belongs to him, and that government has no share or claim. You will know more of this than we do here. If you can see the man and work on his feelings, I am sure you will do so. I found that method successful in Kenhardt in the case of one Smit, and the result was that the nickel-iron about ½ ton went to the South African Museum.[7]

Ten days later Frood replied that while

> ... I should have the greatest pleasure in trying to make myself of any use to you at any time ...

it would be quite impossible for him to be in the Grootfontein district for many months to come. However, he would ask Mr Tönesen to look into the matter of

> ... the supposed meteorite and let me know how the matter stands generally (Frood, 31 October 1921, Fig.2).

It is particularly noteworthy that there was still no agreement that it was in fact a meteorite, although he was clearly aware of its mass, as in the same letter Frood goes on to inform Rogers that

> ... when I was in Grootfontein two months ago, he [i.e. Mr Tönesen] spoke to me about a certain meteorite, that was then being uncovered or further exposed, and no doubt this is the same as that you write about. ... From what Mr Toennesen told me, however, there was still a doubt as to whether it was really a meteorite or not. The first thing to do, therefore, will be to make sure on this point. If at the same time a lump large enough for analysis can be knocked off, so much the better.
>
> You need not be apprehensive of the meteorite (if such) being exported, as that is specially forbidden by law. If anything can be done with it, it will undoubtedly fall to the South African Museums,[8] unless the owner plays dog in the manger.
>
> At the same time, I am doubtful of whether it will be possible to do much with such a mass. Transport of the whole is out of the question. A mechanical saw or other mechanical tool could not well be brought into operation and hand sawing is equally out of the question. Neither do I anticipate that the Oxy-acetylene flame would prove sufficient to so great a task, though of this I am not sure. This question can be gone into later.

[7] Here Rogers is referring to the large meteorite discovered in the Kenhardt district of the Northern Cape in 1909 and generally referred to as the Rateldraai meteorite. It had a recovered mass of some 550kg, the main portion of which is in the Iziko South African Museum in Cape Town. From his letter above, this was clearly a 'donation' organised by Rogers!

[8] Although Frood has written 'South African Museums' here, 'South African Museum' was clearly intended.

It is of particular interest to note that here Frood reassures Rogers that while it would be illegal to 'export' the meteorite (where one must assume that 'export' means to a country overseas) he foresees no problem in moving this obviously valuable object from a League of Nations mandated territory (see box on p.86) to a South African museum!

Finally, to bring this correspondence to a close, we quote from a letter from Tönnesen which indicates the extent of the uncertainty regarding the ownership and future of the meteorite:

> Messrs. Clarke and Hardy consider it a meteorite. The analysis shows 82% iron and 18% nickel. It is very ductile and it took about 10 minutes to knock off a piece the size of a small bean. The weight, as far as we can see is about 40 tons or more. When Mr Hardy comes from Abenab, he will take a photo of it, which will be sent to you, as also a piece of the same.
>
> To whom the meteorite belongs is the question. I presume to the man who pegs it. I shall most likely try an oxy-acetylene flame and see whether it can be cut up in this way or not. The Company, if by pegging, it has a right to it, will no doubt meet the wishes of Pretoria or Windhuk. I don't think Mr Hansen has any right to the meteorite; he showed it to us and we have expended some money on it. We can talk this matter over in Windhuk next week (Frood, 12 November 1921).

(Presumably the "Messrs Clarke and Hardy" referred to here are employees of the South West Africa Company working in the assay laboratory of the Tsumeb mine.)

And there this most fascinating correspondence ends ...

About the author: Peter Ernest Spargo, FRSSAf, graduated as a Metallurgical Engineer (1960) and obtained an M.Sc. in Physical Chemistry from the University of the Witwatersrand. To fulfil his calling as a teacher, he trained as a science teacher at the Johannesburg College of Education (JCE) and the University of Cambridge. After first teaching at the JCE, followed by a period as a Science Education Planner, he moved to UCT's Faculty of Education. After more than 20 years he retired, in 1997, as Associate Professor of Education and Director of the Science Education Unit. He is now an Honorary Research Associate in the Department of Physics at UCT. He was intensely interested in astronomy from an early age and has maintained a lifelong interest in the structure and nature of the Universe. He was a member of the Johannesburg 'Moonwatch' team and other interests include geology, botany and zoology.

During the planning phases of the Hoba Meteorite visitors' centre and tourist site at Grootfontein, he acted as consulting scientist for Rössing Uranium Limited.

Thus as 1921, the first full year of the meteorite's 'existence', drew to a close, the fate of the largest meteorite in the world was still filled with uncertainty: its ownership was unsettled; it had not yet been named; its weight had been seriously under-estimated, its composition had only been very roughly determined and its existence and location was known only to a handful of people.

Much lay ahead …

Acknowledgement

I acknowledge with thanks the exceptional helpfulness of Mr Marcus Prickett, previous Chairman of the Alte Fort Museum, Grootfontein, in providing copies of these previously unpublished documents in the possession of the Museum, as well as the fine photograph of the Brits family (Fig. 1). Also to the ever-helpful and pleasant members of the Inter-Library Loan Section of the Chancellor Oppenheimer Library, University of Cape Town. ☆

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Please note: All the materials referred to in this article series had been deposited in the SAAO library, where they would be available to future researchers.