

The bloodstone source of metallurgy

BY

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Introduction

Participating in the Jubilee celebrations of the *Institute de Antropologia «Dr. Mendes Correia»*, affords me great pleasure because the distinguished Portuguese scientist who founded the Society and whose name has been incorporated in its title was also the first anthropologist on the continent of Europe to accept the significance of *Australopithecus africanus* in throwing new light upon human prehistory (Dart, 1959: 457). Still more compelling is the long friendship enjoyed with Professor J. R. dos Santos Junior, the reigning president of the Society, which has been such a source of reciprocal pleasure ever since our first meeting in Johannesburg over forty years ago. Sharing the hospitality of his home and family at Quinta Judith, Moncorvo in the latter part of October 1956 is an outstandingly happy and ineradicable memory for both my wife and myself.

Journeying then with Dr. dos Santos Junior through the corn-oak grove over the ore-strewn hill side above his homestead — much of whose ore had traditionally been exported to England — had carried my memory at that time, a quarter of a century back. I had already written (Dart 1929) about the making of bronze in South Africa. Whilst traversing Africa from Johannesburg to Cairo, I had also investigated and later described (Dart 1934)

the first stone age mine hitherto described for manganese. But I had little expectation when in Portugal a decade ago that the subject of prehistoric mining would soon again become one of my major archaeological concerns. Meantime Professor dos Santos Junior himself has been placing on record the folk-lore of village bread ovens in trás-os-Montes (J. R. dos Santos Junior 1965-66: 120-146) and has been excavating the Castro de Carvalhelhos (J. R. dos Santos Junior 1965-66: 181-190) amongst his other numerous interests during the intervening years. So once again it is about another of these shared interests that I am writing.

The excess of haematite, or blood storage in slags

The most fascinating feature to me of the chemical analysis of the slag excavated at Castro de Carvalhelhos was that which had excited comments from its investigators viz: the presence of 2.03 % tin and traces of copper, although iron oxide accounts for 64.43 % of the slag. H. Maia e Costa (1965-66: 173-180) who carried out the microscopic examination, found that the compact fraction of the slag revealed that the furnace must have reached elevated temperatures ($> 1,300^{\circ}\text{C}$) at which normally tin would have been released. He therefore concluded that using the *excess of iron oxide* in view of the high content of silica (21.46 %) in the slag was an *ingenious way of recovering the tin* in the absence of a knowledge about the chemical composition of its ore. He thus corroborated the observation that had been made on the chemical analysis furnished by Prof. A. H. de Carvalho Director of the Laboratório do Serviço do Análises do Instituto Superior Technico de Lisboa. The observation made was that although the analysis dealt with a product rich in iron, it did not eliminate the hypothesis that it concerned a slag of tin metallurgy in view of the obvious presence of that element which was not normally present in iron ores. The italics above are mine because what interests me chiefly is that *excess of iron oxide* for I think that our recent work on prehistoric mining here in Southern Africa may assist in explaining its presence.

Both Portugal and South Africa share backgrounds of ancient mining but the Iberian peninsula seems to be recognised only as having been a focus of attraction for Mediterranean traders, smelting locally and carrying metals of to historical metallurgical centres. On the other hand smelted metals older than the iron of 400 ± 60 A. D. found by Beaumont at Ngwenwya Iron Mine (see Dart 1967: 266) have not as yet been discovered in South Africa. However, proof has recently been furnished by radiocarbon dating of *mining for iron ores* at Ngwenwya in Swaziland — which lies between Portuguese East Africa and the Transvaal province of South Africa — that goes back in time further than has hitherto been provided by a mine in any other part of the world.

That very ancient (over 40 millennia) mining for haematite date is why I became deeply interested in the presence of this vast *excess of iron ore* in the slag of an ancient smelting operation in northern Portugal probably intended for the extraction of tin which is a rare metal and of immense value for the making of hard bronze. The suspicion has arisen in my mind through the much earlier mining for iron ore than for tin ore that, whatever the modern reasoning of metallurgists trained in modern chemistry may be about the mixing of ores to make slags, the employment of iron ores by Portuguese, and other metallurgists in Bronze Age times for such a purpose were more likely to have been based upon ancient traditions of an alchemical or religious ritual character handed down by their predecessors than upon a real knowledge, even if of an empirical nature. So it seemed useful to use the present opportunity to set that idea on record.

Theodore A Wertoime (Science 1964: 1257) states «We surmise today that the discovery of smelting did not revolve merely about copper, the first industrial metal but that it engaged man in chemistry that divulged in relatively quick sequence, the existence of lead, silver, tin and probably iron. Tin revealed itself as the ideal alloy in bronze only after long and often unintentional trials with impurities such as arsenic and antimony.

W. Culican (1961: 1137) attributes the overrunning of Syria, Palestine and Egypt (1700 B. C.) to the Hyksos metallurgy of iron, horses and chariots. But a lump of smelted iron (according

to Wertime 1964: 1262) was found at Chagar Bazar in North-east Syria in a level dated provisionally between 3000 and 2700 B. C. and a dagger or sword fragmented (dated C 2700 B. C.) was found at Tell Asmar 350 miles or more down the Tigris river not far from Baghdad, Iraq's capital today. Similar or even earlier dates are assumed for 4th and 6th dynasty iron in Egypt. So iron was being produced, either accidentally or deliberately for at least a thousand years or more before, to use M. Eliade's (1962: 23) words: «Unlike copper and bronze the metallurgy of iron very soon became industrialized. Once the secret of smelting magnetite or haematite was learnt (or discovered) there was no difficulty in procuring large quantities of metal because deposits were rich and easy to exploit».

Amongst the earliest known copper objects discovered are the «copper tubes decorating the end of string skirts found by Mellaart in 1962 at Lakal Huyuk on the Komya plain in Turkey». These may belong to the beginning of the 6th millennium B. C. and thus have an age corresponding with that of the presumed fertility shrine belonging to the second Neolithic phase of Jericho (see J. Mellant 1961: 47). At any rate the use of red ochre (haematite i. e. iron ore) was characteristic of neolithic funerary and ritual practices throughout the Near East and also of the neolithic pottery painting that spread from Mainland Greece to Cyprus and through Anatolia and the Levant to the Persian Gulf and the Red Sea (see Mellaart *op. cit.*).

Although red ochre (i. e. haematite or bloodstone) was the favourite pigment of late palaeolithic man in Europe it was not the only one used in mural art; the blue-black of manganese oxide was also a favourite pigment. But the iron carbonates gave many more colours ranging from yellow to dark orange and even black. It was natural that iron ores of other colours were used as the mural art developed, because the presence of haematite in Mousterian sites such as La Chapelle-aux Saints shows that it was the first pigment known to have been used in burial ritual. The reason for this according to Breuil and Lantier (1965: 249 seq) was that «Primitive man's way of likening red colouring to blood conferred on it the powers of a source of life and strength!»

Sprinkling all the body or only part of it with red ochre which has left its traces on the skeletons — nearby objects like the offerings of food and drink would «help the dead to find the strength to carry on life beyond the grave». As Elliot Smith (1927-30: 356) also expressed it «red ochre was put there as a *substitute for blood*, which was regarded as the life stuff, and the shells as a symbol of birth or life-giving. Both red ochre and shells were amulets believed to be capable of adding to the deceased's vitality — in other words of increasing his chance of prolonging existence» (*italics mine*).

This practice of employing red ochre, i. e. haematite, or blood stone (which is the native red oxide of iron and also occurs in the glittering black micaceous form of specularite, or '*looking-glass*' ore in burial and other ritual spread during late Palaeolithic times right across Europe from Wales in England to the Atlas Mountains and became prevalent both in the region around the Cote d'Azur in the Western Mediterranean and in the Near East in the Eastern Mediterranean especially in Mesolithic times. As soon as pottery making began there in the Neolithic era the application of brilliant red and black and even other pigments to ceramics played a functional and ritualistic as well as aesthetic role comparable only to that which these pigments had exercised in late palaeolithic mural art.

So it is obvious that the greater heats involved in producing better ceramics led through these metallic pigments to glazes and finally to the metals, of which copper was the first to attract attention probably because of its own redness, which it transmitted also to bronze.

Whether these ritual practices (centred primarily around *bloodstone*) arose in the west and spread to the east along with the feminine fertility cult of the late palaeolithic era can only be resolved by radio-carbon dating. That is what makes the facts about Ngwenya Iron Mine in Swaziland so important. As these matters have already been discussed in several previous publications (Dart 1967, 1968a, 1968b, Dart and Beaumont 1967, 1968, 1969 in press C. A.) I will not discuss them in detail now but

merely give a list of the Ngwenya radiocarbon datings from the Yale (Y) and Groningen (GRN) Laboratories:

Y1712	Sample 1	Castle Cavern	1550	\pm 60	B.P. = 400	A.D.
Y1713	> 2	Lion Cavern	9640	\pm 80	B.P. = 7690	B.C.
Y1714	> 3	Banda Cave	5890	\pm 80	B.P. = 4940	B.C.
GRN 5022	Ngwenya,	Castle Cavern	1535	\pm 30	B.P. = 415	A.D.
Y1829		Castle Quarry	3970	\pm 120	B.P. = 2020	B.C.
GRN 5022		Castle Quarry	2860	\pm 35	B.P. = 1910	B.C.
Y1827		Lion Cavern	22,230	\pm 400	B.P. = 20,330	B.C.
GRN5620		Lion Cavern	28,130	\pm 260	B.P. = 26,180	B.C.
GRN (Feb. 1968)		Lion Cavern	43,200	\pm 1300	B.P. = 41,250	B.C.

The last date has come from the bedrock stratum of a trench carried out to the margin of the cliff whose outcrop of specularite seems to have attracted what is so the earliest and longest sustained interest of these miners during the period extending from 43,200 to 9,640 B. P. i. e. from the 44th to the 10th millenium before the present. The work there probably ceased at some time after that date not because of a loss in interest for specularite but because of the fall of a five ton block of haematite lying across the cavern entrance. The first, or Y1713 date was obtained from bedrock on the cavernside of that block; the two (Y1827 and GRN 5620) dates from bedrock underneath that block; and the last date, as stated, from bedrock between that block and the cliff margin. The stone cultural objects and mining tools found were described in *Nature* (Dart and Beaumont 1967) and in the *South African Journal of Science* (Dart and Beaumont 1968). Some possibly Later Stone Age tools were found along with mining tools in the 6-8ft layer of the rubble under the fallen block but the 8-11ft deeper bedrock layer yielded 23,000 artefacts belonging unquestionably to the middle stage of the Middle Stone Age. The investigation of the cultural material from the bedrock layer of the trench beyond has not hitherto evinced any striking divergence from the Middle Stone Age material found in the bedrock layer below the haematite block.

Unfortunately this is the only mining site from which hitherto radiocarbon dates have been recovered. So we can only speak

hypothetically about the probable lines of the dispersal of the haematite mining industry across Asia and Indonesia that carried the religious ritual use of red ochre to every tribe in Australia and Tasmania and also across the Atlantic, or the Pacific ocean or both of them to the Red Indians and Tierra del Fuegians. It seems patent that the dispersal of such rituals involving an industry of mining and concepts about life and death at the intercontinental stage could only have been effected with the aid of water vehicles and the industry of making them; but at what time in the past Australia and America received the impulse only the dating of ochre mines and of the cave or open deposits, where it has been found can tell us.

Haematite occurred in the lowest stratum of Pomongwe Cave near the Matopos in Rhodesia. The same stratum contained a Proto-Stillbay Middle Stone Age culture and has been radiocarbon dated at Salisbury as 40,000 B. C. So it is obvious that mining sources of an age as great as, or even greater than that of Ngwenya will be found both to the north in Rhodesia and also to the south in the Cape Province. Shell midden sites yielding Middle Stone Age culture and dates of 30,000 and 33,950 years B. P. have also been reported from the vicinity of Lourenço Marques itself (M. Louis Lecte: personal communication).

But until cave deposits and more especially mining sites in Southern Europe and Asia for haematite have been radiocarbon dated we will not know for certain whether Western Europe or Southern Africa was the earlier to begin this mine for pigments. It would also be fascinating to learn how far back in time the prehistory of mining can be traced in Portugal and Spain, for this would illuminate the history of metallurgy throughout the Mediterranean area, particularly during the copper and bronze age, for my opinion is that copper and its alloys attracted the early metallurgists first simply because of their red colour. The ambition of making that red metal as hard and strong as possible would then attract major attention.

But two other incidents had awakened my interest in this *excess of iron oxide* before the Castro de Carvalhelhos report. The first was having read Mircea Eliade's (1962) splendid work

on *The Forge and the Crucible*; the second was having learnt from the above-mentioned work of T. A. Wertime (1964: 1262) that «In traditional Iranian practice, lead ores are reduced by a process known as the *iron ore flux process* in which iron oxide is added to the charge»; (italics mine) and from the conclusion he arrived at as a result of his later practical expenditure in Persia (1968: 935) «that iron ore may have been added at a very early date, possibly even before men tried to smelt the sulphide galena».

As Wertime had pointed out (1968: 931 seq) «Iron ore (F_2O_3) was used as an additive in both copper smelting and lead smelting, a practice which was also noted in Palestine by Rothenburg and which was of utmost importance in that it stimulated the identification and ultimate exploitation of iron and advanced the use of sulphide ores of lead and copper «(see R. F. Tylecote, A. Lupu and B. Rothenburg 1967). Indeed, Wertime himself was so struck by the regular use of iron oxide in ancient and recent Iran that he posed the critical question himself (1948: 935): «Was iron ore added as flux from the beginning?» When I looked up my old paper (Dart 1929) I saw that the Rooiberg Transvaal bronze slags were «embedded in an iron-rich slag» also.

So we know today that iron oxide i. e. haematite, or bloodstone was being used from the earliest times not only in Persia for smelting lead, copper and other metals and in Palestine for the recovery of copper but also in Portugal for the recovery of tin and in ancient Transvaal furnaces for the alloying of tin with copper to make bronze. In other words red iron ore was used as an additive in prehistoric metallurgy irrespective of the particular metal it was hoped to recover or the alloy that was being made, but because of the inherited virtue believed by the primitive metallurgists to reside in the *bloodstone* itself.

The excellence of Eliade's (1962) work lies in its professed purpose (*op. cit.* 24) which was «solely to reveal the symbolism and magico-religious complexes which became a reality during the Metal Age, especially after the industrial triumph of iron. For the Iron Age, before it became a factor in the military and political history of humanity, gave rise to spiritual entities. Before changing the face of the world the Iron Age engendered a large

number of rites, myths and symbols which have reverberated throughout the spiritual history of humanity».

I will not discuss Eliade's book in detail here but it is relevant to say that while agreeing with his (*op. cit.* 23) suggestion that «the 'celestial' origin of iron is perhaps attested by the Greek *sideros* which has been related to *sidus*, *-eris*, meaning 'star', and the Lithuanian *vidu*, 'to shine' and *videti* 'shining'. I do not agree with his idea that the Hittite kings use of 'black iron from the sky' had anything to do with meteorites or meteoric iron. It seems far more probable that these primitive 'celestial' ideas arose from the black, crystalline or micaceous form of iron ore, known as *specularite*, or 'looking-glass' ore. Specularite crumbles into a sparkling powder which when spread with a fatty substance over the face or body, transfigures its appearance with a 'celestial' or shimmering, star-like glitter. This black and red colour divergence and transfiguring power of haematite also accounts for the Kitara tribe's division of ores into male and female. The former, hard and black, are found on the surface; the latter, soft and red, are extracted from inside the mine. The mingling of the two sexes is indispensable to fruitful fusion (*Eliade, op. cit.* 36).

The identification of *bloodstone* as the 'blood of Mother Earth' has been dealt with elsewhere (Dart 1968c). The concepts of generative stones, of metals growing in mines, of the earth's and of the furnace's being gestational wombs, of human and other sacrifices to the furnace, etc. with which Eliade deals, can all be traced back to their common source in that ancestral concept symbolized in the name *haematite* and recognised not only by Breuil and Elliot Smith but also by W. J. Sollas (1911) R. R. Marrett (1927-30: 297) as a substitute for blood and thus a symbol of fertility. The breath being invisible, *blood* or a *substitute for it* was to primitive mankind the only visible and tangible substance of life.

For forty thousand years — perhaps longer, since it goes back to Mousterian times — human beings had been using this red ochre and glittering black specularite as a life giving substance in burials, in mural art, in sacred ritual, and in the decoration of their pottery, shrines and dwellings. Seeing that in Eliade's own

words (*op. cit.* 9) «chemistry was born from alchemy, or more precisely, it was born from the disintegration of the ideology of alchemy» during the last three centuries of our era, it is self evident that man's earliest metallurgical activities must have been steeped in the germinal ideas inherited from the multimillennial past of red metals in general and of *bloodstone* in particular.

Conclusion

The discovery that mining in Africa south of the Limpopo river, which separates South Africa from Rhodesia and enters the Indian Ocean about 120 kilometres north-east of Lourenco Marques, goes back 43 millenia before the present, has shown that mining is one of the oldest industries of *Homo sapiens*. It has also shown that the search for, and the bartering, or exchange of red pigment was just as characteristic of Middle Stone Age mankind in South Africa as it was of Mousterian and Aurignacian mankind in Europe. It has revealed how little is known about the origin and dispersal of this mining habit and how important a part this *bloodstone* pigment has played in leading mankind to the search for all metals from red copper to glittering silver, yellow gold, toughening tin and their alloys as well as to iron itself and all the rites and mysteries connected therewith. In particular through the appearance of an *excess of iron oxide* in slags of metals from Portugal to Iran and from Israel to the Transvaal it indicates that a common culture background of *bloodstone* was inherited by metallurgy wherever it penetrated throughout the Old World.

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