

BRITISH MICROMOUNT SOCIETY



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EDITORIAL

Inevitably, the time had to come for me to use this editorial as an appeal for contributions to the Newsletter. As things look right now, I am short of articles for the June edition and write-ups of collecting trips, new finds and even old finds (!) would be greatly appreciated. These could be full-blown articles or simply notes for the *In Brief* column. At the moment it seems that the Newsletter is being carried by a very few regular contributors and the generous efforts of non-members. So please consider putting pen to paper (or finger to keyboard), 'cause otherwise the next issue could be rather thin!

An apology is due to Doug Morgan, who's workshop on thin sections was inadvertently omitted from the write-up on the 1993 Symposium which appeared in Newsletter 36. Doug's paper on thin sections at the 1992 Symposium aroused so much interest that a practical demonstration became a "must" for 1993.

THE FORMATION, OCCURENCE AND DISCOVERY OF NEW LEAD SLAG MINERALS

Richard Lamb

Introduction

Most collectors will already be familiar with the concept of slag mineralogy having visited the dumps of the Meadowfoot Smelter, Wanlockhead (1), where even the blue-green coloration of oxidized copper compounds used to be visible from a considerable distance, or perhaps travelled afar to Laurion to discover for themselves the effects of sea water on 2,000 year old slag. But first things first; what is a slag mineral?

Definition

The definition I use is: the post-smelting formation of a chemical species through the action of natural weathering processes on slags. Thus despite there being a plethora of authors (2) who employ mineralogical names for the products of smelting itself, this practise is erroneous and should be discontinued; the products of smelting are not minerals. This is a most important distinction which should be borne in mind at all times when considering the subject of slag mineralogy.

Formation

Slag minerals are produced via the process of oxidative weathering on slags through the actions of water, carbonic acid formed by the dissolution of atmospheric carbon dioxide in rain, oxygen, and in the special case of Laurion where the slags were dumped on the shores of the Mediterranean, salt water. The products of this weathering are very dependent on the composition of the slag matrix, discussed in detail below, and most mineral-bearing slags are now well over 100 years old, the notable exception being Wanlockhead where the smelter worked into the 1930s (3).

The well-known suite of minerals at the last-mentioned site comprises carbonates and basic sulphates, etc., of copper and/or lead in colourful array, and including several rarities such as elyite, chenite, lanarkite, and the species known by the unauthenticated name lautenthalite. All of these are also found in nature.

Due to the action of brine over 2 millennia, the slags at Laurion have attracted much attention because of their range of chlorine-containing species, several being first described from this site. These include the lead hydroxide chlorides (laurionite, paralaurionite, penfieldite and fiedlerite), copper lead hydroxide chloride (cumengite), silver copper lead hydroxide chloride (boléite), lead fluoride chloride (matlockite), lead chloride carbonate (phosgenite), and lead hydroxide chloride arsenate (georgiadesite) (4). Of these, two have not been found in "nature": fiedlerite and georgiadesite.

The new slag minerals found initially at lead smelting mills in the Yorkshire Dales, and subsequently in Derbyshire, have been formed under conditions very different

to those at Laurion, reflecting both the composition of the matrix and the weathering agents, and consist of various unstable barium/sulphur compounds not found in nature. (yet!).

Brief History of Lead Smelting

However, before embarking upon descriptions of the new species, it is instructive to consider the history of lead smelting in order to understand both the characteristics of slag, and the locations of smelting sites.

The oldest piece of lead so far discovered comes from Turkey and dates to 6,500 BC (5). As mineralogists, this means we have 8,500 years of accumulated slags to examine! It is interesting to speculate on the origins of lead smelting: was it through the entirely accidental incorporation of outcropping galena into a camp fire, or was it part of a series of experiments by the germinal metallurgist who thanks to his powers of observation found the method empirically? We shall of course never know, but to put this in perspective, the definition of smelting can be stated as the process of conversion of metalliferous ores into metal. Early techniques, about which virtually nothing is known, were based on bonfire technology using wood as fuel and blown by the wind; bellows were invented around 4,000 BC and could be used to provide draught where wind-power proved insufficient. Excavations have revealed these early sites to have consisted of a low stone wall to contain the fire, with a shallow bowl-shaped depression at the base in which molten lead collected and ran out into an external well via a channel (6). Indeed, these methods continued into the sixteenth century in Great Britain (7), becoming known as the *bole* in most of the country, possibly from the Latin *bola*, a wind-blown furnace, or even from a precursor of our modern word *bowl*; or *bale*, used chiefly in Yorkshire and County Durham and derived from the Norse word, *bal*, meaning a large bonfire. Only one site has been dated so far, to c.1460 (8). The visible remains are still to be found by the ardent field worker, the débris including a great mixture of black and grey slags, lead, fuel, and ore, denoting the somewhat variable conditions pertaining in a furnace structure of this kind dependent on the vagaries of the wind. Much has been written on the *bole*, but in fact very little is known about the mode of operation or indeed where most of them were located. No real information is available on the range of slag minerals that have been found in *bole* hearths, but they would certainly be present in one form or another.

Towards the middle of the sixteenth century, new technology took over from the *bole* for a number of reasons (7), developing into what came to be known as the *ore hearth*. This development from a bellows-blown circular hearth originating in Mendip, to water power operation, revolutionized the industry, but introduction was delayed some 13 years due to litigation. The *ore hearth* was characterized by having a workstone, an essential feature for its functioning, used wood or later coal/peat as fuel, and was housed in the smelting mill, situated no longer at high altitudes like the *bole*, but in a valley to take advantage of water power. Many accounts of the *ore hearth* have been written (9,10), and an excellent example can be seen *in situ* at Pates Knowes smelter, Wanlockhead, which most collectors will have passed unseen in their headlong rush to find slags at the Meadowfoot smelter further down the track!

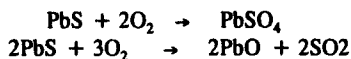
The ore hearth was an enduring piece of equipment, and lasted until the mid-twentieth century at Newcastle in a water-cooled mechanized version known as the Newnam hearth. The products of primary smelting were lead, together with grey slag, and copious amounts of sulphur dioxide released to atmosphere. These hearths, also known as Scotch or Yorkshire ore hearths were utilized in all lead producing counties, but the smelting mills in Yorkshire are particularly well preserved in comparison with those from other areas and have received several comprehensive studies (11,12).

Further technological advances came at the end of the seventeenth century with the introduction of the reverberatory furnace, or cupola, a closed furnace in which the ore, unlike previous methods, was not in direct contact with the fuel contained within a firebox at one end of the structure, the heat reverberating from the roof down on to the ore on the bed below. Because of its size, the reverberatory furnace was expensive to build, and was the tool of the large company. It found particular use in Wales, Cornwall and Shropshire, completely ousting the ore hearth in Derbyshire by 1782 (10,13). "Cupola" place names occur in several localities, and remind us of the former but now forgotten local industry.

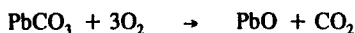
Later developments produced the blast furnace, capable of high throughputs and continuous operation, all earlier techniques being batch processes. The chemistry was complex (13,14) and to my knowledge, no slags from these furnaces are extant in Great Britain, but almost certainly would be in America where the method has regained supreme since the end of last century.

Metallurgy

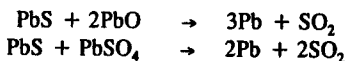
Relatively simple chemistry can be used to explain the release of lead from the three earliest historical modes of smelting, namely the bole, ore hearth and reverberatory furnace. The method is called the air reduction process (10), or by some authors, the roast reaction. Reduction is a chemical term denoting removal of electronegative elements such as oxygen and sulphur, and is the opposite of oxidation. The agent for the reaction is atmospheric oxygen, and the base material is assumed to be galena of correct particle size and purity for smelting. The reactions for low temperature roasting are as follows:



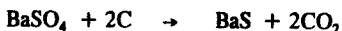
The ratio of lead sulphate:oxide is dependent on impurities, temperature, etc., any anglesite facilitating the process, and cerussite decomposing in a similar manner to limestone:-



The reaction known as double decomposition between the sulphate, oxide and unaltered galena, then follows at a temperature of around 600 - 800°C :-



Clearly, an intimate mixture in the correct proportions is essential for complete reaction, and equally this is impossible from a practical point of view, often producing large amounts of lead and lead compounds in the resultant slags. A further reaction is likely to take place when barite is a constituent of the charge due to its high specific gravity and the difficulty of separation by hydraulic means from lead ores without excessive losses:-



This carbon is derived from fuel, or in the case of the reverberatory, coal, added to the charge towards the end of the process to effect reduction of the oxidized lead compounds, and it is the product of this reaction, barium sulphide, which is believed to be the precursor of the four new slag minerals.

Grey Slag

This, the product of primary smelting, is of considerable mineralogical interest as the matrix for numerous slag minerals, and is called "grey" to differentiate it from black slag (see below). Its colour is often white, black, grey in varying shades, brown, etc., and consists of a heterogeneous mixture of fuel, prills of lead, the products of smelting (lead oxides and sulphate), unaltered galena, lime (often used to stiffen slag showing signs of melting), gangue minerals, impurities and trace elements, e.g. Zn, Cu, Fe, Al, etc. The hot gases form vesicles within the body of the slag, and it is in these cavities that the later slag minerals form. Even adjacent vesicles display very different suites of minerals, particularly well illustrated in material from Wanlockhead, due to the marked heterogeneity of the matrix. Reasonable sized lumps yield the best specimens, and granulated slag (crushed and washed to recover the heavy lead compounds) should be ignored. Often a white cementitious coating binds small pieces of slag together, and this has been found to consist of barium salts (sulphate, carbonate and minor sulphite) (15), or oxidized lead salts (sulphate and carbonate) by other workers (16). The presence of both barite and fluorite in the smelting charge results in a fluid slag, deleterious to the process itself, but which could be the precursor of barium thiosulphate fluoride described below.

Black Slag

Many sources (10,13) indicate that all grey slag was resmelted in the slag hearth using charcoal or coke as fuel to recover the often-high proportion of lead still remaining in it. We must be thankful that this was not always the case since the waste product of the slag hearth, operating at temperatures of 1000 - 1200°C, using coke as fuel and blown by bellows, was the homogeneous vitreous black slag consisting of various oxides and silicates, mineralogically uninteresting, although containing a great many trace elements detected by X-ray fluorescence techniques (17), including Ba, Al and Sr.

The New Minerals

The four new mineral species are described in order of oxidation, and their discovery has recently been published in the international press (15).

Barium sulphite. BaSO_3

Far from common, this species has so far only been found at Surrender Smelting Mill in the Yorkshire Dales, as a pale yellow to greenish-yellow waxy-looking granular substance filling small cavities to about 2mm, or as stalactitic growth associated with other minerals. It is in fact the fourth sulphite to be discovered. The X-ray powder diffraction pattern and IR spectrum match those of synthetic material, and it is slightly strontian by solid solution. It is thought to be triclinic.

Barium thiosulphate. $\text{BaSO}_3 \cdot \text{H}_2\text{O}$

This, the first true "natural" thiosulphate, was initially found in Yorkshire, but is now thought to be fairly widespread in barium occurring areas. It exists as colourless, rectangular crystals and coatings, with prominent cleavages parallel to the crystallographic axes, and showing a very close correlation between X-ray and IR data compared to synthetic material. It is orthorhombic with an S.G. of 3.34, and has a weight loss (water) occurring up to 315°C determined by thermogravimetric analysis (18). It appears to be the most common of the new slag minerals, and has also been found in Derbyshire.

Barium thiosulphate fluoride. $\text{BaS}_2\text{O}_3 \cdot \text{BaF}_2$

Originally discovered at Whashton Smelting Mill, North Yorkshire, usually reported as a copper smelter (11) but now known to have also functioned earlier as a lead smelting site. The colourless, near-rectangular plates lining cavities, and associated with other species, are of widespread occurrence, with a superficial resemblance to baryte. IR spectra show only S_2O_3 without other oxyanions, and microprobe analysis gives Ba 65.9 and S 13.5%, with Al 0.4 and a small variable amount of Sr. The constancy of the Al suggests incorporation into the crystal lattice, somewhat surprising in view of the small ionic radius of the Al^{3+} ion.

This compound has not been reported in the literature before, even as a laboratory product. X-ray diffraction shows a triclinic structure, polysynthetically twinned, cf. the plagioclase feldspars, which makes interpretation of the structure very difficult. The axial angles are $\alpha = 90.03^\circ$, $\beta = 95.82^\circ$, and $\gamma = 89.97^\circ$.

Hydrated barium aluminium polysulphide hydroxide. $\text{BaS}_3 \cdot \text{Ba}(\text{OH})_2 \cdot 2\text{Al}(\text{OH})_3 \cdot 5\text{H}_2\text{O}$

First found at Surrender Smelting Mill, this exciting and colourful new compound has also turned up at other sites chiefly in Derbyshire.

This orange yellow mineral in the form of blades and pseudo-hexagonal plates, often

extremely thin, is transparent to opaque (dehydration?) and associated with other species. Both colour and composition are similar to an accepted mineral bazhenovite, hydrated calcium polysulphide thiosulphate hydroxide, formed in burning coal dumps in the Urals, a process hardly akin to natural weathering(!). Energy dispersive microprobe scans show major Ba, Al and S, with minor Sr and Ca. The calculated formula based on electron microprobe analysis substitutes Sr and Ca for part of the Ba in the trisulphide portion of the molecule, Sr = 5.3 and Ca = 0.6%. Thermogravimetric analysis shows water loss at 130°C, and a stable colour up to 700°C due to trisulphide; at 1,000°C the substance turns white. S.G. = 2.4 (18).

X-ray data, including single crystal diffractometry, reveal the internal structure to be a monoclinic layer lattice, $\beta = 105.98^\circ$, with firmly-held interlayer trisulphide ions, and more loosely-held interlayer water molecules, and with site-selective substitution of Sr and Ca for some of those Ba ions linked to the trisulphide ions. The barium produces zigzag chains, while the Al is octahedrally co-ordinated in this undoubtedly unique structure.

Discussion.

Other known species associated with the above four minerals indicate formation under alkaline and mildly-oxidizing conditions, allowing these new compounds to be stable. Weathering of such slags may indeed provide a model system for the oxidation of galena in ore bodies, because of the ionic radius and charge similarities between Ba and Pb.

Several other slag minerals are awaiting full characterization, and include further thiosulphates, and the barium analogue of gismondine (18). It is my belief that several new species will be discovered over the next few years, the obvious sites to examine being the ore hearth and reverberatory furnace lead smelting mills. The earlier bole hearths may also yield an interesting suite of minerals in their own right.

It is unfortunate that the *Commission on New Minerals and Mineral Names of the International Mineralogical Association* will not at present allow mineralogical names for slag minerals, since they argue these would not have formed without the intervention of man. Although this is strictly true, it nevertheless overlooks the fact that there are several precedents for such naming including fiedlerite, georgeadesite, and as recently as 1984, bazhenovite. With the provision of certain safeguards to avoid abuse and a possible time scale limitation, it would be encouraging to think that the Commission might just be persuaded to change its policy over the naming of slag minerals, and allow "proper" names to be legitimately applied to the four new species described above.

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THE SOUTH KENSINGTON COLUMN

Richard Herrington

OIL AND ORES; COINCIDENCE OR CONSEQUENCE?

Many occurrences of hydrothermal mineralisation which contain minerals of potential economic interest are associated with organic material (Barton 1992). An indication of the broad range of deposit types where this is the case can be gauged by a brief glance through the Natural History Museum's Mineral Collection for organic "species".

Of the truly crystalline material (i.e. that which can be termed a mineral), the most well known are probably the oxalate minerals, particularly the calcium oxalates, Whewellite and Weddellite. The former species is known from a number of localities, including the Reck porphyry-copper deposit in Hungary.

Much more abundant are the poorly structured organic materials which are commonly called "elaterite" and such material is noted in a number of British localities. "Elaterites" commonly comprise large chain hydrocarbons and bitumens which often resemble brown-black sticky fluids or waxy solids. A very rough guide to material from the NHM collection is outlined below, demonstrating the remarkable diversity of settings:

Shropshire: (Vein Pb-Zn-Ba in Palaeozoic)
Maliche, Callow Hill, Minsterley, Penally, Bishops Castle,
Haughmend Hill, Snailbeach, Pitchford (what's in a name?),
Longmynd

N. Wales Orefield: (Vein/replacement Pb-Zn-Cu-Ba in Carboniferous)
Halkyn, Llandudno (Great Orme)

S.W. England: (Vein Sn-Cu-Zn)
South Crofty Mine, Poldice Mine, Gwennap, Herodsfoot

Cheshire: (Cu-V in Permo-Trias)
Alderley Edge

Leics./Notts.: (Pb-Cu in Trias)
Mountsorrel, Mansfield, New Edington, Bulwell, Staunton
Harold, Ashby-de-la-Zouch

S. Wales: (Replacement Fe in Carboniferous)
Merthyr Tydfil

Ireland: (Vein Pb-Zn in Carboniferous)
Longford Down (Carrickboy), Killarney Lake

Pennine Orefield: (Vein Pb-Zn-Ba-F in Carboniferous)
Windy Knoll, Milltown, Ashover (Fall Hill), Matlock

The association of hydrocarbon "elaterite" or plastic bitumen with mineralisation in the Pennines is of particular note, since the common association of hydrocarbons and bitumens with so-called "Mississippi-Valley" Pb-Zn deposits is recorded worldwide. Recent work on the Windy Knoll occurrence by Moser et al. (1992) shows that fluid inclusions in fluorite actually contain hydrocarbons, clear evidence that the hydrocarbons were part of the mineralisation story.

Fall Hill quarry is one of the localities represented in the Museum collection. The two specimens, BM 1978,364 and BM 1980,65 comprise small resinous black globules sitting on fluorite crystals which line cavities in a calcite matrix. Other minerals found in the Fall Hill Vein (Ashover Old Vein) described by Smith (1982) include marcasite, sphalerite, galena, pyrite, goethite, barite, smithsonite, greenockite (and hawleyite), fluorite, calcite and quartz as well as the hydrocarbon phase. Interestingly, Smith records that the hydrocarbons are encapsulated by marcasite in

one case, supporting the close association between the metals and hydrocarbons.

The role of the hydrocarbons in the mineralisation process is still not completely clear, but organic complexes are potential transporters of metal ions up to 200°C; furthermore, they may aid precipitation of metals from solution at temperatures higher than these (Giordano 1993). In the context of the Pennine ores which formed at no more than 150°C, organic complexes (such as acetate, carboxylate) may actually be important transporters of metals.

This link between hydrocarbons and metal ores was one theme of the Geofluids '93 conference held last May in Torquay, a meeting which rather unusually succeeded in attracting academics and industrial geologists from both major disciplines of economic geology. It seems that both ore and oil geologists have a lot of common ground, particularly in understanding how fluids move through the crust to form important concentrations of metals, hydrocarbons, or in special cases, both.

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THE BEIJING GEOLOGICAL MUSEUM

Makolm Southwood

Following my article in Newsletter 34 on the mineral museums in Johannesburg and Pretoria, I would hate to give the impression that my working life consists of swanning around the world from one mineral museum to another. However, a few spare hours on another recent business trip enabled me to visit the Beijing Geological Museum in China. This remarkable establishment featured in a recent - well, fairly recent - edition of the *Mineralogical Record* (Vol. 18, No. 5), although at the time at which Peter Bancroft's paper was prepared, the mineral display had been dismantled for the galleries to be refurbished.

The museum is extremely difficult to find. The article in the *Record* gives no address, and I was lucky to have the assistance of an interpreter/guide who made enquiries on my behalf via the Ministry of Geology. The entrance to the museum is inauspicious to say the least; after battling through a narrow side street full of suicidal cyclists, pedestrians, chickens and even a pig (!), the taxi deposited us at the entrance to an unpromising looking yard.

The only sign of life was an elderly lady sat behind a broken and partly boarded-up window in one corner of the yard. She assured my guide that we really were in the right place and relieved me of the princely sum of one Yuan (about 12 pence) for two tickets to the museum. But where was the museum? With some confusion we were directed along a narrow passageway between some gloomy looking buildings to a second courtyard where, in all its faded glory, we found the same entrance pictured in Peter Bancroft's article.

We were the only visitors in the building that morning and, until we were joined by one of the curators - quite late on in our visit, we saw no members of staff either. The geological museum occupies three floors of a rather drab building. The ground floor is devoted to natural resources, although one or two large and spectacular mineral specimens are placed on pedestals around the gallery as a promise of what's to be found on higher floors.

Emerging from the stairway onto the first floor, we encountered a group of cabinets containing mineral specimens. The best of these is the remarkable stalagitic malachite pictured in the aforementioned *Min. Record* article. It is about 50 x 50 x 30 cm and comprises a large cavity on one side of the specimen lined with stalagmite-like growths of malachite which in some cases grow right across the cavity. The specimen is from Guangdong Province in the South of China.

The rest of the first floor houses the palaeontology collections, and I had a quick wander around it out of curiosity, hoping to see some of the spectacular dinosaur fossils for which China is justly famous. However, the dinosaur collection was rather disappointing, consisting mainly of single bones and small parts of skeletons.

The second floor occupied rather more of my time. In spite of its recent refurbishment the gallery is poorly lit and many of the minerals are not particularly well displayed. The labels (all in Chinese) state the mineral names, but seldom give details of the localities. Where locality details are provided, they tend to be limited to the county and province; no mine names are given at all. After about twenty minutes or so, my interest was noticed by one of the curators - a Mr Yang Gang - who joined us for the rest of the visit. He spoke only a little English, but with my guide as translator we were able to discuss the minerals in some detail. According to Mr Yang, the poor lighting in the gallery is quite deliberate, and is to protect the orpiment specimens which are light sensitive. I rather imagine that this condition also applies to the cinnabars.

So what of the specimens themselves? They really are quite remarkable. In my opinion it is the sulphides which steal the show! At least 15 specimens of cinnabar are on display. Most of these are from the Tongren mine in Guizhou Province, but a mine (for which Mr Yang had no name) in Hunan Province is also represented. All of these specimens really are world class and any one of them is better than anything that I've seen elsewhere. My favourite was a 20 x 15 cm matrix specimen consisting of finely crystallised drusy quartz to 3mm, interrupted by numerous sharp, interpenetrant twins of cinnabar to 2 cm - silvery red in colour and with a bright metallic lustre. The specimen is further enhanced by a number of small (3-5 cm)

groups of cream-coloured dolomite crystals. It is completely undamaged and utterly mind-boggling.

Another eye-catching example consists of a plate of quartz and dolomite crystals, with a single interpenetrant twin of cinnabar about 4cm high aesthetically perched on it. The crystal is perfect, but perhaps the colour and lustre are not quite as striking as in the first specimen. More familiar to Western collectors are the rich red cinnabars nestling in a matrix of cream-coloured dolomite. There are several large specimens of this association on display, and I was able to purchase a few small examples in Mr Yang's office before leaving the museum.

China also produces some fine stibnites and, of course, the museum has plenty of examples. Most are from the well known Xikuangshan mine in Hunan Province, and some are associated with finely crystallised quartz and - remarkably - native sulphur. The specimens in the museum are certainly spectacular, but equally good material from Japan and Romania is available in many Western collections.

Orpiment is another matter altogether. Several specimens from Hunan Province (no precise locality is given) are on display. The best is a 50 x 50cm dome of orange-brown crystals to 5cm, showing complex terminations. The sheer size and beauty of this specimen is quite astonishing. Staying with the arsenic sulphides, but towards the other end of the size range, are the spectacular specimens of realgar - also from Hunan Province. The gemmy red crystals in association with quartz have a lustre which rivals the best Chilean proustites, and the colour contrast with the quartz makes these specimens all the more striking.

Columbite is not a mineral that conjures up spectacular images for most collectors, but two specimens from the Altai Pegmatite, in China's Xinjiang autonomous region (in the extreme north-west of the country) really caught my eye. These specimens consisted of sharp, blue-grey, adamantine crystals to 4cm, on a bed of white mica. Once again the colour contrast, the lustre and the perfection of these crystals is most impressive.

Finally, I will mention the beautiful carbonates which come from Yangchun County in Guangdong Province. I have already described the remarkable specimen of stalactitic malachite which is on display. The same mine (for which I have no name) also produces fine blocky azurites, similar in appearance to some of the best Bisbee material. A different (though also un-named) mine in Yangchun County produces fine rhodochrosites. The best specimen on display is an 8cm rhomb of a fine rose-pink colour.

It is tempting to continue with descriptions of the fine Chinese scheelites, fluorites, cassiterites etc., but the line has to be drawn somewhere. More and more Chinese minerals are now appearing on Western markets but regrettably, information about the localities is much more difficult to obtain. This fact is commonly attributable to the considerable difficulties of translation and transliteration between Chinese and English, and sometimes to the fact that some unscrupulous dealers (both Chinese and Western), are attempting to conceal the sources of the specimens they have for

sale. It seems to me that a third difficulty exists; namely that Chinese mineralogists are less concerned with details of specimen localities than their Western counterparts. It was indeed surprising that a qualified mineralogist and museum curator was unable to provide locality names for what must be some of the worlds finest mineral specimens.

WHEN IS A MINERAL NOT A MINERAL? Trevor Bridges

At the Symposium, the hoary old chestnut "Are slag-minerals true minerals or not?" raised its head again. In his write up on the Symposium in the last Newsletter, Roy developed this theme and asked whether lanthanite-Ce should be a mineral if slag compounds are not. I propose to defend lanthanite-Ce for a start. Almost certainly the mineral existed in small amounts in the Britannia deposit before mining started. If it did not, it certainly would have done in a few millennia when erosion exposed the part of the deposit where the primary minerals were deposited. All man has done is to have created a place particularly suitable for the mineral to form from natural processes. It is rather like hydrozincite. If you dig up the surface exposure of a vein containing sphalerite, you will usually find thin, nearly invisible coatings of hydrozincite on joints and rarely anything more than that. However, underground in old mine workings you often get favourable conditions and thick deposits build up on the floor and walls. It is the same with dump alteration minerals - all you do is accelerate and concentrate natural processes. You do not change the fundamental chemistry.

In the case of slag-minerals, the slag is made by man and has a chemical composition totally unlike anything that occurs in nature. Even if a volcano erupted in the middle of a lead-zinc ore field it would not duplicate a slag. I therefore find myself in agreement with the IMA Commission [sic] and I do not think that slag minerals should be true minerals. You might as well start digging up Victorian and Edwardian rubbish dumps and calling all the weird and wonderful chemical compounds (both organic and inorganic) which you would find minerals.

So far I am happy, although I know that many of you will not be! Where I have difficulty is with minerals typified by sweetite (zinc hydroxide). Steve Rust found this in an entirely natural situation. However, the formation of sweetite requires very alkaline conditions - far more alkaline than is likely to arise in a limestone quarry. When I first heard about it, I surmised that either someone had lit a fire against the place in which it was found, or there had been lime kilning in the area. I have since been told that the latter is correct and I think that very alkaline slaked lime solutions have trickled into the vein and reacted with pre-existing supergene zinc minerals to form the sweetite. You could argue, therefore, that sweetite should not be a true mineral. On balance, though, I think it should get the benefit of the doubt. Nature does have a habit of achieving the impossible. I console myself with the thought that if a volcano erupted under Nenthead, apart from doing wonders for the place, it would almost certainly create the right conditions for sweetite to form entirely naturally somewhere in the area.

SOUTH EAST GROUP MEETING

Austin Lockwood

In spite of the bad weather, no less than 25 members attended the forty-second South East Group meeting, held on November 21, 1993. Austin Lockwood reported on the field trip to North Wales which was held over the August bank holiday weekend and which was attended by eleven members. The sites visited at Minera, near Wrexham, appear to be worthy of further exploration and it is hoped to run further trips in 1994 if there is sufficient interest from members.

Steve Rust reported on the formation of the study collections. He is still looking for more donated specimens in order to make up these sets, and would be grateful if members could bring any suitable material to the next meeting.

South East Group members distinguished themselves in this year's Micromount Competition, the results of which were announced at the Leicester Symposium. Harry Day took first prize for his linarite from the Meadowfoot Smelter, while the fourth and fifth prizes went to Martin Pruden and Bridget Belson respectively.

Peter Wallace reported on the specimens of interest which had been brought to the meeting. These included:

- From Stowes Shaft, Wheal Phoenix, Cornwall:
 - torbernite (?) with libethenite growing on it (Pam Fitzgerald)
 - langite, chalcotrichite, pseudomalachite etc (Fred Cornwall)
 - olivenite (Richard Belson)
- From Hendre Quarry in North Wales: anatase - but big enough to see without a microscope (Austin Lockwood)
- From Hamstead Farm Quarry, at Chipping Sodbury:
 - yellow fluorite on quartz and barite (Steve Burchmore)
 - octahedral pyrite, quartz and barite (Steve Rust)
- From the 30 fathom dump at Driggith: plancheite - extremely rare in the Caldbeck Fells (Eddie Foy)
- From Padstow Consuls: cumengeite and phosgenite, and an unidentified mineral - possibly "barstowite"? (the Wallace family)

Provisional dates for meetings in 1994 are Sunday February 20; Sunday May 8; Sunday August 14 and Sunday November 20. (The latter may be altered as it is the day immediately after the Sussex Show.

NORTHERN GROUP MEETING

Mick Wolfe

An exceptionally large turnout - for Bircotes - of 18 members met on October 30 to talk minerals for the last time in 1993. Apart from the usual old faithfuls, it was a pleasant surprise to see the two Beryls (Harrison and Taylor), Bob Weatherall, Richard Belson and Kevin Johns who had all made the long trip. Also, most welcome visitors were Bill and Muriel Swindle. Bill is now making excellent progress after his recent serious illness and had driven up from Leicester to be with us.

We were treated to a series of slides brought along by Mike Rothwell, David Green and Peter Braithwaite which were mainly of minerals, but with the odd underground shot as well. John Dickinson had some excellent ramsbeckite which he found quite by chance just outside the village of Ystumtuen in Wales, which is over half a mile from the nearest mine dump! The two Beryls had just returned from a trip to Laurion in Greece. To bring home their spoils they had to leave behind such essentials as shoes and clothes etc (apart from what they were wearing, that is!) in order to make room in their luggage.

The usual excellent repast was laid on by Jean Spence. The next meeting will be on March 26, 1994 and all are welcome.

IN BRIEF...

The editor of *Il Cercatore* ("The Searcher"), an Italian magazine for mineral collectors, is looking for contributors across Europe. He would like one or two articles a year about new finds in the UK, with colour photos. If anyone is able to help in this enterprise, please write to:

Signore Simone Berni, 17 Loc. More di Cuna, 53014 Monteroni D'Arbia-Siena, Italy.

A recent article in *Metal Bulletin* (January 27, 1994), suggests that the end of the road for Cornish tin mining may be approaching. South Crofty mine is threatened with closure because of low tin prices, coupled with the reluctance of the Department of Trade and Industry to provide further financial aid. However, according to Carnon Consolidated, which operates the mine, the immediate threat has been staved off by a recent rally in the tin price. South Crofty mine produces around 2,300 tonnes of tin annually and employs some 250 people.

At the old Glencrieff mine at Wanlockhead, a small group of enthusiasts is tunnelling into the old workings in order to recover an old pumping engine, which was abandoned when the mine closed in the 1920s. The engine is believed to date from the 1830s and is thought to be the only one of its kind. Since its re-discovery, the old workings have flooded due to a rockfall, and this has necessitated the re-excavation of an old drainage level to reach the engine once more. (*The Independent*, December 28, 1993)

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New members are urged to inform the editor should any of their particulars (as noted below) be incorrect:

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(Please note that the deadline for articles for Newsletter 38 will be June 1st, 1994. Please let me have contributions as soon as possible in order to spread the typing load. Many thanks.)