BRITISH MICROMOUNT SOCIETY

NEWSLETTER NO. 35 JUNE 1993

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EDITORIAL

Time seems to fly very quickly these days, and it's therefore no surprise that it is once again time to register for the annual BMS Symposium which is to be held again in Leicester on September 18 and 19. This year's event is being organised by Messrs Belson, Johns and Stolworthy of Norwich, and promises to be another most enjoyable and educational weekend. You should by now have received details of the Symposium and an application form; if by any chance you have not done so please contact Pearl Freeman who has some spare copies. This is the last Newsletter before the Symposium and therefore no further notices will be sent.

Two apologies are due! Firstly to Isabel Geldart: I inadvertently shifted Talisker Bay from the Isle of Skye to the east coast of Northern Ireland in her article on zeolites in Newsletter 34. Secondly, Richard Tayler's name was mis-spelled and an incorrect area code for his new telephone number was given; the correct version is as shown on page 20 of this Newsletter.

AN INTRODUCTION TO ROCK THIN SECTIONS

Doug Morgan

Micromounts are collected for a variety of reasons; not the least of these is that they are beautiful. To obtain these crystal beauties, we usually have to break up a lot of rock, and the surplus probably ends up filling the garage or under the bed. Many specialists have succeeded in using this waste material for a mosaic pathway, or as ballast for a model railway, or even as a sewage filtration bed. I want to suggest that this material can form the basis of a new and fascinating hobby and that far from being rubbish, we can in many cases produce very beautiful microscope slides by making thin sections of these rocks and viewing them in transmitted polarised light.

The study of the structure of rocks by examination of thin sections is called petrography. There is plenty of information on this science in the literature; in particular, the mineral components of a rock can be identified by a study of the optical behaviour of the light passing through the thin section, and normally this is the purpose of preparing the section. Identification of these components could be a useful pointer to what microminerals might be found associated with the rock. However, the subject is complex and the preparation of the sections can be tedious and difficult, since the requirement is a thin section ground down from the rock sample to a close thickness tolerance of between 26 and 30 microns (i.e. 0.026 - 0.030 mm). At this thickness the mineral sections produce interference colours which enable the birefringence and other optical properties to be determined, leading to an identification of the mineral in the majority of cases. The final grinding of the section is necessarily done by hand even though earlier stages may have been carried out using a machine. Many a section has been lost in these final stages leading to frustration and disillusionment of the would-be petrographer. When viewed in this light there seems to be little to encourage the amateur mineralogist to make rock thin sections.

This article intends to take a somewhat heretical approach; the author suggests that quite interesting and beautiful microscopic objects and pictures can be produced with very little practice and with minimum outlay by deliberately abandoning the attempt at perfection, and simply by grinding the section until it reveals its inherent beauty in transmitted polarised light without attempting the tricky task of grinding to a standard thickness. On the other hand, should the operator wish to continue working on the section until the standard thickness is achieved and then carry out optical measurements, let him by all means do so; there is nothing to hinder him. There is no doubt that once this method is mastered a whole new fascinating world of colour and patterns is revealed to delight the artist, photographer and scientist alike.

Choosing Material

Although limestones such as Cotswold oolites and fossiliferous Derbyshire limestones can be ground down easily to give very interesting sections, they do not develop brilliant colours in polarised light. The beginner may be tempted to start with these soft rocks, however, and should not be disappointed with results, - he may even decide that fossil limestones are his delight after all! The most attractive sections and the brightest colours are produced by igneous and metamorphic rocks containing such minerals as olivine, augite, hornblende, and twinned minerals such as plagioclase. Almost any basalt or other volcanic rock will give superb patterns and colours. As experience is gathered it is worthwhile examining furnace

slags and certain artificial materials, but these will not normally be rejects from micromounting. The list of rocks yielding interesting and beautiful sections is endless; even sandstones and slates can provide attractive sections.

Optical Equipment

Micromounters will normally be using a stereo microscope with oblique or incident illumination. For examination of thin sections we need an instrument that enables transmitted, polarised light to be used. The stereo or binocular system is no disadvantage except perhaps, where photographs are required (and very few viewers will be able to resist taking colour pictures of the images seen!). However, a little D.I.Y. with some tubing and micromounters' ingenuity will usually get around any problem. If it is intended to take photographs there is nothing at the price to beat a camera with off-the-film automatic exposure such as the Olympus OM2. This will save much time and money that must otherwise be spent on exposure trials.

The production of plane polarised light by a Nicol prism is now superceded by the use of a filter of Polaroid. This can be obtained as small pieces, one of which is cut to size and inserted in the eyepiece to form the analyser. Another must be inserted below the microscope stage, usually in a holder below the condenser, to form the polariser. Acceptable results can be obtained using polaroid sunglass lenses, although this material generally does not give good colours and does not extinguish completely when "crossed" (i.e. when the polariser and analyser are so arranged that their planes of polarisation are at 90° to each other, which is the normal condition for obtaining the interference colours.

Interference colours can sometimes be further enhanced by introducing another filter made from a sheet of transparent acrylic plastic; this cheap accessory takes the place of the ¼-wave plate or gypsum plate normally supplied with polarising microscopes for petrographic use. The optical theory involved here need not worry us, but again this could form the germ of another fascinating hobby - optics.

It is an advantage to be able to rotate the stage, and several microscope suppliers provide facilities or accessories which enable this to be done. As a D.I.Y. project it is not difficult to mount a metal disc, circumferentially held in position by three pegs on the stage so that it is free to rotate. So much for the viewing equipment; we now come to the making of the rock sections.

PREPARATION OF SECTIONS

The items of equipment needed are as follows:

Diamond Saw

Several saws are available commercially for lapidary work. These usually consist of a steel disc, the rim of which is coated with diamond particles either embedded in notches or as a composite metal/powder brazed to the rim. The disc is driven by an electric motor and is partly immersed in a fluid to keep it cool and free of debris.

A 6" diameter disc is not expensive and will last for hundreds of slides if used carefully. There is much to be said for a hand driven saw that can be revolved at various speeds as required. Such a device was recently examined by the author; this was used by Mr A.

Herriot to produce over 5,000 slides in a study of the geology of Arran. It was made from a hand bench grinder, the grinding wheel being removed and replaced by a 6" diameter saw. The gearing enabled quite high speeds to be obtained when required so that a 1" section of quartz could be cut in about five minutes.

Whatever means is used to drive the saw, the most important component is the clamping device used for holding the rock specimen. This should be very strongly made and arranged to hinge and slide on a bar perpendicular to the saw blade. The jaws are best made from a hard wood previously soaked in hot paraffin wax to waterproof it, or from Tufnol. An arrangement for dropping water onto the blade is needed, and splashing can be minimised by draping a plastic bag over the machine.

Hot Plate

The hot plate is needed to melt the cement used in fixing the rock to a glass plate for subsequent grinding. A temperature of 110 - 140°C is required. The hot-plate can be made from a piece of metal plate placed over a gas ring, but a much better arrangement consists of an inverted electric iron held in a wooden frame. This has the advantage of having thermostatic control.

Glass Plates

In the method described here the rock specimen is cemented to a small plate glass holder about 5cm square and 6mm thick. The sharp edges should be ground away to make the holder comfortable and safe for handling. Two sides should be parallel because the plate is held and aligned in its holder by its edges. These plates can be reused. The plates used for the actual grinding are made from any flat glass, and a separate one should be reserved for each grit size. An ideal size is 6-8" square. Finally, a supply of standard microscope slides - 3" by 1" - is required.

Cement

The traditional material for cementing rock specimens on to glass slides is Canada balsam. This is a natural resin, purified and dissolved in xylene, and with a refractive index close to that of glass. However, this property is not important unless it is intended to make optical measurements on the rock section. Balsam also has an advantage over other adhesives such as epoxy cements in that it will soften and melt on reheating. This is important because our method involves sliding the ground section from the glass holding plate to a microscope slide having a balsam layer on it.

The balsam as supplied needs to be baked gently until it strings on pulling from the glass. It is essential that it is hard when cold so that it too may be ground down with the rock section without picking up carborundum particles. An alternative adhesive which is more convenient to use is Lakeside 70 cement. This is a pale yellow, clear synthetic resin sold as sticks which melt at about 110°C. It melts on reheating, and the only problem with it is its tendency to produce bubbles if not heated carefully.

Nail Varnish

This is used as a dilute solution of ordinary clear nail varnish. About 50% acetone or amyl acetate is added to the varnish as purchased. It is used to strengthen the section before transfer to the microscope slide.

Carborundum Grinding Grit

A supply of carborundum grits is needed. The most useful grades are sizes 120 (100 micron), 220 (60 micron) and 3F (12 micron). Some variation in grit sizes is allowable if these particular sizes are not available, but the finest grade should be near to 12 microns.

METHOD

1. Select a piece of rock and either grind or cut a flat face, and trim to a convenient size.

2. Grind the face on a glass plate using ¼ - ½ teaspoonful of grit and a little water, using a 120 grit until a flat surface is obtained. Wash thoroughly and repeat using 220 and 3F grits, taking care to remove the scratches from each previous grade before proceeding to the next. These scratches are best seen under a low power magnifying glass. Use a different plate of glass for each grit.

3. Wash the specimen and place on a hot plate at about 120°C.

4. Grind the face of a 5 x 5cm holding block on 600 mesh grit to produce a matt surface. Place this on the hot-plate alongside the rock specimen.

5. When both the holding block and the specimen have reached temperature apply cement to both surfaces using a minimum of cement necessary to cover the surface of the rock. Allow bubbles to subside.

6. Taking the glass holding block in tweezers invert it on to the rock specimen block and press very gently to exude excess cement. If free from bubbles, invert the assembly, remove from the hot-plate and allow to cool slowly so that stresses produced are minimised. If bubbles are present, repeat the operation.

7. When cold, fasten the holding block and its attached rock specimen in the saw clamp and adjust it so that it is parallel to the saw blade. It is a good idea to practice this operation with a blank holding block until the correct position in the jaws is located so that the surface of the glass plate just grazes the saw blade as it is passed across the cutting edge. This position is then marked on the inside of the jaws, or a thin strip of wood or metal acting as a guide is fastened to the inner part of the of the jaws adjacent to the inside face of the holding block enabling subsequent blocks to be readily located in the correct position.

8. Adjust the clamp so that the saw cut will leave about 6 - 8mm of rock section attached to the holding block, and proceed to saw off the excess rock using plenty of water. If all has been carefully adjusted, this operation should leave a parallel faced slice of rock attached to the holding block.

9. Remove the holding block from the jaws of the clamp and proceed to grind down the rock section using grades of grit as before, taking care to keep the section of uniform thickness. Some practice will be needed to decide when to change to a finer grit. The first grit (120) should bring the section down to about 0.2mm. Follow this with 220 grade to a thickness of about 0.1mm.

10. Change to 3F grit and grind down carefully and evenly. At this stage on viewing in polarised light, quartz and feldspars will show some bright interference colours.

11. It is now up to the operator to decide whether to attempt to grind down to 0.03mm (30 microns - the standard thickness) or to be satisfied with the beautiful coloured slide he has already produced. As stated at the beginning of these notes, the slide does not necessarily have to be used for optical identification of the minerals present, and many beginners will be quite happy to complete the operation at this stage as follows:

12. Wash the section thoroughly on its holder with water using a soft brush to remove any debris.

13. Have a clean microscope slide ready. Place this on top of a spare glass holding block of the same thickness as that previously used (i.e. cut from the same glass sheet) and put this on the hot-plate.

14. Dry the section, and when dry lightly coat it with a film of the 50% nail varnish solution. Allow this to dry thoroughly.

15. Place two microscope slides side by side on the hot-plate, and place the holding block with its section on top of these slides, the object being to have the top of the block level with the top of the microscope slide already being heated on the hot-plate.

16. Apply cement to the microscope slide so that a bridge of liquid cement is formed between the adjacent block and slide.

17. Put a drop of balsam on to the section, apply a cover glass and gently push the section off its holding block on to the clean microscope slide using a suitable spatula. There should be no problem in carrying out this operation since the varnish will strengthen the section and prevent its breakage during transfer.

18. Allow to cool. When the cement has hardened, excess is removed with a knife and the slide is cleaned with xylol and with soap and water.

19. Apply a label with details of the section, and admire your handiwork.

Further Reading

Most books on petrology give details for the preparation of thin sections, using methods similar to those described in these notes. For further information on identification of the minerals the following books are useful:

1. "*Atlas of Igneous Rocks and their Textures*" by W.S.Mackenzie, C.H.Donaldson and C.Guilford. Longman. Harlow, Essex, England.
2. "*Petrology of the Igneous Rocks*" by F.H.Hatch, A.K.Wells and M.K.Wells. Thos. Murby & Co. London.
3. "*Harker's Petrology for Students*" Cambridge University Press.

ALPINE MINERALS FROM THE BRYN-YR-AFRMINE, MID WALES

Steve Rust

The Bryn-yr-Afr Mine (SN 745 878) is located on the east bank of the Nant-y-Moch reservoir in mid-Wales. The deposit has yielded an unusual set of minerals which is more akin to the alpine cleft assemblages than to the mudstones of mid-Wales. The suite includes colourless "albite" crystals to 1mm, aggregated rosettes of a white mica covering areas up to more than 1cm across, chlorite group minerals and very thin hair-like crytals of rutile. The latest mineral in this paragenesis is colourless to yellowish apatite which occurs rarely as rounded, tabular crystals to 0.75mm diameter. None of these minerals are abundant; they occur along parted bedding planes in the mudstones and less commonly, in sandstone clasts which are included in vein breccias. The cavities in the mudstones seldom exceed 1cm in lateral extent (i.e. along the partings) and are typically 2mm wide. This assemblage does not appear to have developed in the more indurated mudstone horizons which lack parted bedding planes.

Nodules of apatite are concentrated at the base of some of the mudstone units and the feldspathic mudstones themselves would provide a ready source of the elements necessary to form the other minerals in the suite. It is suggested that the "alpine" minerals were sweated out of the country rock prior to the deposition of sulphide and carbonate minerals as it is evident that the latter have formed on the earlier "alpine" suite.

On a few specimens tiny apatite crystals were found with white prismatic pyromorphite crystals growing on the basal pinacoid {0001}. (Pyromorphite has been confirmed by microprobe analysis from this locality, although there is a remote chance that the crystals growing on the apatite pinacoids are of a second generation of apatite.) These growths are possibly epitaxial as the c-axes of the pyromorphite crystals appear to be parallel to the c axis of the apatite. The literature indicates that epitaxial overgrowths would not be unexpected. Both apatite and pyromorphite belong to the "apatite group" of some 18 species with the general formula $A_5(XO_4)_3(F,Cl,OH)$, where A can be Ba,Ca,Ce,F,Na,Pb,Sr or Y, and X can be As, P, Si or V. From the table below it can be seen that pyromorphite and apatite are both chlorophosphates with A = Pb and A = Ca respectively. Furthermore the minerals have very similar structures as indicated by their common space group and the number of formula units per unit cell (Z).

	Pyromorphite	Apatite
Composition:	$Pb_5(PO_4)_3Cl$	$Ca_5(PO_4)_3Cl$
Crystal system:	Hexagonal	Hexagonal
Space group:	$P6_3/m$	$P6_3/m$
Z:	2	2

Bryn-yr-Afr mine has also yielded poor specimens of colourless to creamy-brown pyromorphite to 0.75mm and poor specimens of hemimorphite, linarite, malachite, cerussite and caledonite have also been found. The most interesting minerals in the sulphide assemblage is millerite, which sometimes accounts for up to 20% by volume of hand-picked ore specimens. It forms wiry masses of crystals exceptionally to 2.5cm in length. Large masses of crystalline marcasite are also found.

ROSASITE FROM HENDY QUARRY, MISKIN, SOUTH WALES

Stephen Plant

Rosasite, a basic carbonate of zinc and copper, is a comparatively rare mineral in Britain. It has been reported from a few localities including Rutland Cavern at Matlock Bath, in Derbyshire[1]; Closehouse Mine, Lundale[2]; and the Grisedale group of mines in Cumbria[3]. In Wales, rosasite was first reported from Bute Quarry, Mid Glamorgan[4], as recently as 1988.

Hendy Quarry (ST 054 810) is located only a few hundred metres south-east of the now disused Bute Quarry and, not surprisingly therefore, rosasite has also turned up at Hendy. The quarry is currently working limestones of the Black Rock group (lower Carboniferous). Mineralisation in the quarry takes the form of narrow vein systems which invade faults and major joint planes. The veins consist mainly of calcite but primary sulphides of lead, zinc and copper occur sparingly. Several supergene minerals have been found. These include azurite, aurichalcite, anglesite, hemimorphite and malachite. Associated with the malachite and aurichalcite can be found bluish-green radiating spherules. One such specimen consisted of approximately 30 intergrown spherules with a combined extent of approximately 8mm on calcite.

Infra-red analysis of one of these spherules showed a spectrum quite distinct from malachite or aurichalcite. The spectrum was compared with one of authenticated rosasite from Closehouse Mine, Lundale, and found to be identical. Nevertheless, absolute confirmation by XRD is necessary.

References

1. Braithwaite, R.S.W. and Ryback, G. 1963 *Min. Mag.* 33, pp441-449
2. Young, B. et al. 1985 *Trans. Nat. Hist. Soc. Northumbria,* 54, p31
3. Kingsbury, A.W.G. and Hartley, J. 1957, *Min.Mag.* 31, p501
4. Fletcher, C.J.N. and Young, B.R. 1988 *J. Russell Soc.* 2(1) pp19-23

IDENTIFYING ZEOLITES

Mike Rothwell

Reading Isabel Geldart's article on Dean Quarry Zeolites in Newsletter 34 has prompted me to cause a few more ripples on this particular pond. A few months ago someone asked me to use the EDAX technique to try to confirm a suspected stellerite from a road cutting at Edinbain on Skye. In theory this technique should be able to distinguish between stellerite and stilbite because of the absence of sodium in the former. Indeed the EDAX analysis confirmed stellerite with a strong calcium peak and no sodium. Fine so far, but then out of interest I also analysed a specimen labelled stilbite from Auchen Bothie; this one likewise showed no sodium at all and hence corresponded to stellerite as well. I then took a piece of "stilbite" from Poona and - surprise, surprise - again no sodium but lots of calcium.

I checked the machine by analysing AnalaR BDH sodium chloride (salt); lots of sodium

and no calcium. Then I took another stilbite from Talisker Bay on Skye. This one behaved itself and showed both sodium and calcium. Finally I analysed a "stilbite" from Lon Drusieach on Skye and this one showed calcium and potassium but no sodium. At this stage I gave up.

One possible explanation for not finding sodium in the "stilbite" is that the EDAX technique, which provides essentially a surface analysis, does not always reliably pick up cations in zeolites where the spatial arrangement of the cations may not be homogeneous. However, this explanation is questionable given the sensitivity of the technique. Furthermore, a crude flame test of the specimens gave calcium but no sodium except for the Talisker Bay specimen.

I am told that stellerite has a different lustre from stilbite, but unfortunately I cannot confirm this from my specimens; they all look the same to me and the Talisker Bay specimen is quite small. Clearly this is a bit like identifying individual minerals in the leadhillite or langite groups - perhaps the best thing to do is to label them as "stilbite group"?

My thanks to Kemp Meikle and Alan Dyer for supplying specimens.

NORFOLK VETERANS' FIELD TRIP TO CORNWALL, MARCH 1993

Article by Martin Stolworthy, Title by Sheila Harper

Our party consisted of Bob Snowball, Alan Hanton, Richard Bell, Richard Belson, Mike Jackson, Kevin Johns and Martin and Phyllis Stolworthy. As usual we stayed at Sheila Harper's renowned Chichester Guest House in Newquay. We all met up in Cornwall on Saturday March 13. Bob, Richard Bell and Mike had spent the previous week at the Chichester on the Interest Holidays Prospecting Week. Kevin and Richard Belsen left Norwich on the Thursday and took in a couple of localities on their way to Newton Abbot where they over-nighted on the Thursday and Friday at Kevin's parents' place. Alan, Phyllis and Martin travelled down separately via Clevedon Beach and met up with Kevin and Richard in Newton Abbot on the Friday evening before moving on to Newquay on Saturday.

On the way to Newton Abbot, Richard and Kevin intended to visit the Bridford Barite Mine, but although the barite vein was clearly visible from a distance, they were unable to find a means of access either to the large area of dried up settling ponds or to the quarry on the side of the valley. They moved on to the Birch Ellers Mine at Bridford, where a large chimney stack and engine house are located in the grounds of a private property. The owner, one Mr Steer, was very willing to talk about the mine and has in his possession some old documents relating to it. Access to the mine is no problem as there are two adits on the site. Definitely a locality to return to in the future! Kevin and Richard's next stop was Wheal Exmouth where they re-examined the dumps by the banks of the River Teign, finding traces of linarite, sphalerite and barite. Their final stop for the day was the Frank Mills Mine, where they found only siderite and some water-clear double terminated quartz crystals. After the Frank Mills Mine they decided to call it a day and retired to Kevin's parents' house to sample his mum's cooking and the local cider bar.

The next day they left for the Gunnislake area to meet up with Steve, a local collector who had agreed to guide them at three underground sites. The first of these was the Florence Mine incline. Approximately 75 metres down the incline the lead lode is visible and there is a stope with some oxidised vein material which, in the past has produced pyromorphite, wulfenite, cerussite and galena. The second site was Redmoor Mine which proved to be very wet and yielded nothing in the way of specimens. The third site was New East Wheal Russell (South Creabor Mine) - again with a flooded entrance. There is a deep flooded shaft in this mine where it is said that Richard Barstow lost a bag of minerals when he slipped and fell in! Here they collected native copper, brochantite, malachite, cuprite and other copper secondaries. Then it was time to head back to Newton Abbot via Merryvale Quarry to meet Martin, Phyllis and Alan and to patronise, once again, the local cider bar.

Martin , Phyllis and Alan travelled to Newton Abbot via Clevedon Beach, where they spent some time grovelling in the mud collecting anything that felt vaguely heavy (barite) before retiring to a local cafe for a cream tea. Then it was on down to Newton Abbot to meet up with Kevin and Richard at Kevin's parents' house.

Saturday morning saw us leave Newton Abbot at 10.00am to head for Herodsfoot Mine near Liskeard. After obtaining permission we set about removing a section from the top of the dump. By this time Kevin had assumed the role of film director with our every move being followed by the video camera strapped to his wrist. Not too much material was found at Herodsfoot, but one piece of galena obtained by Dick was later found to contain many fine crystals of pyrargyrite. We left Herodsfoot at about 2.30pm and continued to Newquay where, after dinner, we set about arranging our places in the shed. Sheila had planned the programme for the week which proceeded as follows:

Sunday, March 14. In the morning we drove down to West Cornwall to the cliffs of St Just. The more agile members of the party descended the path to the Crowns engine houses to search for the area where veins containing axinite and garnet are exposed in the cliff. Martin and Richard Bell went down further - close to the sea - where Richard found veins of pyrite with a green coloration on the surface which later proved to be tiny crystals of botallackite and paratacamite. A small pocket containing specular hematite was also found in the same area. Kevin and the others located the axinite veins and the bags were soon full, making the climb back to the cliff top something of a struggle. After lunch some of us explored a few of the adits and holes in the cliffs, while the rest made their way to the dumps at the end of the Crowns sett to collect golden goethite and specular hematite. The return to Newquay was made in virtual silence as the day's efforts took their toll.

Monday, March 15. The area around Redruth has many sites of interest and Wheal Uny to the south provided a location where on previous visits Dick had found an interesting variety of siderite. Between the gorse bushes, parts of the dumps have been exposed from time to time and in some of these exposures we managed to find the siderite. It occurs as acicular crystals of various colours. In some cases siderite has been replaced by specular hematite. Elsewhere on the site we found amethyst quartz. After lunch we went on to Wheal Bassett where the dumps have been levelled. Alan managed to find cyanotrichite, cuprite and tourmaline, while Steve and Sheila managed some good torbernite. After a sunny day the mist closed in at 4.00pm, so we headed for home.

Tuesday, March 16. Sheila had been kind enough to allow us half a day's rest, and some of us used it as an opportunity to visit the book shops of Truro. In the afternoon we met up with the rest of the party at Penberthy Croft, where we visited several areas around the site. The usual minerals were found - mixite, mimetite, pharmacosiderite and scorodite - and Dick found some anglesite on massive galena. After dinner we made our annual visit to Maurice Grigg's home and were shown some of his latest finds from Greystones Quarry.

Wednesday, March 17. Kevin's friend Steve joined us at Wheal Edward for an underground visit. We met up with him on the coastal path at Botallack and, after picking our way through a colony of New Age Travellers, and a scramble down the bramble-covered path, we reached the partly blocked adit. We all made it through the tight squeeze of the entrance, and Steve gave us a quick lesson in the art of abseiling. We were soon at the bottom of the 20 foot shaft and onto the next level. There we collected torbernite from the vein in the roof, and Kevin and Dick climbed to an upper level and collected connellite from a location above a makeshift wooden platform. At 3.00pm Steve gave us the word to leave and another lesson in how to climb a rope. We all finally got to the top of the shaft and and began the long haul to the cliff top, where Steve's wife was waiting with hot drinks and food.

Thursday, March 18. For the first time in the week we had the threat of rain and, as we were going to the Caradon area this was no surprise. In the morning we visited the dumps of East Caradon Mine where, after much digging, Alan found a nice group of cuprite crystals. Dick found a rock which, later that evening, yielded some olivenite. After lunch we drove around the hill to the Cheesewring and as we approached Stowes Shaft it began to rain. After breaking a lot of rock a few small samples of chalcosiderite were found, and Kevin managed to miss the video shot of Martin falling backwards off the dump when his pick slipped while trying to prize a rather large rock from the rubble.

Friday, 19 March. Prince of Wales Mine was the first location of the day. As we walked onto the site the sun was shining and all we could see was the twinkle of childrenite crystals. A few of the group went off to search for scorodite under the trees and close to the road. After lunch we visited the Greenhill arsenic smelter near Gunnislake. Walking onto the site we could smell the arsenic, and next to the main buildings we dug for realgar and orpiment which have formed on the smelter bricks. The smell, and the obvious danger posed by the arsenic encouraged us to move on before too long. The final locality for the day was the Holmbush Mine, where we found the usual siderite and "francolite". As this was to be our last evening at the Chichester, we made our return to start packing the cars for the journey home.

Saturday, 20 March. We all left Newquay after breakfast to meet Maurice Grigg at Greystones Quarry. Dick and Kevin retraced their route of the previous day as Dick had discovered that he had left his camera at one of the localities. The rest of us arrived at Greystones in good time to meet Maurice. As we put on our field gear, Dick and Kevin arrived waving the missing camera; he always is lucky! Maurice led us to where, the previous week, he had found leadhillite and schmeiderite, but by this time the dump had been moved and all of the material had gone. We then went to the quarry bottom where recent working had uncovered pockets of superb quartz crystal groups. Soon we were all working hard collecting quartz until it was time to leave. At 4.00pm we bade goodbye to

Sheila, Steve, Maurice and Vic and started the long journey home.

For Alan, this was his first long collecting trip, and at the end of it he swore that he felt more tired than before he left home. Nevertheless, he enjoyed it very much - but I'll never forget his face as he struggled to the top of the rope on the way out of Wheal Edward!

TWO OCCURRENCES OF TURQUOISE FROM CORNWALL

Peter Wallace

Two occurrences of turquoise are described. The first is from Wheal Cock, Botallack, and the second is from Castle-An-Dinas, St Columb, where the turquoises is associated with wavellite.

The Wheal Cock specimen (collected in May 1991) was identified by the Natural History Museum, South Kensington using XRD (film number 8650F). The crystals vary in colour from a pale turquoise blue to light green, and appear to be in some instances an "offset diamond" shape with bevelled faces. Other crystals on the specimen are rather like double ended arrow heads, with what appears to be a re-entrant angle in the middle. The crystals have a vitreous lustre and a foliated appearance and are on a matrix of limonitic quartz. Although the specimen was collected at Wheal Cock there remains some doubt as to whether it originated there or whether it was an "erratic"!

The specimen from Castle-An-Dinas was identified by Monica Price at Oxford University using XRD and the SEM. The "turquoise" is actually a mixture of turquoise and variscite, with the latter accounting for about 30% by volume. The material is blue-green to light green in colour and takes the form of globular aggregates and spherules coating a quartz and tourmaline matrix. Associated with the turquoise/variscite are numerous light beige to colourless acicular crystals which have been identified as wavellite using the above methods. The wavellite crystals are randomly orientated (in contrast with the usual radiating habit) over and amongst the turquoise/variscite. This specimen was collected from the small dump near the old mine buildings in October 1992. At first appearance the turquoise/variscite is not unlike the scorodite from this locality.

ETTRINGITE FROM TRESAVEAN MINE, CORNWALL - AN UPDATE

Peter Wallace

The occurrence of ettringite on a "concrete" matrix from Tresavean Mine was described in Newsletter 34. The Natural History Museum, South Kensington have now examined the matrix and have stated that it is an unknown material containing quartz. Discussions with Dr Andrew Clark have confirmed that the matrix is indeed a concrete; i.e. an aggregate made up of mine waste including fragments of quartz, fluorite and chalcopyrite. Specimens of the material have been lodged at the NHM and further work may be done on this material, although further results could take a considerable time.

A MOUNTING PROBLEM

Peter Braithwaite

Following the presentation of the Micromount Trophy at the 1992 Symposium, a great deal of discussion took place on micromounting in general and on the competition in particular. I pontificated in my usual fashion that there are only two ways to do anything - the wrong way and my way - however, I have now had time to reflect.

I still hold my view that micromounting means a specimen permanently mounted, boxed and labelled. With some three thousand mounts I am unlikely to change that view. Our society has always been democratic in spirit as well as in constitution and with the number of members who are unable or unwilling to mount other than on "blue-tack" their views must be considered. We certainly do not want to deteriorate into two sub-societies - the mounters and the tackers.

Someone at the meeting asked if it were not allowable to mount a specimen just for the Competition. My reply was that this was not in the spirit of the Competition. I think that reply was too dogmatic. If one mounted specimen from a total collection of one specimen is valid, then one mounted specimen from a collection of many unmounted must also be valid. Anyway, having mounted one - and perhaps having won the trophy - you may catch the bug and continue.

There still remains a large number of people who wish to stick with blue-tack (joke! - please laugh) and I do not see any reason why a separate competition could not be started. As you may know I presented the trophy originally to the Russell Society "to encourage micromounting' and they kindly donated it to the BMS. I would be disappointed if the Committee decided to change the conditions of its award. A new prize and/or trophy would be needed I think.

It is difficult to draw the line; what about the 3 x 2 inch specimen with a small group of superb crystals which you simply dare not split down any further? Should there be a separate class to cover such specimens? These are questions that only the members can decide. Let the Committee know you views; perhaps they can be proposed and voted on at the next AGM.

I do know that some members are concerned at the apparent difficulty of the mounting process. The "bible" of micromounting by Speckles does not really help with all its gadgets. Over the years I have evolved a method of mounting which is quick and, I believe, within everyone's capabilities. It is described in an old issue of the Newsletter and I did a short demonstration at last year's Symposium which appeared to reassure at least some of my audience. Try one now. Remember, never put off until tomorrow what you can do today - if you like it today you can do it again tomorrow!

MICROMOUNT COMPETITION, 1993

As you will have seen from the notice announcing our twelfth Symposium, it is intended to hold a micromount competition once again. The rules remain the same as in previous years

and are reprinted below. However, the deadline for submissions has been extended to August 15 (instead of the former two months before the Symposium). Once again the competition will be judged by Peter Braithwaite. Please support this competition!

Micromount Competition Rules

1. Entries will be judged on specimen quality, labelling and micromounting technique.
2. A maximum of two entries per member.
3. All specimens to be British and collected by the entrant.
4. Each entry to be contained in a box no larger than a 25mm cube.
5. Each entry to be permanently mounted and oriented for viewing, by microscope, in the horizontal position.
6. Each entry to be labelled with the name of the mineral and its source location as a minimum.
7. All entries submitted at the owner's risk and must reach the judge by the closing date of August 15. Each entry must be accompanied by a completed entry form.
8. The judge will be appointed annually by the committee and will not be eligible to enter the competition that year.
9. All entries will be returned at the Symposium. Please note that entrants not attending the Symposium need to organise collection of their entries on their behalf.

VISIT TO THE NATURAL HISTORY MUSEUM, LONDON, 16 JANUARY 1993

Roy Starkey

This visit, arranged by Malcolm Southwood, was attended by Colin Firkin, Sid and Pearl Freeman, Neil Hubbard, John and Pam Pearce, Mike Rothwell, Malcolm Southwood and Roy Starkey. The party assembled in the main foyer at 2.00pm to rendezvous with our host for the afternoon - Peter Tandy. Many of the party had spent some time in the morning drooling over the systematic displays in the ever-popular mineral gallery.

Peter led us via the meteorite pavilion and back staircases up into the Russell Room, where Sir Arthur's collection of 13,000 top class British specimens is housed in superb wooden cabinets. With the relatively small number of people in the party we were able to examine the specimens in a pleasant relaxed atmosphere, opening most of the cabinets and drawers during the course of the afternoon. As usual the vast array of colourful fluorite specimens attracted much attention and the comment: "that one at the front would do me" (NH) typified the running commentary! Specimens from such famous localities as Heights Mine, Rotherhope Fell, Hilton and the Cornish mines around Illogan will always be timeless classics for collectors.

A particularly fine fist-sized lump of ullmanite from the New Brancepeth Colliery caught my eye - a real one-off specimen. Fine witherite groups from Settlingstones and elsewhere in the Northern Pennines show well the extraordinary depth and breadth of the collection.

Drawer after drawer of supergene copper species - arsenates, phosphates, chlorides etc. make one wonder what might be lurking in the lofts and cellars of mining families in the south-west. A complete drawer of fine pyrite crystals - many from Cornwall - equal in

quality to contemporary Brazilian material reminded one of the potential which existed 100 years ago.

The immaculate and regular italic style handwriting which graces Sir Arthur's labels and registers is surely an example to all would-be curators of natural objects. The monotonous greyness of the modern dot matrix printer does not have the same mark of quality, nor the enduring reminder of the great man that built this unequalled collection. Many notes of specimens and localities were taken down, perhaps to be followed up subsequently in the field in the hope of finding traces or evidence of what used to be....

For those members who have not yet enjoyed the privilege of a visit to the Russell Collection - watch out for the next opportunity! To Peter Tandy - who gave up his Saturday afternoon to show us around we express our grateful thanks, and look forward to the time when we may once again tour the antique cabinets and gaze appreciatively on the treasures within.

RECENT ADDITIONS (Nos. 1301-1400) TO THE BMS COLLECTION
Max Wirth

Continuing from Newsletter 34, and still with Steve Rust, specimen numbers 1301-1304 show various habits of caledonite and hydrocerussite from Frongoch Mine. The hydrocerussite (1303) presents relatively thick tabular crystals. 1305 is an excellent example of the rare namuwite, in milky, pale blue crystal clusters. Steve has also found namuwite at Dylife and from Llanwernog; all have been confirmed by XRD. For the inquisitive there is an "unknown" from Frongoch (1307) - tight sprays of green crystals, perhaps looking like agardite (which they are not!). From Nantycagal Mine, Steve has contributed very clean crystals of anglesite (1318) with an unusual squat habit in a dark brown gossany matrix. The same site also yielded a brochantite pseudomorph after cuprite (?), bedded in linarite (1319).

The rare ramsbeckite (1323) comes as dark green prisms looking like brochantite. It is a small specimen but worthy of further study because the mineral may be more common than is generally thought. Steve's serpierite (1326) from Ystrad Einion Mine is the finest I have seen and very photogenic. From the same site comes beaverite (1326), which was at first mistakenly identified as jarosite. XRD analysis at the NHM has confirmed that this is beaverite, possibly with a little plumbojarosite. The connellite (1329) from Knockmahon Mine in Ireland is another rich and photogenic specimen.

Peter Wallace gave us a nice phosgenite from Wheal Penrose. This mineral is gradually turning up all over the UK. Mike Rothwell has now found and confirmed bismuthinite (1333) and agardite (1334) from Buckbarrow Beck in Cumbria. Thomsonite (1337) and analcime (1338) have been found by Tim Neall in the alkali dolerite from Cnoc Rhaonastil in Islay. Nick Zachariades has found cinnabar (1339) at Stancombe quarry near Bristol - a first occurrence for the Mendips area. Jeremy Hooper sent us fine "francolite", childrenite and scorodite (1342-45) from Cornwall. The scorodite is particularly fine, with both blue and white spherules.

Isabel Geldart entered a better specimen (1349) of the chabazite (var. phacolite) from Dean

Quarry on the Lizard. (The true identity of this mineral was discussed at length in Newsletter 34.) Isabel's prehnite (1351) from the same locality is nicely crystallised, with a second generation of prehnite as tiny prisms sprouting from the main crystals. Nick Zachariades entered a very unusual goethite (1353) from Colemans Quarry, near Frome. It is unusual in that it looks like a tetragonal plate which is composed of stacked blades. He also contributed a pyrite floater (1354) found in clay at Hamstead Farm Quarry near Chipping Sodbury. It is a spherical group, consisting of a few dozen individual crystals.

Mike Leppington found erythrite (1388) at Sandbeds in the Caldbeck Fells - very pale and possibly weathered, but a first for the locality. All of the remaining minerals up to number 1400 were supplied by Peter Braithwaite.

Peter's pumpellyite (1355) from Loanhead comes in a nice vug with epidote. Mind you, pumpellyite has never been confirmed by XRD from this site. Clinozoisite (1357) also needs confirmation as the visual distinction from epidote is very uncertain. There is also a question mark with the offretite specimen (1358), but it is very attractive, occurring with what may be a bronze-coloured manganese oxide. The Loanhead anthophyllite (1362) also requires confirmation.

From East Wheal Russell there is a specimen of ajoite (1367), new to our collection and accompanied by brochantite and native copper. There is also an excellent specimen of cuprite with copper from Geevor Mine. The barite from Kinniside Mine (1380) is interesting. An early-formed clear crystal has been overgrown by an opaque stage. Andalusite (var. chiastolite; 1381) is a rock-forming mineral at Cligga Head and occurs embedded in schist. Crocoite (1383) from Greystones Quarry is a rare mineral in Britain, though not very striking. Boracite (1387) from Boulby Potash Mine is a new mineral to our collection. "Polianite" (= pyrolusite) is not a recognised species; the "polianite" specimen from Westdown Mine (1391) appears to be a pseudomorph of manganese oxides after cassiterite. The manganese oxides can be very confusing and the identity of this specimen is uncertain as yet.

NORTHERN GROUP REPORT

Mick Wolfe and Malcolm Southwood

A dozen of us met on **March 13** at the Bircotes Library for the first Northern Group meeting of 1993. Richard Bell was unable to attend as he was in Cornwall - isn't he always? Peter Braithwaite brought his daughter to the meeting. He had been in Cornwall the previous week visiting, amongst other locations, the old smelter site at Gunnislake. Jean Spence, David Green and others were planning a field trip to Cornwall for late March. This seems to be "the place" at the moment, although other old favourites are still producing. Mike Rothwell and John Dickinson had been digging holes at Roughten Gill (and filling them in again!) which resulted in a nice find of brochantite. David Green had been underground at Brandy Bottle Incline and obtained an excellent hand specimen covered in attractive cerussite micro-crystals. Malcolm was planning a trip to some classic Derbyshire localities with Fall Hill Quarry and Masson Hill opencast high on his hit list. Malcolm also brought to the meeting some superb cinnabars he had bought for a song whilst on a recent visit to China. Nigel Hoppe was planning trips to the Caldbecks, Heddle locations on Skye

and, would you believe, Cornwall. As well as some excellent minerals to inspect there was also an impressive display of microscopes with David Green's Wild and Leitz M10 taking pride of place. I really must start doing my pools coupon again! Mick Cooper showed a selection slides - all up to his usual standard and ranging from specimens in the Greenbank collection to material he had seen at recent mineral shows around Europe. The meeting broke up at 5.30pm with the next one scheduled for May 22.

Only seven members attended the meeting on **May 22** which unfortunately clashed with various weddings, holidays and other personal commitments for several of the regulars. People really should get their priorities sorted out! Nevertheless the meeting was a very good one. Mike Rothwell and Richard Bell had recently been underground at the Hilton Mine in search of yellow fluorite. They found no fluorite to speak of but returned with some fine (large) specimens of barite. Jean Spence and David Green visited Cornwall in April. Jean found a superb micro of native silver at Greystones, and a fine selection of minerals was collected at the Mulberry Openwork. David has been experimenting with a labelling system for his micros and has come up with a method of transferring text directly from his database to his word processor and hence to his laser printer. By using a 6-point font he is able to get several lines of clearly legible text onto the top of each box without the need for any photo-reduction.

Peter Braithwaite treated us to a private showing of some of his watercolour paintings. These are mainly landscapes of Cornwall and the Lake District and the quality is quite superb. Particularly interesting was Peter's view of the Crowns engine houses at Botallack. Mike Rothwell presented some slides that he took recently in the mineral gallery at the Natural History Museum. Mike used a flashgun to take pictures of specimens through the glass of the display cabinets. His efforts were remarkably successful in that he managed to avoid unwanted reflections of the flash in the glass. David Green also presented some slides, chiefly of minerals in the Truro and Plymouth museums. These included two fine views of the famous liroconite specimen which is shown on the rear cover of "*Minerals of Devon and Cornwall*". The Northern Group does not intend to meet again until November and a date will be arranged at the Symposium.

SOUTH EAST GROUP REPORT

Austin Lockwood

Thirty-four members attended the South East Group meeting on Sunday February 21, 1993, at the temporary venue of the Library Hall, Burnt Ash Hill, Grove Park. Our usual meeting place, the Ringway Community Centre, was not available until later in the afternoon. Please note that future meetings should be back at the Community Centre.

A thank-you card signed by the members, together with a cheque for £50 was presented to Elsie Hansford as a token of appreciation for all the hard work she has done for the BMS and for the South East Group in particular.

Peter Wallace has agreed to record members' "finds" at each of our meetings and to announce the more interesting ones at the meeting so that other members can see and discuss them with the finder. Peter duly reported on:

Siderite and amethyst from Wheal Unity, and brochantite from Tolvaddon (Richard Belson)

Sparable tin from Caradon Consols (Martin Stolworthy)

Schulenbergite and other copper secondaries from Lletty-even-Hen (Steve Rust)

Turquoise crystals from Wheal Cock, and cumengite and phosgenite from Padstow Consols (the Wallace family)

Harry Day is setting up a database on his PC with details of mineral sites and the minerals to be found at them. The information will include the name and location of the site, the minerals previously found there, the means of access and the name and address of the owner etc. Members are asked to provide information from their own records and to update the information according to recent experience. The database information will be available to BMS members only. Harry has also volunteered (along with several assistants) to organise a number of workshops, commencing with one on micromounting techniques.

Steve Rust is setting up a South East Group study collection of micromounts, primarily to assist new members with mineral identification. Peter Wallace, Harry Day and Fred Cornwall have agreed to assist Steve with this, and a number of members have offered to donate specimens to get the project moving.

AN OPEN LETTER TO THE CHAIRMAN

Edgar Taylor

Dear John [Pearce],

BMS Newsletter 24 pp11-12. For purely selfish reasons I support enthusiastically your suggestions 1 and 2.

Despite many years interest in the subject of minerals and latterly micromounts, because of a combination of advancing age and natural stupidity I am still woefully ignorant. Too much of my time is spent in re-labelling earlier specimens in the light of later (but still suspect) knowledge.

I would find it extremely useful to have access to Visual Identification Kits with notes, of the sort you suggest. BMS Short Papers on the lines proposed would be very welcome - your adjectives "short, informative, readable and cheap" are music to my ears. Most of the books I borrow or own are designed to tell me much more than I want/need to know, or can absorb. With the possible exception of "Paper Chromatography" all your tentatively suggested titles have an immediate appeal.

Yours sincerely,
Edgar Taylor

IN BRIEF....

Many members will have seen and admired the 1989 book "Micro Minerals of Mont Saint-Hilaire, Quebec" by **R.W.Fisher and G.H.Glenn**. The book contains more than 460 pen and ink drawings of microminerals from this remarkable locality and is at the same time a first-class source of reference and a magnificent work of art. By popular demand the book has recently been reprinted and is available for the sum of C$26.00 plus C$6.00 for postage and packing from either of the authors:

G.Glenn	R.Fisher
8459 Parkway Drive	17 Gavin Drive
Niagara Falls, Ontario	St Catharines, Ontario
Canada, L2G 6W8	Canada, L2M 2X8

Once again it is necessary to request that members borrowing volumes of the Society's set of Goldschmidt atlases must please inform **Muriel Swindell** if and when a volume is passed on to another member. It would also be appreciated if the member to whom the volume is forwarded could confirm his or her receipt of it to Muriel in writing.

As a result of its affiliation to the Geologists' Association, the BMS receives two copies of the quarterly G.A.Circular. If you would like to see these publications, please contact **Shirley Adrian** (her address is given on page one of this Newsletter).

Malcolm Southwood is currently researching an article on anglesite from Parys Mountain. He would like to make contact with anyone who has any information on anglesite from this locality and in particular with anyone who has specimens which show habits other than the most commonly encountered "arrowhead" crystals.

New member **Jon Gliddon** has recently returned to the UK after working for many years in the mining industries of Zambia and South Africa. He has a wide selection of micros and thumbnails available for exchange or for sale. Jon can be contacted at: The Old Bell House, Bell Square, Blagdon, Bristol, BS18 6UB.

You have probably noticed that Quintin Wight's *Complete Book of Micromounting* has recently been advertised in the *Mineralogical Record*. It costs £44 (including p&p) and credit card orders can not be accepted. It is intended to have a copy of this book as this year's raffle prize at the Symposium. It will not only make an excellent prize, but it will also give those attending the Symposium an opportunity to see the book before deciding whether or not to buy one. If there is sufficient interest we might want to consider a bulk purchase for BMS members. Even if you are not attending the Symposium you may still wish to purchase a raffle ticket by sending a cheque for £1 (made out to BMS) to **John Pearce**. Please also let him know if you want to be included in any bulk purchasing plans.

John Toma (c/o A.N.Z Bank, 16 Gawler St., Mt. Barker 5251, South Australia) has an extensive collection of Australian minerals and specialises in minerals of the famous Broken Hill mines. He would like to hear from anyone interested in exchanging or purchasing material and he suggests that his South Australian copper phosphates and arsenates would be interesting to compare with similar material from Cornwall.

CHANGES OF ADDRESS / PHONE NUMBERS

Please note the following new addresses.....

David Whipp: Staghury Dene, Outwood Lane, Chipstead, Surrey.

...and telephone numbers:

Richard Tayler: (0932) 862 340 Roland Thomas: (0483) 488 459

NEW MEMBERS

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

David Baker: 36 Watford Road, Croxley Green, Rickmansworth, Herts. WD3 3BJ. Tel: (0923) 772 977

Richard Braithwaite: Chemistry Dept., U.M.I.S.T.,Manchester M60 1QD. Tel: (061) 200 4525

Andrew Castleton: Castle Acr, Brickle Loke, Upper Stoke Holy Cross, Norwich, Norfolk. NR14 8NF. Tel: (0508) 493 470

R.Cody: 17 Dorning Road, St Agnes, Cornwall, TR5 OUP

Harry Critchley: 23 Fryent Close, Blackrod, Bolton, Lancs. BL6 5BU Tel: (0204) 694 345

Jonathan Gliddon: The Old Bell House, Bell Square, Blagdon, Bristol, Avon BS18 6UB. Tel: (0761) 462 920

Neil-John Leonard: (Re-instated) $^{c}/_{o}$ Phillips. 10 Salem Road, Bayswater, London W2 4DL

Ian Lindsay: 27 Canterbury Place, Norwich, Norfolk NR2 4QJ Tel: (0603) 633 071

Derrick Ling: 6 Cauldwell Hall Road, Ipswich, Suffolk. IP4 4QB Tel: (0473) 724 779

NEWSLETTER EDITOR

Malcolm Southwood

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(Please note that the deadline for articles for Newsletter 36 will be October 1, 1993. Please let me have contributions as soon as possible in order to spread the typing load. Many thanks, and look forward to seeing you at the Symposium.)