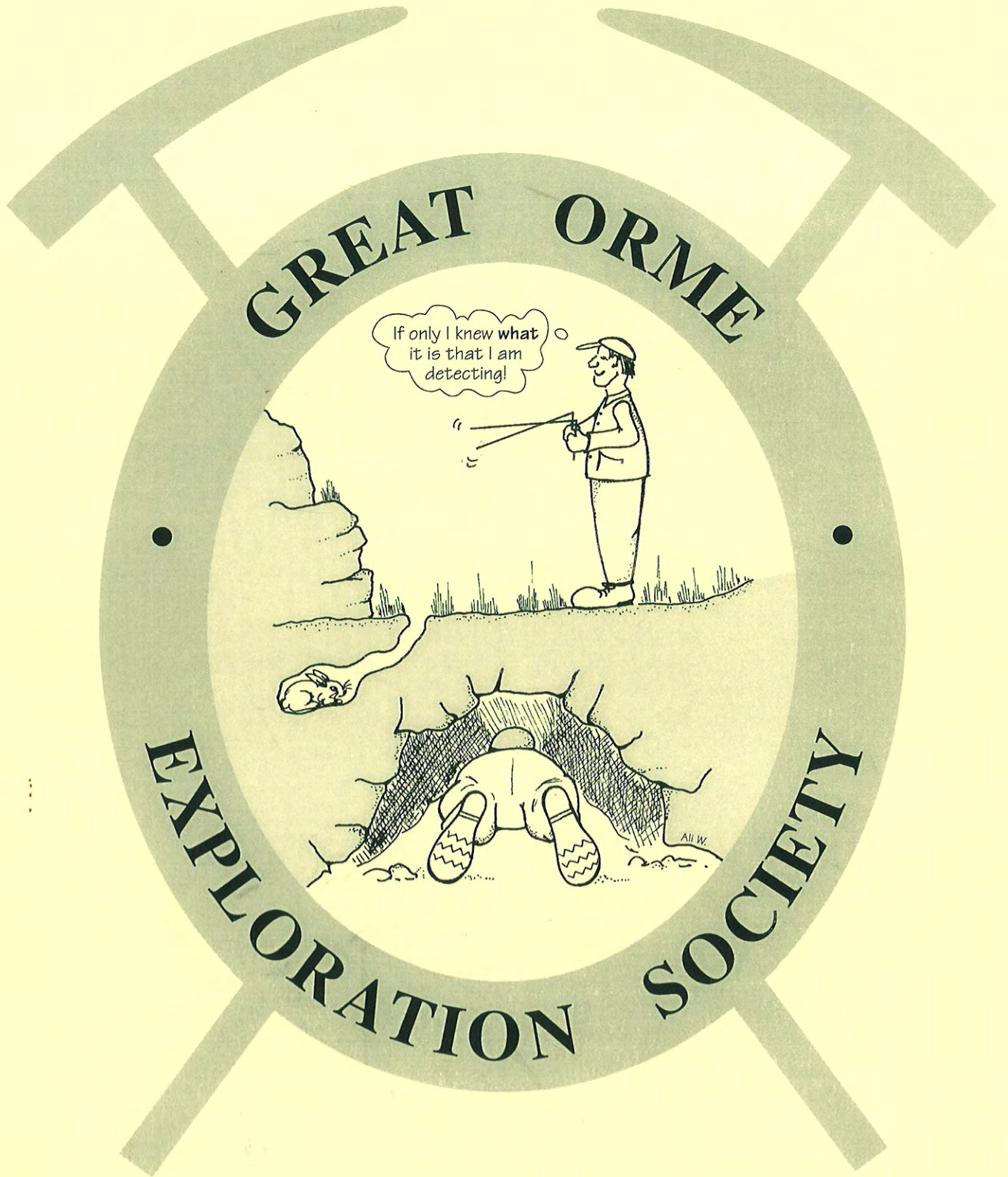


# JOURNAL OF THE



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Illustration by Alison Walton



*Happy Valley shaft, 1996  
'Maybe if we watch long enough it won't need digging'*

We now have the go-ahead to start digging the shaft in Happy Valley. It is believed that the shaft is part of the Ty-Gwyn workings, and after an evenings dowsing session last summer it was estimated to be approximately 100ft deep, capped, and has at least four passages coming off it. Only time will tell. Digging is expected to start in September, and volunteers would be greatly appreciated.

The Penmorfa drainage adit spent seven weeks undergoing some serious repair. The main adit was pipe-jacked using 1 metre wide concrete sections. GOES are hoping to regain access to the mine in the near future, when a reasonably accurate survey will be carried out.

Nigel is organising another Day School to take place on May 10th and 11th. There will be a series of lectures on Saturday followed by Orme walks and trips underground on Sunday. If you are interested in attending then contact Nigel Bannerman for a full programme (01492) 879416.

This years AGM took place on March 22nd at Queen Elizabeth Court. Mark Beardsall was elected Vice Chairman, allowing Dave Chapman to step down. All other committee members were re-elected unopposed.

This summer there are several walks planned which will take place on Thursday evenings at 7.00pm, the first of these will start on May 15th. See the enclosed listing for more details.

*Alison Walton, Llandudno, May 1997*

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## KIBBLES AND COUNTERS

The Old and New mines at Llandudno are reasonably well documented for mines of their size and importance. (The Ty Gwyn however is much less so, with only one single manuscript collection relating to it.) The surviving documents are nearly all those kept by the mineral owners, the Bishop of Bangor and the Mostyn estate, and by lessees of the mines. None of the mine companies' own records remain; probably they were destroyed soon after the mines closed. This is unfortunate, as mine company cost and account books provide detailed information on how the mine was worked, and what work was done when. Something of this loss is made up by a bundle of vouchers relating to the Old Mine among the Bangor diocesan records in the National Library of Wales (B/EP/575). These are paid bills for the years 1840-51. They shed interesting light on where the mine company obtained its materials, many of them brought by sea in the boats which carried the ore from the mines along the north Wales coast and up the Mersey for smelting. From Liverpool came oil and hemp, iron, rope and shovels. There are also bills for coal from Mostyn and Runcorn, clothes from a Llandudno draper, candles from Llanrwst, and paper from Hugh Humphreys, printer of Caernarfon. There are payments to Joseph Tamblin, the engineer, and to the miners (with their signatures), and bills from a sawyer at Pen-y-gwaith, and for the carriage of goods from the mine to the shore and for loading vessels.

In 1849-50 there are three bills for the expense of drawing (i.e. winding) kibbles from the workings. These were all submitted by Jonathan Rowling, probably a descendant of the Jonathan Rawling who was agent to the Old Mine. He died aged 53 in 1836 and was buried in the churchyard of the old parish church. The bills list the miner for whom the work was done (presumably the head of the partnership), and give the number of kibbles landed for each at a shilling (5p) the score. The numbers of kibbles varied from two for Jonathan Rowling himself to 781 for Benjamin Hughes. (The period this covered is not stated.) Among the miners named were Thomas Kendrick the lapidary and his brother William (see article in the Journal for Oct 1996). Some of the kibbles were wound for the company itself, but all the bills were settled by the manager of the Old Mine, John Williams. The following is a list of the miners named:

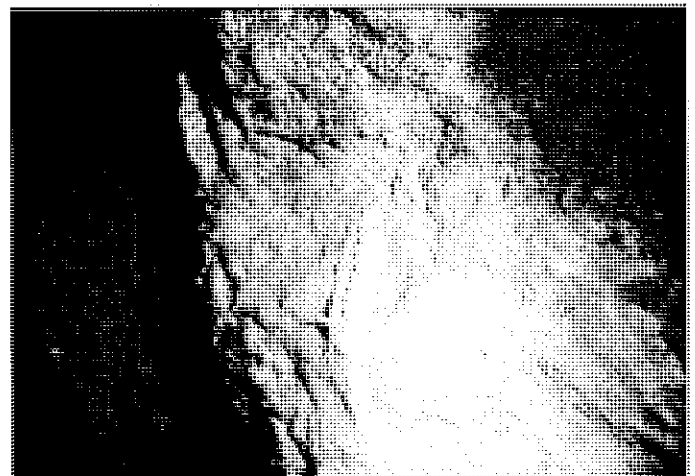
Edward Brookes; Henry Davies; Thomas Davies, Pen-y-mynydd; Thomas Davies, Troed-yr-hen; Thomas Edwards; Thomas Ellis; Benjamin Hughes; John Hughes, Bryn-y-gwynt; John Hughes, Bryn Hyfryd; John Hughes, Ty'n-y-pwll; Joseph Hughes; Richard Hughes; Thomas Hughes, Nant Gammer; Hugh Jones; Hugh Jones, Adwy rydd; Hugh Jones, Bron-y-berllan; Hugh Jones, Ty isa; Lewis Jones; Owen Jones; Owen Jones, Plas Uchaf; Richard Jones, Morva; Robert Jones, Bryn Cynol; William Jones, Morva; Thomas Kenrick (sic); William Kenrick; Roger Lester; Griffith Owen; Hugh Owen; John Owen junior; Thomas Owens; Hugh Parry; John Parry, Ty Gwyrdd; Robert Parry; Daniel Powel; William Richard; James Roberts; Benjamin Robinson; Jonathan Rowling; Thomas Rowling; John Williams, Cwlach; William Williams.

When the miners worked on tribute, it is interesting to consider how they kept a check on their work to ensure that they were paid fairly. In 1972, when taking photographs near the end of the level off Treweek's Shaft about 80 feet below surface, I noticed a primitive counter on the wall. It consisted of a strip of clay about an inch wide and six inches long, smeared onto the wall to leave a flat surface exposed. A small peg like a matchstick had been used to make twenty holes down the right-hand side; three more had been made on the left, working upwards from the bottom, and the peg was still in place in the last hole. The counter was probably used to keep count of loads of ore at the point where it was transferred from a barrow to a wagon in order to be trammed to the shaft for winding to the surface. Shortly afterwards, I noticed a similar counter in workings underground on Parys Mountain. This has ten holes, with the peg still in the lowest one. I photographed this recently on a trip to see the newly-discovered early workings nearby. I would be very interested in hearing from anyone who has seen other such counters underground.

*C. J. Williams, Marford, November 1996*



*Counters From Llandudno*



*Counters from Parys Mountain*

## GOES CHRISTMAS DINNER 1996

The GOES annual Christmas Dinner for 1996 took place on the 29th November in Richard's Bistro, and was highly successful.

The event began in orderly fashion, with everyone in their best bibs and tuckers, talking politely by a roaring gas fire. All the ladies were decked in black, the in colour this season. There was a display of legs, not often seen on GOES ladies, in mini skirts, much appreciated by our Chairman, who posed for the cameras with two of the aforementioned, in fairly seemly fashion. Less seemly, was an event, which involved one of the gentlemen being molested by a lady, and a glamorous leg show, much appreciated by all the other gentlemen. Room for future blackmail here, I feel.

The gentlemen sported a variety of gear. There were two lounge lizards, looking handsome in their dinner jackets and bow ties, several besuited gentlemen and one or two in casual wear, who let the side down. In fact, one gentleman, who shall be nameless, was only just persuaded not to turn up in his "labyrinth trousers", (with a plethora of pockets, which, although supposedly practical, in actual fact preclude him from finding anything in a hurry!) and mucky old sweat shirt.

The gentlemen's shirts were interesting, being mostly of the blue and white striped variety. However, one smart young man wore a dazzling, multi-coloured, eye shade demanding, transatlantic influenced, red, turquoise, white and navy blue creation.

The food was quite excellent, although one of the mini-skirted young ladies had to be prevailed upon to eat anything at all. However, ultimately, she managed the three course meal, all the bread rolls, a plate of chips and the last chocolate mint. We did manage to restrain her from drinking an entire bottle of red wine by herself, when we assured her that it was not absolutely essential that she did so.

As the evening advanced, the general behaviour began to deteriorate. It started fairly innocuously with the Chairman making corny jokes - on reading "Grilled Goat's Cheese", from the menu, he asked, "How do you get cheese out of a grilled goat?"

After this, the rot set in. A waitress bet us £10 we could not eat all the bread rolls. The mini skirted young lady almost did. Luckily, the waitress did not come to claim her winnings.

Our President, although under supervision by his strict minder, told us a story about Dewi Sant, which included eating leeks, a prophesy about a hole dug in a fellow member's garden, Gobowen Station, doctored port and shoe laces tied together. I was a bit confused by the end.

Our Chairman then did something obscene with a runner bean, which I did not understand, but I suspect that several other ladies did, judging by the squeals of laughter, led by the Chairman's lady.

These events all took place at the Chairman's table. It was a little difficult for me to see the high jinx at the other table. All I can say is that there was a cacophony of musical sounds from their spoons and wine glasses, and our two very able Organisers of the event (For which, congratulations, by the way. You both did a great job, and we loved the computer made place cards and menus), hotly denied snogging at table. But someone was doing it!

Later in the evening, our Chairman was presented with a large toilet roll holder (one can only wonder at the implications) in which was folded an enormous photograph. It might have been a rude picture - I could not see it - but was assured that it was only "A great big something or other on the Orme". Anyway, the Chairman seemed pleased to receive it.

After the mini skirted young lady eventually finished her repast, the Chairman was able to announce the winner of the raffle - the prize, a bottle of whisky, kindly donated by our President. To cries of "Cheat" and "Unfair", the male half of the organising team happily took possession of this.

The evening was concluded, when the Chairmans' good lady pulled on her thigh length boots, and we all knew it was time to go home.

Seriously, one of the best GOES dinners ever. The food was superb - Thank you Richard and his Staff - and the Company was marvellous.

*Eve Parry, Llandudno, December 1996*



*Eve at the GOES Christmas dinner, 1996*





My friend John Bowen and myself had been invited to Pen-y-Bryn to date some old pottery. After a goodly time, we gave up as it's a very tiring job. To explain, we both use a pendulum. In my case a pre-arranged length of thong, and a length of cord in my friends. They swing around in a circle for a 'No' response, and move back and forth for a 'Yes'.

I hold the pendulum over, and a short way above the object. For things that have been in the ground for a long time there is no use in starting to date from a low figure. This day I started at 50 years and went up in 50's. The pendulum just circles around until it comes to the correct date. Some pieces had a date of 800+ years. The pendulum now stops rotating and starts to go back and forth as it has come to the age of the object. The explanations could go on for much longer, but back to my story.

We then asked our hosts if we could look into the cellar. "Yes, we will show you" was the reply. We went down a short flight of steps under the floor of the tower. The cellar was not very big, but interesting. We had with us our rods. These are two thinnish rods about 18 inches long. Mine are brass, my friends' copper. They have a short bit bent over for a handle, perhaps 4 inches long. They are held about 18 inches apart. One has to practice to get it right. We walked back and forth across the cellar floor and at one point I found two lines 6 feet apart. My friend also found them on the other side of the cellar. We then went outside, my friend to the back of the house and me to the front, and yes, the lines were on both sides still 6 feet apart. It was decided to go down to the beach, and lo, into the sea they went still 6 feet apart, just like a railway track.

Later on in the same week I went across to Anglesey, located the start of these tracks on the mainland, did a short walk about and there they were 6 feet apart again and in a good straight line. This was posing a problem as to what they could be. We did not follow the Anglesey find overland as we would have had to ask Sir J. Bulkeley about having to cross a large portion of his land. We would do all this another day. The Anglesey lines could have Druidic connections, but perhaps it was a Prehistoric railway!...well, you think of all sorts at this stage.

Back now to Pen-y-Bryn. This time we took lunch and drink, as you never know how long, or how far you will go.

We started at the back of the house, up the bank, across the fields, through the woods, still finding our 6 foot wide tracks. There was no variation in the 6 feet width. The two lines of the tracks were quite narrow, they were not surface lines, but in the ground somewhere. We passed below the fort. I volunteered to climb over the rocks as they were a bit on the steep side, but even on a 45° angle the lines were still there, passing through the woods above the cottage, heading towards the Falls through pine woods. This was very hard going as we did not have a path, apart from the two thin lines. We came now to the scree slope. You may or may not know, but these slopes keep moving. Again I volunteered to traverse the slope.

Looking back, I had come on a gentle curve from Pen-y-Bryn. I was perhaps half way up on a level with the top of the Falls, my friend had gone by the pathway. My lines took me along and over some very flat rocks, and so to the top of the Falls with no great effort.

We both had our food and drink, then off we went. For the most part we were just above the stream on the left side. The strange thing about the journey was that we were travelling over very boggy ground, but so long as we stayed within the two lines we had dry feet. We were unable to do all this exploration in one day. It was very time consuming because holding the rods out in front of you is very tiring. (something to do with the earth's forces).

Autumn arrived, and now we found the snow blocking our way. I think we were somewhere above the Leder Valley. Unfortunately my friend died that Christmas, and I have not been back. I need help!, so if this is read by some interested party I would be only too glad to share what we have found.

#### **Conclusion:**

I have read of roads of healing being similar to this in the south of England. The things of interest to me at Pen-y-Bryn are some very big old lime trees. The wood is white and is used for making spoons and plates. The fibres of the inner bark were used for matting, nets and ropes. The flowers make a tea-like drink, and drunk hot helps makes you sleep, drunk cold will give you energy. Unfortunately it does not set seed, as in the days of old the temperature was perhaps 2 or 3 degrees warmer than today. Who knows, it might come this way again. So Pen-y-Bryn could have been a place of healing. The only thing I did find on using my pendulum was whilst standing between the two lines I asked 'Did young people use it?' Yes. 'Old people?' Yes. In fact, all sorts of people, all sick or maimed in some way, all going to Pen-y-Bryn...Why?

The other herb that would have been there was the Elder, which hints towards the Druids who worshiped the groves of the trees. The flowers when made into an infusion would have been for fever and colds. There was wild garlic used as an antiseptic, or for lung infections, food poisoning, worms and warts. Sedatives long ago would have included hops, lemon balm, poppy, some of the dogwoods, camomile and valerium. The last two are a good sedative for intestine pains.

On the banks of the stream, Pen-y-Bryn side, are the remains of several dwellings. I have looked for records of them without finding a thing. They are a short way up, and opposite the Moot. Just lower down is the old crossing, made up of lovely large stones. Around Pen-y-Bryn have been found evidence of old habitation, post holes and the like, also found was part of an old baking oven as used by the Cornish tin miners. In the area above Pen-y-Bryn there used to be gold mines - one can still see some of the old workings. I'm quite sure there is still gold to be found up there. I do know of some likely spots...perhaps some time I just might?

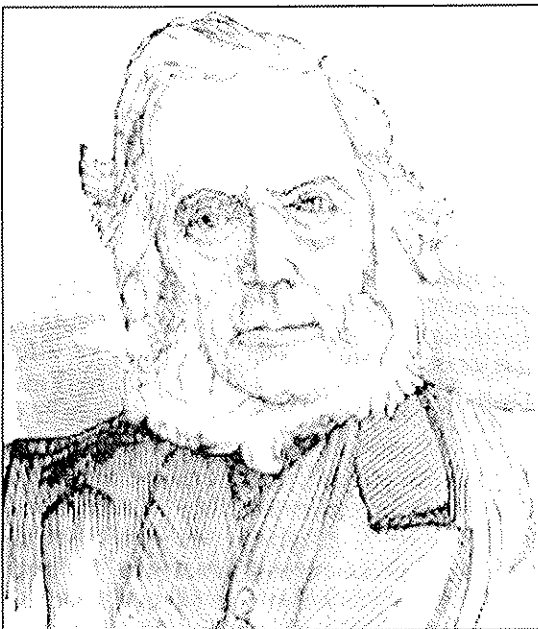
*Ramon Rainford, Llanbedr-y-Cennin, 1997*



Thomas Jones was born at Afon Goch, Llanasa, Flintshire in the year 1799. He started his working life in the lead mines of Flintshire, but at the age of twenty seven was appointed as the Agent of the New Mine at Llandudno.

At that time Llandudno was a small, remote village with a population of about six hundred, the majority of whom worked as miners. They also enjoyed grazing rights for their sheep, the right to catch rabbits in well defined and strictly specified warrens and abundant sea fishing. A carrier delivered essential goods from Conwy twice a week. Very often during the winter, 'luxuries', such as tea and sugar, were unobtainable as bad weather prevented the coastal trade from Chester and Liverpool.

Thomas Jones arrived in 1826, and was, during the course of his lifetime, to see amazing and far reaching changes. He witnessed an unprecedented boom in the mining of copper. He then observed the total demise and disappearance of that industry. He saw the birth of a completely new and revolutionary industry, tourism, and was instrumental in its development.



*Mr  
Thomas  
Jones,  
Plas Fron  
Deg.*

One of the problems facing Thomas Jones on his arrival was the ongoing problem of the build up of water in the constantly deepening shafts on the Orme. His stewardship of the New Mine, and his expertise as a mining engineer, is remembered mainly because of his work in this field. It is to Thomas Jones that the building of the, "Tom and Jerry" pumping engine is attributed. Traces of this remarkable pumping device are still to be seen running from the Pyllau valley down to the old cottage ruins deep in the undergrowth at Gogarth. Apparently it did work. David Bick in his, "Old Copper Mines of Snowdonia", sums it up thus,

"... And in surveying this windswept hillside we can only applaud the 19th century mining engineers who risked their reputations on contrivances of this kind. In the words of Dr. Samuel Johnson concerning a dog walking

upon its hind legs -'It is not done well; but you are surprised to find it done at all' ". It is perhaps significant that a shaft called "Tom and Jerry" was to be found in the Gwern y Mynydd Mine near Mold.

However despite the installation of this wondrous device, the workings were still flooding and in 1834 the most ambitious scheme in the history of nineteenth century mining in Llandudno, was launched. This was the driving of the Penmorfa Adit from the present site of Abbey Place to the base of Vivian's shaft under Pyllau. The completed tunnel was nine hundred and eighty four yards in length (899.7 metres.) and dewatered over two hundred feet of flooded workings. The work was completed in 1842. The project was a joint venture between the Old and the New Mine Companies and was supervised by Thomas Jones and Captain Davey of the Old Mine.

The following ten years were very profitable and productive times for the Llandudno mines. Population statistics for the period of Thomas Jones's stewardship of the mine reflect the growing prosperity of the industry:

1821: 509.  
1841: 1047.  
1851: 1137.

It will be seen that the population had more than doubled at a time when the only industry in Llandudno was mining. The future looked promising but great changes lay ahead. Several factors contributed to the sudden and dramatic decline of the copper industry. In 1848 the import tariffs on copper ore were lifted, cheaper foreign copper flooded the country. In Llandudno the tourist industry had arrived and from 1854 the building boom of hotels was under way. The census of 1851 shows 191 miners out of a population of 1137. By 1861 a population of 2,318 showed only 69 miners. By 1864 the New Mine was to all intents abandoned.

By this time Thomas Jones had lived in Llandudno for thirty eight years and had played a prominent role in the community. A staunch Congregationalist he had been instrumental in the building of Christ Church. He had successfully managed the New Mine and was a highly respected and popular figure. At this stage, at the age of sixty five, he could well have retired and rested on his laurels.

However the new Llandudno was arising out of the marshes of Morfa Rhianedd and his experience and expertise was called upon. In 1854 he was elected as one of the first Llandudno Commissioners. In common with many others such as, Thomas Kendrick, Richard Hughes, and Thomas Rowlands he was able to turn his back on the past and face the challenge of a new and exciting future.

He died on the 21st December 1875 and is buried in Llanrhos Churchyard.

*Tom Parry, Llandudno, December 1996*

**INTRODUCTION:**

Any visitor to the Great Orme copper mine must feel a sense of awe at the achievement of the Bronze Age miners, who toiled to produce a myriad of labyrinthine workings unprecedented in their scale and complexity, using only the simplest stone and bone tools. When faced with the evidence for such unrivalled technological achievement, it is difficult to remember that mining was just one facet of a highly complex metal production sequence essential to the manufacture of all the weapons,

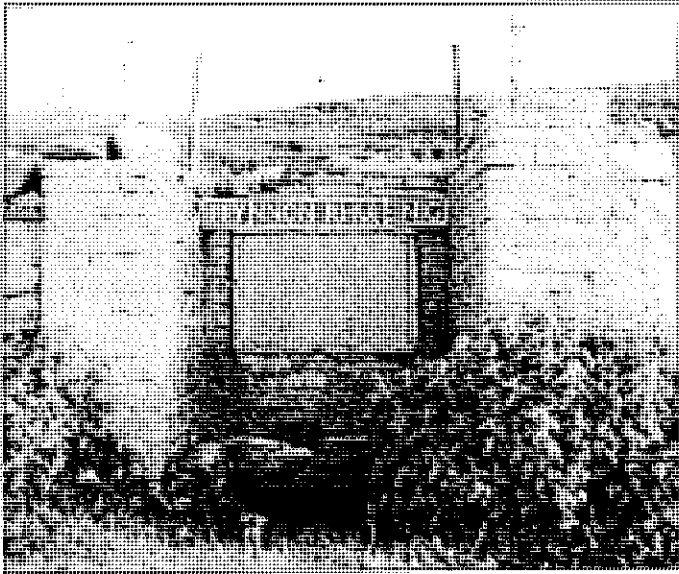


Fig.1 Ffynnon Rhufeinig wellhead

jewellery, utensils and agriculture implements used in everyday life. The ore extracted from the mine had to be processed, smelted, refined, alloyed and cast to produce even the simplest of objects, activities likely to have had social not just technological dimensions. We therefore have to try to understand the significance of the Great Orme copper mine at any given time in terms of both the techniques involved in its exploitation and the nature of its interactions with the people who produced it. In order to achieve this we should attempt to place the mine within the broader context of associated activity on the Orme. We must find the places where the ore was processed and smelted, where the people who worked in the mine lived, farmed, worshiped and enjoyed themselves, died and were buried. This paper presents the results of an attempt to do just that, through the preliminary survey and excavation of the potential prehistoric ore washing site at Ffynnon Rhufeinig. (SH 7655 8386) (fig. 1).

**COPPER ORE PROCESSING:**

Ore processing, or beneficiation as it is referred to by archaeometallurgists, involves the separation of the unwanted associated rock or 'gangue' from the desired ore minerals by a series of filtering processes (O'Brien 1994). It is carried out prior to smelting, both to increase the yield of metal produced for a given input of ore and to reduce the amount of fuel needed during smelting. It also eases transport of the mined ore to distant smelting sites. Despite its apparently trivial nature, there is a growing realisation among archaeometallurgists that ore

processing was a crucial stage in the copper metal production sequence, influencing the choices made at the smelting stage (Doonan 1994) and the subsequent minor and major trace element patterning of the metal produced (Merkel 1985). This has important implications for attempts to use trace element analysis to determine the source of Bronze Age metalwork.

The available archaeological evidence for prehistoric copper ore processing, when considered in the light of ethnographic and documentary evidence from more recent periods, suggests that the mined ore may have been crushed into smaller fragments using stone pounders, before being ground to a finer particle size using a stone pestle and mortar. Possible examples of these tool types have been tentatively identified at the Great Orme mine itself (see e.g. Pickin 1990), perhaps suggesting that both of these processing techniques were carried out there. Crushing would have resulted in the liberation of the ore minerals from the unwanted host rock.

The brightly coloured copper carbonate and sulphide ores could then have been hand sorted from the waste rock with relative ease, purely on the basis of their physical appearance. Grinding however is likely to have resulted in material too fine to be hand sorted, requiring the use of mechanical separation techniques. One of the simplest of these, the use of which is attested to in the archaeological record (see e.g. Craddock 1995), is gravity separation in water. In this process, the ore is 'washed' so that the lighter gangue material becomes suspended in a flow of water and carried away, while the denser material sinks and can be periodically retrieved, for example by shovelling (Craddock 1995) (fig. 2).

The evidence from other prehistoric mines, such as Mt. Gabriel in Ireland and Timna in Israel, indicates that ore processing during the Bronze Age could have been a multi-stage activity, some of the simple techniques outlined here being used in a flexible sequence in order to achieve a deceptively difficult and complex process (O'Brien 1994). Developing a model of ore processing at a site depends upon both careful interpretation of any available archaeological evidence and our understanding of the nature of the mining process at a given time. At the Great Orme, the available artefactual evidence hints at phases of ore crushing and possibly hand sorting in the immediate vicinity of the mine itself. No ore washing sites known to be contemporary with Bronze Age activity at the mine have been identified on the Orme until now, with the possible exception of Ffynnon Galchog (Lewis 1993). It is perhaps possible that none ever existed to be found, crushing alone achieving a degree of separation considered satisfactory by the Bronze Age miners. However, during some phase of exploitation at this mine, the prehistoric workers appear to have extracted ore contained within the harder host rock found at greater depths. The hardness of this host rock, together with a concomitant increase in the degree of dissemination of the copper ores, would have required more rigorous separation techniques, such as washing, in order to ensure that at least a minimal amount of mineral was removed from the gangue (Lewis 1993).

Such a process is likely to have required a water source and today at least five can be identified on the Orme. However, a strong local tradition exists for the existence of a pre-19th century ore washing site at Ffynnon Rhufeinig or the Roman Well. It was therefore decided to investigate the possibility that ore washing may have occurred at this site during the Bronze Age.

### BACKGROUND TO THE INVESTIGATION AT FFYNNON RHUFEINIG:

Ffynnon Rhufeinig is a natural spring located less than a kilometre to the northwest of the Pyllau mining area. The available documentary sources paint a picture of intermittent agricultural, settlement and ore washing activity there prior to the 19th century, when considerable reworking of deposits thought to be the product of one of these earlier phases of ore washing appears to have been undertaken. Most accounts written at the turn of the century refer to this site as a Roman copper ore washing well, although this is more likely to reflect "the habit of the time to attribute old structures to the Romans" (Jones 1994: Appendix 3) than to represent an accurate

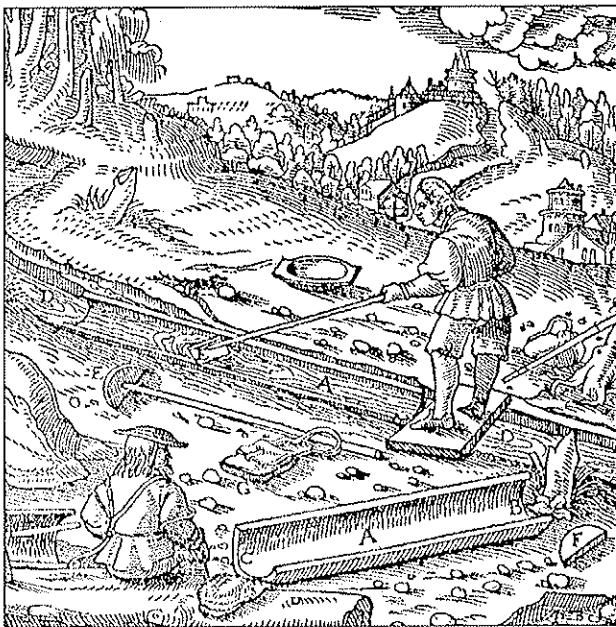


Fig. 2 Ore Washing (Agricola in Hoover & Hoover, 1950)

indication of date. Despite the later reworking, carried out both to obtain smeltable ore (*copper slime*) and to resurface Marine Drive (Aris 1996), the "yellow stain of copper washing" (Roberts 1909, quoted in Jones 1994) was apparently still visible at the site at the turn of the century. The last recorded activity at Ffynnon Rhufeinig appears to have occurred during the 1900s, when the Urban District Council carried out some work in an attempt to redirect the spring water to supply the cemetery (Aris 1996).

On the basis of this documentary evidence, a topographic survey of the area immediately to the north of the wellhead was carried out and aerial photographs of this part of the Orme were examined in order to support and supplement the evidence collected on the ground. A number of low mounds, that could be interpreted as dumps of waste material or tailings from a phase of ore washing at the site, were identified to the east of the present stream course. Downstream, a series of shallow gullies, embankments and regular-shaped shallow

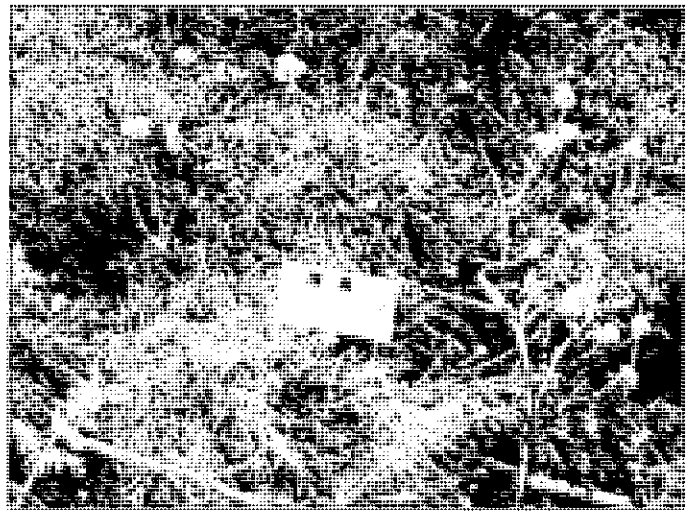


Fig. 3 Thrift (also known as Sea Pink or *Armeria Maritima*)

impressions appeared to represent a deliberately constructed channel and a number of pools, a series of features possibly designed to utilise the natural gradient in order to control and adapt the flow of water from the well for ore washing.

A small-scale vegetation survey carried out in the vicinity of the earthworks identified immediately to the north of the well appeared to tentatively support this interpretation of Ffynnon Rhufeinig as a site where ore washing had been carried out during some earlier period. Scattered patches of Thrift (*Sea Pink* or *Armeria maritima*), a submetalphyte or plant species that grows in areas of heavy metal pollution (Buchanan 1992), were identified (fig. 3). Its presence at the site could be an indication of copper deposits, or, more likely given the underlying geology, of copper mining waste (Jones 1994). However, care is needed when attempting to determine the factors limiting the observed distribution of this species on the Orme, as it is also a coastal plant (Ary and Gregory 1965). During the topographic survey, surface scatters of altered dolomitic limestone and malachite nodules were recovered where the ground had been disturbed by digging and grazing animals. The presence of such material at this location on the Orme may be highly significant as such rock types are associated exclusively with the areas of dolomitic limestone found close to the summit of the Orme and are not naturally occurring at this level. Concentrated deposits of such material at Ffynnon Rhufeinig could therefore provide further evidence for the transport of material from the mine to this site, strengthening the hypothesis that ore washing occurred there.

The results of this preliminary topographic and vegetation survey of Ffynnon Rhufeinig therefore appeared to lend considerable support to the strong local tradition of copper ore washing in the vicinity of the well, as recorded in the available documentary sources. However, no clue was provided as to the date of these proposed episodes of ore washing and it was still unclear whether they represented a Bronze Age or later phase of such activity at this site. It was therefore decided to carry out a small-scale excavation in an attempt to determine the answer to these problems.



### Excavation at Ffynnon Rhufeinig:

In June last year, permission was given by Mostyn Estates and Conwy County Borough Council to excavate within an area 40 x 40m immediately to the north of the wellhead. Four trenches positioned in order to investigate a number of the different features identified during the pre-excavation stage of analysis were dug over a three week period, with the help of six archaeology students from Sheffield and a Teaching Fellow, David Dungworth. Fig. 4 shows excavation in progress.

Within each trench, care was taken to record the presence of a number of different features considered to be characteristic of the debris of specifically prehistoric ore washing. These included:

Concentrations of rock types, such as altered dolomitic limestone, chert and copper carbonate ore, thought to have been exploited by Bronze Age miners and not naturally outcropping at Ffynnon Rhufeinig.

Well-graded deposits of rounded-subrounded material with the characteristic lithologies mentioned above.

Deposits of this type are typically considered to be the product of ore crushing and hand sorting, predominately sandy material being the result of grinding and washing.

The presence of bone and stone artefacts thought to have been used as mining and ore processing tools at the Great Orme during the Bronze Age. These include fragments of bone stained a blue/green colour due to impregnation by copper carbonates and igneous or metamorphic beach pebbles that may have been used as mining, crushing and grinding tools.



Fig. 4 Coordinating!

The presence of charcoal fragments disseminated through the soil matrix. This is one of the characteristic indicators of firesetting and, when found associated with other cultural material considered to be characteristically prehistoric, such as bone and stone artefacts, could represent mining and processing debris.

the presence of any artefacts and structural features that could be associated with any of the stages involved in ore processing, such as stone, wood and clay-lined buddles, devices which allowed water to "flow down a suitable gradient leaving the heavier material deposited at the head" (Hall 1990:78).

In order for a deposit or context to be interpreted as the product of Bronze Age activity at this site, it had to meet most, if not all, of the above criteria.

### RESULTS:

Unsurprisingly, this preliminary excavation actually raises more questions than were answered:

The results of the excavation of Trench I, positioned across one of the potential spoil tips to the east of the stream, appear to refute the suggestion that these low mounds are spoil tips dating to a phase of ore washing at this site. The mound excavated appears to have been produced during a phase of activity at some point in the fairly recent past, a machine-made glass bead and a large quantity of animal bone, none of it blue/green stained, being recovered from the latest deposits forming this feature. It is possible that this series of deposits could relate to the recovery of copper slime in the 19th century, or to the excavation of material for the resurfacing of Marine Drive during the same period, any unwanted material simply being heaped up to form the observed mound. It could also represent attempts to redirect the flow of water from the wellhead during the early years of this century. Further work should be carried out in order to determine whether similar conclusions can be drawn about the other low mounds observed in this part of the site.

The low linear embankment to the north of the site examined by Trench II also appears to be post-prehistoric in date, a sherd of late 15th/16th century Cistercian-type ware and another of 17/18th century black-glazed ware (*Julie Edwards pers. comm.*) being recovered from the deposit forming the bulk of the embankment. This evidence suggests that this feature may have been constructed sometime after the 18th century, although it is possible that the black-glazed ware actually represents an intrusion into an earlier deposit produced at some point during the late 15/16th century. Alternatively, both sherds could be intrusive, providing little or no indication of the possible date of this deposit - even when pottery is present, dating archaeological deposits can still be problematic!

The precise function of this feature is also still unclear. Its method of construction suggests that it may have been a field boundary, the low earth bank having been consolidated by the incorporation of large limestone blocks into the soil along its top. It may possibly be associated with the rectilinear feature to the west of the site, the excavation of which was not attempted. Alternatively, given its position in relation to both the present and suggested old stream course, it is possible that this embankment was used to control water flow during a post-prehistoric phase of ore-washing activity at this site. Further excavation is clearly needed to help resolve these problems.

A similar puzzle was presented by Trench IV, which also contained little evidence to suggest that it dated to a phase of prehistoric ore washing at Ffynnon Rhufeinig. This trench was positioned in order to investigate the first in the series of possible leats and pools identified downslope of the low mounds during the topographic survey. The results of this preliminary excavation appear to support the suggestion that these features could relate to a phase of ore washing at this site, although this activity is unlikely to have been prehistoric. A pool-like feature appears to have been constructed by the digging of a shallow depression into the underlying natural, earth then

being piled up to create a more substantial embankment around the edge of this depression. In order to consolidate this bank, stones may have been shovelled onto the top and covered with more earth, more stones being positioned flush to the slope of the shallow depression, perhaps to act as a sort of lining. At some point after construction of this feature, a very fine-grained sediment appears to have been deposited within the shallow depression. This sediment could possibly represent the waste of a later, post-prehistoric phase of ore washing associated with this feature and it is clear that further work is needed to explore this suggestion.

The results of the excavation of these trenches were of great interest, although no convincing evidence had yet been recovered for any phases of Bronze Age ore washing at Ffynnon Rhufeinig. Trench III, located across a considerable earthwork to the east of the site, however revealed a significant number of deposits that possess many of the characteristics proposed above for the identification of possible prehistoric ore washing waste, such as well-sorted concentrations of dolomitic limestone,

malachite nodules and blue/green stained bone fragments. Significantly, the anatomical distribution of this bone appears to broadly reflect the distribution identified within the bone assemblages recovered at the mine site itself, there being a slight bias in favour of ribs and limb bones (Lewis 1993).

Almost all of the deposits within Trench III appear to have been mixed with considerable amounts of intrusive material, indicating that they are not primary contexts but have been greatly disturbed. It is possible that the observed stratigraphic and physical relationships within this trench actually represent successive phases of the reworking of earlier, probably prehistoric, deposits of ore washing debris. Much of this later activity could have occurred during the 19th century, when material thought to contain sufficient copper for smelting may have been dug out of existing waste deposits, that considered to contain insufficient ore mineral being shovelled aside and redeposited. The degree of disturbance indicates that this activity was probably carried out on more than one occasion. The orangey-brown colour of the deposits tentatively identified by this study as prehistoric ore washing waste could also have formed the basis for the observation of the "yellow stain of copper washing" (Roberts 1909 quoted in Jones 1994) recorded at Ffynnon Rhufeinig at the turn of the century.

#### SUMMARY:

As a result of this excavation, it can be suggested that phases of prehistoric activity did occur at Ffynnon Rhufeinig. The nature of the deposits recovered in Trench III and their location close to a water source all indicate that ore washing was carried out there at some point in prehistory. However, when interpreting this evidence, it is important to bear in mind the following caveats: Identification of prehistoric ore washing waste at Ffynnon Rhufeinig is based on our interpretation of the processing techniques that may have been adopted during the Bronze Age at this site. This model is in turn dependent on current understanding of the nature of mining activity on the Orme during this period, both in terms of the type

of ore being exploited and the organisation of production. As our understanding of the prehistoric exploitation of the mine develops, it may be possible to extend and reassess both our model of ore processing on the Orme during the Bronze Age and the interpretation of the evidence recovered at Ffynnon Rhufeinig presented here.

Different processing techniques may have been adopted during different phases of prehistoric activity at the mine. For example, ore could have been washed in tubs close to the mine site, a technique described in Agricola's historic accounts of ore processing (Hoover and Hoover 1950), or, more unlikely, it may have been separated by air winnowing (Doonan 1994). Again, we need to develop our understanding of the different phases of exploitation at the mine before such changes can begin to be detected archaeologically.

It is clear that further excavation and survey work at Ffynnon Rhufeinig is urgently required in order to recover any further evidence of Bronze Age activity there. Investigation of the other features discussed may also shed some light on post-prehistoric phases of activity on this part of the Orme, as these are still only dimly understood. It may eventually be possible to interpret these earthworks within the context of some of the other features that can be clearly seen in the immediate vicinity, both on the ground when out walking and on aerial photographs. Understanding this mine and its role in prehistoric life will be a long but ultimately rewarding process. It is essential that more studies such as this one are carried out if we are ever to put some much needed flesh on the bones of the story of copper mining during the Bronze Age on the Great Orme.

Note: The full report on the excavation at Ffynnon Rhufeinig, including other post-excavation analysis not discussed here, is available for consultation in the Society's archives.

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Emma Wager, Liverpool University, Summer 1996

More was to come, as excavation of the soil on the west side of this rib quickly revealed a narrow, tortuous trench running parallel to the rib and cut through the solid rock to a depth of almost two metres. On the north side of the excavation this trench continued as a tunnel beneath a layer of massive limestone, finally emerging into daylight again about three metres further north, just above the cliff which forms the east side of the Great Opencast.

Near the bottom of this trench-cum-tunnel (to be known as passage "A") some real prizes appeared - several stone hammers and a large number of bone fragments, including several complete tools. The best of these was a complete rib from some large animal, probably a cow, with one end artificially rounded by wear, perhaps as a gouge. This was lying horizontally right on the bedrock at the bottom of the trench, at a point where this narrowed sharply to less than ten centimetres. Could it, I wonder, have been yet one more of those "ritual deposits" found in so many places in the mine, beseeching the "gods who make the copper" to allow the previously rich vein to continue? Sadly, the gods must have been otherwise engaged at the time of this prayer, as the vein obviously petered out a short distance beyond.

To the east of passage "A", and running parallel to it along the top of the rib of bedrock, was a much smaller tunnel - passage "B" - which also penetrated right through the massive limestone capping and out into the daylight beyond. But this passage was so very narrow, barely forty centimetres in diameter, that even a small child would have difficulty working in it, whatever the threats or bribes. In fact, after the first two metres the passage suddenly narrows still more, and then opens out again beyond suggesting that it was worked from both ends.

East of the bedrock rib was a large mass of boulders in a matrix of very sticky clay, and this deposit continued eastward right up to the little cliff forming the east side of my excavation. At first I thought that this stony platform was artificial - a foundation, maybe, for some of the machine or process set up by the 19th Century miners. But now I am inclined to think it is natural, the result of a roof-fall or landslide. When I eventually overcame my scruples and dug away the whole mass I found underneath it a solid floor of undeniable bedrock, and crossing this floor in a north-south direction two shallow grooves, upto thirty centimetres deep in places, obviously marking the locations of two more copper veins. No sign of copper there now, except for the faint green staining left by the Malachite on the side walls.

The westernmost of the two grooves - passage "C" - produced very little in the way of bone fragments or other evidence of Bronze Age working, and petered out just south of the northern edge of the excavation. But the eastern one - passage "D" - was much more promising. As I followed it northwards, it got gradually deeper, until just at the northern edge of the excavation it dived down steeply beneath what looked almost like a masonry wall. Cleaning off the surface of this pseudo-wall I found a little

hole, and testing the depth of this with a measuring rod I found - to my surprise and delight - that the rod went in for over fifty centimetres without meeting anything solid. Could this be the "Hidden Passage" of so many of my dreams, I wondered?, and put up a little prayer to the Guardian Spirits. Then, having photographed the "wall" from several different angles, and also made a careful drawing of its main features, I demolished it with a sledge hammer and much relish - and found my prayer answered. For in front of my eyes was a beautiful big passage, roughly square in cross-section, and about 1.5 metres high and broad, with a fine solid roof and an equally fine smooth rock floor.

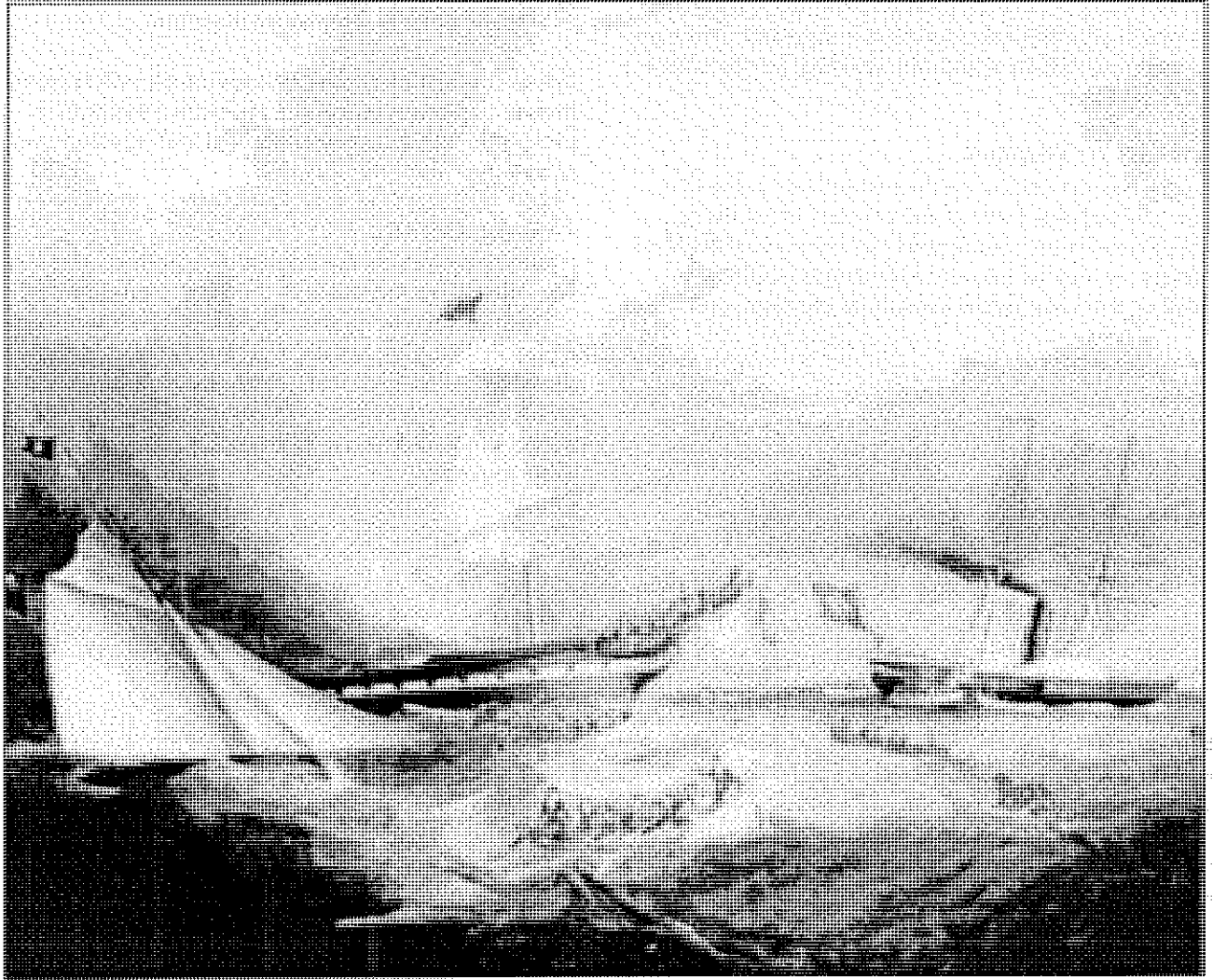
Further excavation showed that this passage went eastwards for about two metres and then turned sharply northwards - and in the light of our torches we could see it continuing for an unknown distance. Alas, it was blocked almost to the ceiling with large angular boulders set in a matrix of soggy - and very sticky - clay, and removing this will clearly take a lot of muscle-power and carefully-chosen invective. Meanwhile, the rains came, the winter set in, and we had to leave this new passage - passage "E" - until next season.

I have great hopes of it for 1997. Various experts, including Andy, assure me that it does have a Bronze Age look about it, even though its walls do bear two obvious shot-holes. These might have been made by modern (18th or 19th Century) miners reworking an ancient passage, as they did in a number of places in this mine. If it is Bronze Age, then it might - just *might* - connect with another complex of Bronze Age underground workings some metres further north, found by Andy during his underground surveys some years ago but still awaiting full exploration. Which could be exciting.

Meanwhile, Thank You, kind Guardian Spirits.

*Geoff David, Llandudno, 1997*

BURNING OF THE OCEAN MONARCH OFF THE GREAT ORME,  
24 AUGUST 1848



Launched only the previous year, and described as one of the finest and largest ships ever built in the United States, the OCEAN MONARCH was a notable addition to Enoch Train's White Diamond Line of Boston-to-Liverpool sailing packets. Her total loss with almost half of those on board aroused enormous public sympathy on both sides of the Atlantic.

Walters painted at least three pictures showing successive stages of the conflagration and rescue attempts, this being the intermediate one, when only the foremast was still standing. First on the scene was the cutter yacht QUEEN OF THE OCEAN, commanded by Thomas Littledale, Commodore of the Royal Mersey Yacht Club, seen on the left in the painting, having launched her boat to pick up survivors. On the right is the Liverpool-built Brazilian naval steam frigate AFFONZO. Having started in the after cabin, the inferno has now reached the bow, with only a small group crowding forward of the foremast and out onto the bowsprit. The jib boom has given way, and some desperate survivors are using it as a means of escape.

Women and children too terrified to make any such attempt were rescued by Frederick Jerome, a British crew member of the nearby American sailing packet NEW WORLD. Climbing aboard by means of the trailing gear and rigging, he succeeded in lowering them to within reach of the waiting rescuers.

Shortly afterwards the foremast fell, as portrayed in another painting by Samuel Walters. Within a few hours the OCEAN MONARCH burned right down to the waterline, and subsequently sank. The hulk remnants still lie on the seabed northeast of the Great Orme, the outline of which is visible just astern of the AFFONZO.

*Marine Paintings and Drawings, Peabody Essex Museum.  
Samuel Walters (1811-82)  
Oil on canvas 41 in. by 52 in.  
Obtained from the Internet, Last updated  
November 25, 1996*





**CENTRE LINE SURVEYING:**

Cave surveying is generally based around a centre line from which all other information is connected. There are two basic methods by which the readings for the centre line can be made.

**FORWARD TECHNIQUE:**

This proceeds by setting up the instruments at the first station and sighting them at the second, when these readings have been completed both the instruments and the target are moved forward and station readings are then taken from the second station to the third, and so on.

**LEAP FROG TECHNIQUE:**

Here the instruments are set up at the second station and readings taken to a target at the first. Next the target is moved to the third station and readings are taken to it while the instruments are still at the second station. When this has been done the instruments are moved to the fourth station and measurements taken to the third, then the fifth, etc.

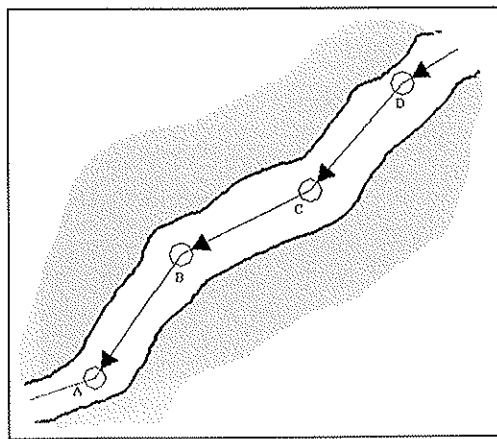


Fig. 1a  
Forward  
traversing

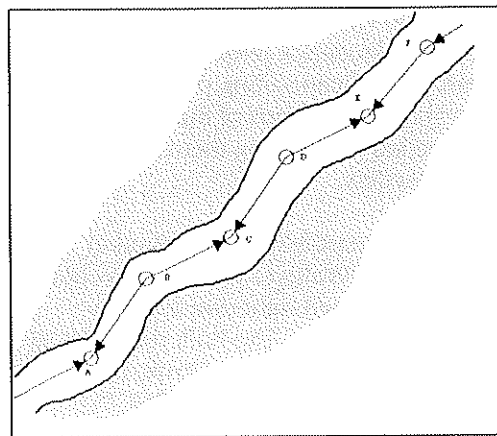


Fig. 1b  
Leap-frog  
traversing

The accuracy can be improved if instead of leap-frogging, readings are taken in both directions on each leg. It is a time consuming exercise but shows up errors in readings immediately. Otherwise, the leap-frog method is recommended as it is quicker and inclined to be more accurate because it can cause some systematic errors to cancel one another out. Its main advantage is that alternate stations (those only used as target stations) do not have to be as accessible and this can make a very big difference when surveying in constricted passages.

However, the fact that some compass and clinometer readings are taken in a backward direction can give rise to mistakes when the survey is being calculated, especially with an inexperienced surveyor. It is very important to indicate clearly in some way or another those readings which are taken in the reverse direction.

Whatever method of surveying is used it will be found that on occasions one of the alternative methods is preferable, these can be combined with readings noted to record this.

**PASSAGE DETAIL:**

A survey should always consist of more than just a centre line, it requires the shape of the area to be shown. The amount of detail required depends on the intended class of survey being produced. The amount of detail also depends on the final scale of the drawing produced, there is no point in spending time surveying detail which when drawn out will not be possible to be shown on the final scale drawing.

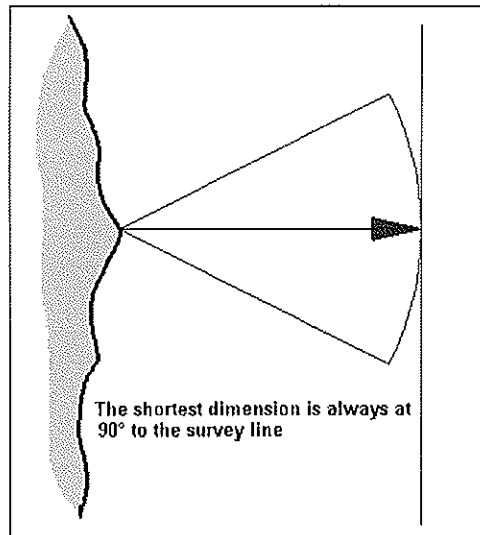
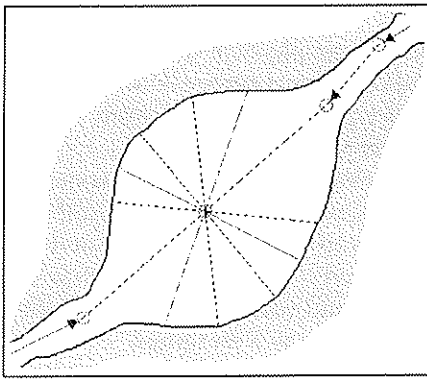


Fig. 2 Offset  
method

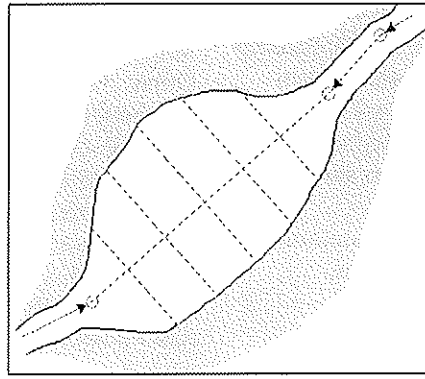
Although measurements made for the centre line must be as accurate as possible, this is not necessary for the detail. Passage width is likely to change at various heights so small errors will not be significant, in any case will only affect one measurement and not the survey as a whole. Measurement to the nearest 25 or 50 cms will usually be sufficient.

The passage details are measured as offsets to the main survey line. The passage wall details required can be located by swinging the tape from the wall, the shortest distance being the measurement at 90° to the survey line at that distance along the survey line as shown in figure 2.

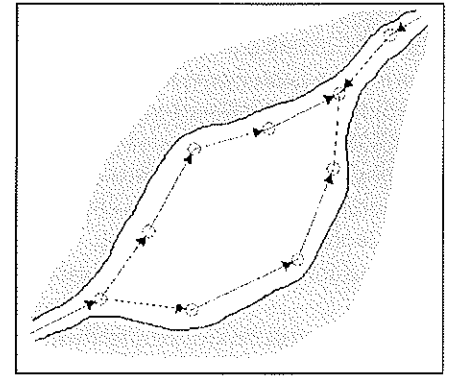
In very wide passages or chambers it may no longer be practical to simply measure the distance at right angles to the centre line. It may be necessary to take the centre line around the chamber so forming a closed traverse or to measure radial legs. If there is an appreciable slope (greater than 10°) and if the distances are large, clinometer readings will also have to be taken (figure 3).



a) by radial legs



b) by offsets from traverse



c) by closed traverse

Fig. 3 Surveying wide passages and chambers

### SURVEY READINGS:

The recording of the survey can take many different forms, a typical example is given in figure 4, all readings are taken looking in the direction of the survey line.

SURVEY OF LESSER KNOWN CAVE					DATE 12 JAN 1997				
FROM	TO	COMPASS	CLINOMETER	DISTANCE	STN.	LEFT	RIGHT	UP	DOWN
A4	A5	014	+14	5/62	A4	0/58	0/86	0/25	0/65
A5	A6	125	-2	9/65	A5	0/25	1/25	1/68	0/54

Fig. 4 Typical survey recording sheet

The stations for a survey can take various forms, the example shown in figure 5 has string lines hung from the roof to position the stations, a knot is tied at a convenient level to take readings on each station which enables the distance between the knots to be measured and the inclination. Compass bearings are taken by lining the two string lines together with the sighting compass. The station details are taken as height above knot to the roof and below to the floor as well as left and right.

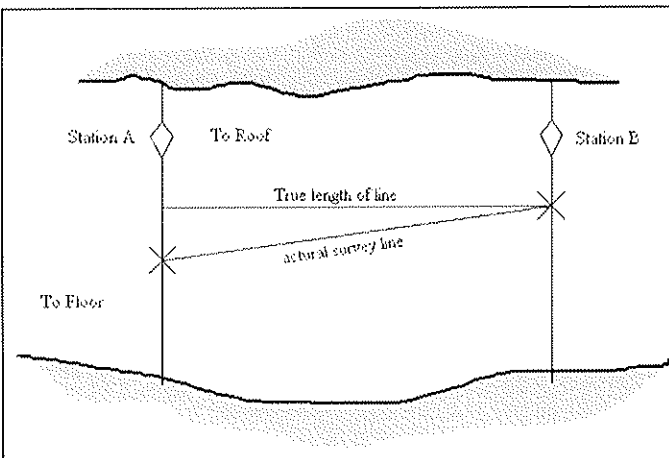


Fig. 5 Typical survey stations

The passage details are recorded with a centre column to record the distance along the survey line with offsets shown to left and right together with the direction of the survey.

### SURVEYING TIPS:

- Where a decimal point is required use an oblique stroke eg. 26/3 not 26.3 as this is easier not to mistake in dirty or muddy conditions, especially when plotting the survey.
- Don't alter any figures, these should be crossed out and rewritten clearly.
- Ensure all clinometer readings have + and - signs.
- Always use three figures for compass readings eg. 014, as clinometer readings cannot be three figures.
- Don't try to save paper, start a new sheet when muddy or reasonable full, less information can mean clear information.
- Stay to one unit of measurement eg. metres or millimetres.
- Always keep completed sheets in a waterproof sleeve to prevent accidental damage.
- All survey books etc should contain your name and address (very useful if lost).

### PART THREE - to cover survey plotting, coming in the next issue.

The Society has its own surveying equipment, anyone wishing to have hands on practice of surveying techniques should contact the author of this article. (The last leg in the Ty Gwyn remains to be completed.)

Stephen J. Lea, Glan Conwy, April 1997

During the Easter period, under graduate students from the School of Archaeology, Classical and Oriental Studies (SACOS) and University of Liverpool conducted a geophysical survey of Pen-y-Dinas. This hillfort site was the subject of a contour survey by Gwynedd Archaeological Trust in 1993. This highlighted a number of circular features which are probable hut circles.

The use of geophysics is a non-intrusive method of discovering what lies beneath the soil surface. It enables archaeologists to identify walls, ditches and hearths without digging the area. By using different techniques such as resistivity and magnetometry, a picture is built up of the underground features, and from these archaeologists can glean the nature of the structures.

**Why is this study necessary?**

Pen-y-Dinas is a known hillfort site, but we don't know exactly when it was used. It appears to be similar in structure and position, to other well known, Iron Age hillfort sites situated around the Irish Sea coast and the Isle of Man. However, an excavation conducted in 1960 on one of the hut circles, concluded that it was a "Bronze Age Summer Camp".

At this time the vast underground prehistoric copper mine in Pyllau Valley on the other side of the Orme, had not been identified, as it was difficult to see why people would want to come up to the Orme at all! With the discovery in the late 1980's of the age of the mine, a whole new scenario emerged.

Studies conducted at the mine since then have in the main concentrated on the workings themselves, the types of ore extracted and the amount of copper removed. Only recently have we started to turn our attention to the society which worked in the mine and which provided the "back up services". Where did the miners live? Where did they raise their crops and keep their animals? Where did they process the ore from the mine? Where did they bury their dead? These questions need to be answered if we are to reconstruct the Bronze Age environment of the Orme, and work out the importance of the mine to the whole of Europe.

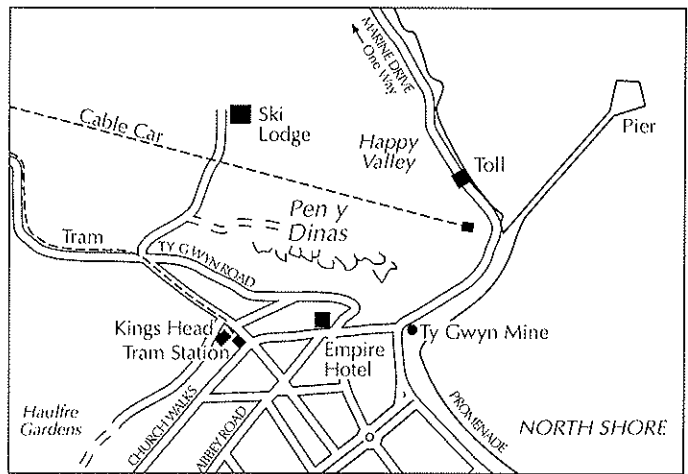
Analysis of the data obtained during the survey should provide us with some answers to the above questions. By the time it is completed, we would hope to have a clearer picture of the exact number of structures inside the hillfort. We may be able to say which were living areas and which were not, and by comparing the results with other known Bronze Age or Iron Age sites, we hope to shed some light on the use to which these structures were put. Either way we will have increased our knowledge of this important prehistoric area.

**Further survey:**

Running in parallel with the geophysical survey on Pen-y-Dinas, a contour and topographical survey is now being conducted (again by under graduate students from SACOS), on the area below Mynydd Isaf. Aerial photographs from 1947 onwards have shown up some possibly interesting features, which again require further investigation. Field survey work can only be done at this time of year when the bracken is down and the features are more easily identifiable, and when disturbance of the natural environment can be kept to a minimum.

We would like to thank Conwy County Borough Council for their permission to carry out these surveys, and local residents and businesses for their help and cooperation.

*Jo Jones, Post Graduate Research Student, SACOS, University of Liverpool, 1997*



Location of Pen-y-Dinas

## HANDLIDNO FRUIT CAKE

8oz butter  
4oz caster sugar  
4 eggs, separated  
1 teaspoon grated orange rind  
1 teaspoon grated cinnamon  
4oz ground almonds  
2oz ground rice  
12oz self-raising flour  
8oz raisins, finely chopped  
4oz currants, finely chopped  
2oz glacé cherries, finely chopped  
4oz sultanas, finely chopped

Set oven to 350°F or Mark 4. Grease and line a 9 inch cake tin. Cream the butter and sugar together in a mixing bowl until light and fluffy then break in the egg yolks, the orange rind and the cinnamon. Mix the ground almonds and ground rice into the flour and then add this, a little at a time, to the creamed mixture, alternating with handfuls of the fruit. Beat well after each addition. Whip the egg whites until stiff and fold carefully into the mixture. Turn the mixture into the cake tin and bake for half an hour. Reduce the heat to 325°F or Mark 3 and cook for approximately 2 more hours; the cake is cooked when a skewer pushed into the centre comes out clean. Cool in the tin then turn out onto a wire rack. Leave until quite cold.

*Taken from 'Favourite Welsh Recipes', compiled by Sheila Howells*

## CAVERS SLANG DICTIONARY

Here are a few cavers' terms compiled by Tom Moss from postings by individuals all over the world, and reflect the language of various regions:

AIR RAPPEL - an accidental fall down a pit  
ARMCHAIR CAVER - one who talks about caving more than going underground  
BABYSITTING - referring to those cavers who can cave one day of the weekend, while they look after the kids for the other day  
BOMB PROOF - suitable natural rig point  
BOTTOMED OUT - reaching the lowest part of a vertical cave  
BRAIN BUCKET - helmet  
CARBIDE ASSIST - refers to "encouragement" of a caver (especially slow cavers) in a crawlway by a close following carbide caver  
CARDBOARD CAVER - a caver who turns around at the first sight of wetness - so that his/her layers don't delaminate  
CRATERING - too fast a rappel ending with too quick a stop. "Put a knot in the end of the rope or ya' might crater"  
CHEMICAL PERSUASION - explosives...



DANGLE - a strap used to hang packs out of the way below your feet while on rappel  
EARDIP - water passage that gets so low that you must drag one ear on the ceiling, while the other dips below the water  
ENTRANCE FEVER - when a caver is anxious to get out of the cave  
GOES - the report on a lead that says it continues  
GROTS - any caving clothing, save only that it is well used  
INSTANT CAVE - explosives  
JANGLIES - assorted SRT ironmongery  
ROCK SOLVENT - explosives  
SPELUNK - the sound made by a caver hitting the bottom of a pit (see Air Rappel)  
SRT - single rope techniques  
STINKIES - carbide lamps  
WINKER - a fray in a caving rope when the core is exposed

*From the Cavers' Digest electronic mailing list, edited for the World Wide Web by Loel Laws, 1997*



## CONSTITUTION OF THE GREAT ORME EXPLORATION SOCIETY

1. The Society shall be known as the Great Orme Exploration Society and shall be referred to below as the Society.

2. The aims of the Society shall be to encourage the study of caves, mines and allied subjects of the Great Orme and Llandudno area, for the scientific and recreational benefits of the members of the Society and the general public. The Society's objectives shall include:

- 2.1. The discovery, exploration and conservation of caves and mines.
- 2.2. Keeping a permanent record of Society discoveries and activities.
- 2.3. Preservation of archaeological material and mining relics.
- 2.4. Conservation of flora and fauna.
- 2.5. Giving lectures, displays, staging and attending conferences.

3. The income and property of the Society shall be applied solely towards the pursuance of the objectives of the Society as set forth in this constitution, and no part thereof shall be transferred to individual members of the Society.

4. Membership of the Society is open to all those interested in the aims of the Society as set out in paragraph 2. The committee reserve the right to refuse membership after due and careful consideration. Honorary members may be elected by the Society at an Annual General Meeting. Such membership shall be for a period of three years, when its renewal will be reviewed.

5. Applicants under sixteen years of age must provide written parental consent, and be accompanied on Society activities by parent(s) or appointed guardian, who must also be members of the Society and must be responsible for their charges at all times.

6. The committee reserve the right to expel any member of the Society after a proper hearing.

7. Annual subscription shall be payable on January 1st. The amount due shall be reviewed annually by the committee. Paid-up members will be advised of General Meetings and will be eligible to vote. No voluntary donation shall be binding on the Society.

8. The business of the Society shall be conducted by the committee consisting of a Chairperson, Vice-Chairperson, Secretary, Treasurer and Public Relations Officer, who will be elected at the Annual General Meeting and have authority to co-opt members as necessary. In the event of a tied vote, the Chairperson shall have the casting vote. Candidates for election to the committee must declare all possible conflicts of interest prior to nomination; eligibility for election shall then be judged by the members of the Society at the Annual General Meeting.

9. The Society shall maintain a bank account in the name of the Great Orme Exploration Society. Three members shall be eligible to sign cheques on behalf of the Society: the Treasurer, Secretary and another committee-approved member.

10. The Treasurer shall keep books of account of the Society's business, which shall be brought before the members at the Annual General Meeting.

11. The Secretary shall keep a proper record of all Society business, which will be made available for inspection by members on request. no member shall enter into any correspondence or agreement using the name of the Society without the approval of the committee, or commit any act likely to bring the Society into disrepute.

12. The Public Relations Officer (PRO) shall promote the Society's interest through exhibitions, lectures, liaison with the press and via any other suitable means. The PRO shall operate under the constraints of paragraph 11.

13. A suitable person shall be appointed each year to audit the accounts.

14. The Society shall bear no responsibility for accident, injury or any loss which may occur to members or non-members attending Society activities.

15. No member shall use Society equipment without the approval of the Equipment Officer.

16. The Society shall maintain insurance cover only on paid-up members over the age of sixteen whilst engaged in Society activities. Cover shall be restricted to third party risks only. Such part of members' subscriptions, as are required to provide the cover, shall be set aside for that purpose. Members are strongly advised to take out their own personal insurance. Those members under sixteen years of age, shall provide their own personal and third party insurance, a photocopy of which shall be lodged annually with the Society's secretary.

17. Amendments to the Constitution can only be made with a quorum of 70% of the members present at the Annual General Meeting or at an Extraordinary General Meeting called for the purpose. A proposal to alter the Constitution, must be received by the Secretary at least 21 days before the meeting at which the proposal is to be discussed. At least 14 days' notice of such a meeting must be given by the Secretary to the membership and must include notice of the alterations enclosed.

18. Postal votes or nomination of a proxy vote must be received in writing by the Secretary prior to the meeting at which the vote is to count.

19. The Society may be dissolved when, at an Extraordinary General Meeting with a quorum of 70% of the members present, the resolution to dissolve the Society is carried by a 2/3 majority. This Extraordinary General Meeting shall be convened, and notice of the resolution shall be given, as described in paragraph 17. Following the discharge of all liabilities and debts, the remaining assets of the Society shall not be distributed to the members, but may be transferred to another Society or Institution with similar aims and objectives to the Society.

*October 1992, Llandudno*