

**JOURNAL OF THE**



**OCTOBER 1996**

£2.50 to Non-members

## FRONT COVER

Quern found by Dave Flowers on Penmaenmawr beach earlier on this summer (1996). A quern was used for grinding material, and its shape has been found to sit comfortably on your knee, snugly fitting around the stomach. Also shown next to the quern is a large lump of copper slag, found in the same location.

## EDITORIAL

Welcome to your new look journal and to your new look editor. I have recently taken over the editorial duties from Don Smith. I would like to say a big thankyou to Don for the hard work he put into all those journals he published over the years. I would also like to thank everybody who contributed to this journal. There will be many more like this in the future so please keep those interesting articles flowing - without you, there would be nothing to read.



Don't forget that on production of your membership card, all GOES members can take advantage of discounts at the following places:

Juan and Juliette of the **Kings Head** have kindly offered a choice of either a free starter or a free bottle of wine for every two people dining (four people = 2 bottles of wine). This offer applies to the Main Menu only.  
**Millets** – 5% on purchases under £50 and a 10% discount on purchases over £50.  
**Climber and Rambler**, Betws y Coed – 10%  
**Outdoor Leisure Supplies**, Ruthin – upto 20%  
**Settle Watersports & Caving** (and accommodation) – ask!  
**Cash Clothing Company**, Colwyn Bay – 5%  
**Joe Brown**, Llanberis & Capel Curig – 10% on most items  
**Camp & Climb**, Chester – 10% on most items  
**Rough Country, Wild Water**, Llangollen – varies; ask!  
**Famous Army Stores**, Rhyl & Chester – £5 vouchers on items over £25

You may be interested that Mike Moore deals in specialist mining books and mining share certificates. He can be contacted on 01952 405105

*Alison Walton, Llandudno September 1996*

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*Our Chairman like you've never seen him before!*



## A CHRISTMAS DINNER TO REMEMBER: PEACOCKS AND PYROTECHNICS

The 1994 Christmas party in the Wedgewood Hotel was a great success and much like the good old times. Barry and Yvonne, our host and hostess, provided an excellent meal with second and third helpings of the delicious puddings. The atmosphere was relaxed and informal, which is most essential on these occasions.

This year the members surpassed themselves in their sartorial elegance. Graham looked very suave in a Canadian navy shirt trimmed with crisp white piping. There were some smart gentlemen in well cut suits and the more casual look was adopted by some members who wore macho sweaters and slacks. However, the real trendies, in keeping with the traditions of the Victorian miners, turned up in waistcoats. Tony, absolutely in character, was the peacock of the evening in his superb, blue, shot silk ensemble, decorously spattered with these elegant birds. Andy by contrast, sported a brilliant multi-coloured striped affair. The ladies were a little less colourful. Di's beautiful black creation, iridescent with sequins, was the cynosure of every eye\*, and Eve's more subdued black, studded with small pearls and silver sequins, was overshadowed by this spectacular brilliance. Helen's creation was in snug fitting black velvet, modest, but the envy of the less trim ladies of the party.

Well done members. Let us hope this becomes a tradition of high fashion amongst GOES. Can we look forward to floral patterned wetsuits underground?

The highlight of the evening was a brilliant firework display. A member who has arsonistic tendencies, decided to play with the centrepiece candle and set fire to the foil cover from her wine bottle. The resulting evil black smoke, curling towards the ceiling, gave off a noxious 'bouquet' (Gilly would not have approved).

The occupants of the adjoining table became greatly alarmed. Fortunately, the smoke detectors decided to ignore the highjinks. At another table, a certain highly intellectual and respected lecturer from Llandrillo Technical College, attempted to blacken her husband's face with a burnt cork and in the ensuing battle, dropped a lighted taper onto the floor. Luckily nothing became seriously ignited.

However, sometime later the table decorations burst into spontaneous combustion (or was this too, arson?) and had to be doused by our host. When we departed for home after this truly enjoyable evening, the Hotel was still standing.

\* With apologies to John Milton!



Eve Parry, Llandudno, December 1994

## CHRISTMAS DINNER 1996

This year Alison Walton and Tony Davies are organising the festive celebrations. The meal will take place in Richard's Bistro, Church Walks on Friday November 29th. Meals will cost £16.00 per head and must be booked in advance. You will find enclosed a booking form. If you would like to attend the meal then please complete the form and return it to either Ali or Tony by 15th November, along with your cheques (made payable to GOES). Unfortunately Richard can only seat 30 people so it will be a case of 'first come, first served'



### STARTER:

*Duck Liver Pate with Cumberland Sauce*

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*A Winters Vegetable Soup*

~~~~~

*Grilled Goats Cheese Salad with Roast Hazelnuts*

### MAIN COURSE:

*Roast Breast of Chicken Stuffed with Ham and Melting Cheese on a Creamy Tomato and Basil Sauce.*

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*Salmon and Lemon Sole Parcel with a White Wine and Spinach Cream Sauce.*

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*Roast Peppers with a Lentil, Leek and Cheddar Stuffing Served on a Spicy Thai Chilli Sauce.*

### SWEET:

*Sticky Toffee Cheesecake*

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*Brandy Snap Basket with Lemon Ice Cream*

~~~~~

*Chocolate and Vanilla Charlotte*

~~~~~

*A Pot of Our Calypso Ice Cream*

~~~~~

*Fresh Raspberry Roulade*

~~~~~

*Coffee*



## "TO GREAT ORME"

Arise, O Orme, from out your sleep!  
And then be born again  
This autumn, though your leaves may weep;  
In spring revive, be fain.

Then keep your members from decay -  
Your tram, your cable car -  
Each has a little part to play  
Though summer days are far.

And now your cairn looks like a hearth!  
A fire for winter's hours  
of biting chill, the time of dearth;  
While waiting still, wild flowers.

*John Benson, Llandudno, September 1996*

## MEMORIES - ANTICIPATION - LIFE

There I was, leaning against my friends  
In the corner of the hardware store.  
Thinking about my past existence.  
I was still so shiny and new.

When, into the store came a tall stranger.  
He looked me up and down with a complementary gaze.  
Casting his eyes over my slim, yet strong shape.  
My long body and my strengthened back.

I was whisked off by the stranger.  
to a stone built cottage with an entrance porch.  
I thought my new life would be comfortable.  
Standing looking out at the world passing by.

My hopes of peace and tranquillity were soon shattered.  
The stranger took me out one fine sunny Sunday  
to a very strange hole in the ground.  
It was dark, very cold, wet and dirty.

My shine and inexperience soon disappeared.  
I was forced into the floor by many feet.  
My strong strengthened back soon ached.  
It was hard labour that was expected of me.

After what seemed an age of exertion  
the stranger took me back to the porch.  
He left me all dirty and aching.  
Leaning me up against my new friends,  
the pick and the mattock.

*A Spade, Llandudno, October 1996*

## WEIL'S DISEASE

Weil's Disease is a bacterial infection spread by the urine of rats. Cave/mine water draining from farmland or areas of human habitation is usually infected with the leptospirosis bacterium. The organism enters the body through breaks in the skin or via the nose, throat or alimentary tract. Mostly Weil's disease resembles an attack of the flu but it can cause serious illness or death.

### Testing for the disease:

A blood test is usually undertaken to confirm this notifiable illness. If the local Public Health laboratory is not equipped to undertake an ELISA Test, the sample should be sent direct to:

The Leptospirosis Reference Unit, Public Health Laboratory, County Hospital, Hereford HR1 2ER.  
Telephone 01432 277707.

### WEIL'S DISEASE CAN BE A SERIOUS ILLNESS.

If it is suspected, antibiotics must be administered immediately.

### Symptoms:

The incubation period can be from 3 to 19 days.

Early symptoms are: Fever, muscular aches and pains, loss of appetite, vomiting with prostration.

Later symptoms may include: Bruising of the skin, sore eyes, nose bleeds, jaundice.

The fever lasts for about 5 days and may be followed by significant deterioration.

If you become ill after going underground, particularly between 3 to 19 days later and have any of the above symptoms, CALL YOUR GP EARLY and tell your doctor you may have been in contact with Weil's Disease.

*This information has been issued by the National Caving Association.*

## ANCIENT BRITON'S FOOD

The Celts seem to have eaten a lot of fish, and the Gauls meat. Both had herds of sheep and cattle, which were prepared for eating by roasting or boiling, all this during the summer months. For winter it was salted.

To make the salt they dug a pit, then set fire to a pile of logs - Oak and Hazel chiefly, and reduced them to charcoal, upon which while it was still glowing they poured quantities of sea-salt water. This converted it's whole mass into a kind of salt of a black colour.

*Just a bit of interest, Ramon Rainford.*

## LLANDUDNO PUDDING

Take the weight of two eggs in suet and flour, and the weight of one egg in sugar and well mix together with two tablespoonfuls of jam, the three eggs and a small teaspoonful of carbonate of soda. Steam for two hours. (The weight of two eggs, size 1 is 4oz)

*Donated by Bett Davies, Newport, September 1996*

## KENDRICK - THE MAN NOT THE CAVE!

I write of Thomas Kendrick, the well known lapidary, who discovered Neolithic bones at the back of his Orme workshop. Because of this stroke of good fortune, Thomas became the celebrated man whose name will be forever associated with a cave. However, few people have any knowledge of Thomas's life before this event.

Thomas was born of a very poor family, in a cottage at Pant-y-Wennol in Craigside. He was the eldest of five children, one of whom, Joseph, died in infancy. Thomas's Father, William, born in Ysceifiog in Flintshire, was a copper miner on the Great Orme, and his Mother, Anne, came from Llanrhos. Thomas was christened in Ebenezer Calvinistic Methodist Chapel on the 2nd of December, 1821. In the parish records he is known as Thomas Cynric, a surname which two of his brothers, Joseph and William, shared, although his two younger siblings were christened Anne and John Kendrick.

At a later date, the family moved to Bryn - y - Bia Farm, where Thomas's Father, William, died in 1835 at the age of 42. After his death, the family had no means of support. As William had not been born in Llandudno, the Parish returned the widow and her family to Ysceifiog, where, according to the Poor Law, he would have been entitled to a settlement. The expense of the move, paid by the Parish of Llandudno, was thirty shillings.

By the 1841 Census, the fortunes of the Kendrick family appear to have improved, and they were once more living in Llandudno, at No 4 Tan yr Ogof, on the lower slopes of the Great Orme, where Thomas and his brother, William, became copper miners. Eventually, all Thomas's siblings left home, and presumably married. His Mother, Anne, died in 1860, and Thomas, still a bachelor, lived alone at Tan yr Ogof.

By 1871, Thomas Kendrick is described in the Census as a Lapidary. During the Victorian era it became the fashion for the affluent visitors to seaside resorts to collect pretty pebbles from the beach. These they would take to a stone cutter, or lapidary, where the stones were shaped and polished. Obviously, Thomas had realised the potential of this custom. Often high prices were paid for beautiful, green, crystalline pebbles, which were in fact fragments of old glass bottles, worn and rounded by the tide. Business seems to have been very good, and soon Thomas built himself a workshop in a cave under Pen Dinas, the old hill fort. Eventually, he extended his workshop further into the back of the cave, and, as everyone knows, made his astounding discovery - the bones of Neolithic people, brown bear, badger, boar, horse, sheep and goats. Ever the business man, Thomas exhibited these in a small museum, for the viewing of which, there can be little doubt, he would have made a charge.

On the 26th of December, 1897, Thomas Kendrick died of Bronchial Pneumonia and was buried under an ornate marble headstone in St. Tudno's graveyard. He was still a bachelor, although many people claim to be his

grandchildren and great grandchildren. Perhaps they are! In his Will, Thomas left his sister, Anne, effects to the value of £436.,10. 0d, a sizeable amount in those days. Thomas Kendrick had come a long way since he was a poor child living off the parish.



On his gravestone there is a strange little verse:-

"To me you all were kind and true,  
While here on earth I was with you.  
Then do not mourn, you did your best  
You kindly loved me to the last."

One gets the feeling that their best might not have been good enough! Did he write the memorial himself, in anticipation of his death, one wonders?

*Eve Parry, Llandudno, September '96*

## BRONZE AGE MINING IN NORTH WALES

The Great Orme is now recognised world-wide as a major site of copper ore production during the Bronze Age. Ample evidence of ancient man's activity has been demonstrated with the finding of many thousands of mineral-stained bone tools and thousand of stone hammers of various sizes from handy hammer to substantial anvil proportions. Archaeological remains found in context underground, supported by radiocarbon analysis of organic material, bone or charcoal, has dated mining between 1800 and 800 BC. In addition, metallic fragments have been demonstrated within sieved excavats which appear to be bronze, perhaps flaked by hammer blows.

Activity and interest in the potential of early mining began in the late 1970's when Duncan James, working in the area of Roman shaft about 200m north of the Bronze Age Mine Centre, discovered bone and stone tools. He realised their significance, brought them to notice and confirmed their potential significance with a radiocarbon date circa 800 BC. This did not surprise us completely since local literature and archaeological accounts from the last century described, all be it briefly, finds within the mines ascribed presumptively to the ancients.

The major break was achieved when vivien's shaft, a major 19th century pumping and winding shaft, was accessed in the late 1980's for the first time since the mine's closure in 1881. As expected, the major features on entry were those of 19th century modern mining. Almost immediately, and without digging, the evidence presented itself, e.g. stone hammers set into cemented waste in walls and ceilings, bone fragments, characteristic bone tool-marks, charcoal and disturbed calcite flows. very soon the full extent of Bronze Age mining activity became evident, at every turn on the modern cross-cuts tight sinuous passages led off along the mineral veins, some easily accessible others backfilled, but all abandoned and left virtually or totally undisturbed by 19th century man.

Received wisdom in the 1980's dictated that earlier mining activity would be obliterated by later more modern activity. Yes, modern mining, and indeed all mining, is destructive but our experience on the Great Orme would suggest that evidence of early mining activity survives modern man's best endeavours. If, by the financial or ergonomic standards of the day, an area is uneconomical to work, it is left or back-filled and then abandoned to await rediscovery by a later generation of miners who may re-work or destroy it to achieve their economic goal or, like their forbearers, totally ignore it and pass on by. Excavation, surveying and cataloguing by Great Orme Mines Ltd continues at the Bronze Age Mine Centre, as does the search for other sites of ancient mining activity on the Great Orme. On the north escarpment of the Great Orme the Great Orme Exploration Society (GOES) have re-explored a cave/mine. This site (Ogof Tudno) was partially excavated in the 1970's by Tome Stone who found evidence of ancient man in the smaller superficial parts. Since then the depths of the system had not been explored in deference to the then occupants, badgers. A question mark hung over this site for decades and the badgers were left undisturbed.

In the last year it was realised that they had moved away from the site and had been away for some time as the dung and bedding had rotted down and now smelt sweet. A fresh look at the site confirmed the cave features that Tom Stone has excavated as well as the 19th Century widening along the main passage from which radiate mined out flats still bearing mineral remnants (copper oxides) and charcoal. The majority of the floors have been covered by mud brought in by water seeping through faults from above preventing further examination which will follow the detailed survey now underway. Approval has been given for partial excavation which it is hoped will demonstrate objective features of ancient mining and provide datable material. Also recognised within the last year are several more sites on the north escarpment which probably represent sealed mines of as yet indeterminate age. The prospects for this area of the Great Orme seem very interesting indeed.

A similar tale is unfolding at Parys Mountain where Thomas Williams' monopoly of the copper trade was based in the late 1700s. Nearly all the shafts (marked) and adits on this mountain were sealed in the 1970s. During the summer of 1995 a shallow modern working was accessed within a few metres of surface using a JCB backhoe. Within metres of surface, evidence of early mining activity was identified as had been our experience on the Great Orme. Stone tools were present in abundance in walls, deads and cemented debris, along with organic and potentially datable material, charcoal, leaves and bone. To date, evidence of early mining activity has been detected to a depth of 30m and evidence of greater depths is anticipated. A portal has been established and secured for future access.

In my last contribution to the Society's journal I reported the finding of silicate copper-slugs on many beaches, including at Llandudno. Disappointingly these appear to be 18th or 19th Century slugs, probably dumped as ballast by boats arriving to load copper ore for the smelters at Parys Mountain or Swansea. However, within this cloud there was a silver lining. A none too attractive coast defence scheme proposed for Llandudno's north shore, based on theoretical models of beach erosion, was scotched. The bands of slag, clearly visible on photographs taken over the last 100 years, had not moved.

Collaborating with the extra-mural department of University College of North Wales and other local agencies GOES continue surveying beaches and cooperating in underwater survey and exploration. The tree stumps found low on Llandudno's north shore have been sampled and dated at 8000BC, rather older than anticipated and certainly not contemporary with Bronze Age axes and Roman coins found by metal detectors. What, therefore, was happening to sea level in the intervening periods? Our search continues for the answer. As for the smelting sites, we may find them though perhaps not in this part of the Celtic world. Perhaps they're further down the coast nearer fuel or nearer tin in Cornwall.

*Don Smith, Chester, February '96*

## NEW DISCOVERIES ON THE GREAT ORME

Ever since the late 1980's, when the true age of the copper mines on the Great Orme became apparent, the area has attracted great academic interest. The largest known copper mine of the Bronze Age, as well as the only known copper mine in limestone in Britain, is truly unique. A number of studies have been conducted both on material obtained from the main mine site in Pyllau Valley, and on the system of mine workings themselves.

### These studies include:-

1. The identification of animal species from the well preserved bone remains found in Vivian's shaft and elsewhere in the mine system.
2. Lead isotope studies together with ore petrology which was undertaken in order to characterise the copper and lead bearing ores believed to have been mined during the Bronze Age.
3. Work is still in progress on dating the flowstone found both within and sealing prehistoric layers.
4. Other studies have also been done on wasted pebble hammerstones, and experimental work conducted on the hafting of stone mining hammers and on firesetting techniques.

Generally, this and the other British Bronze Age copper mining sites in Ireland, and North Wales, together with areas such as Alderley Edge in Cheshire (which some regard as a prospecting, rather than a mining site), have sparked off much debate and controversy. So far, the majority of the work has centred on the mines themselves, their structure, the way in which they were worked, the type of ore extracted and the quantity of pure metal obtained from the ore bodies.

Whilst it can thus clearly be seen that a considerable body of knowledge has accumulated to do with the mines themselves, little work has been done on the people who worked in the mines. We know next to nothing about where they lived, buried their dead, processed the ore or perhaps engaged in smelting the copper. We do not know if the ore was removed by land or by sea, and we do not know where they farmed the land that supplied the support services required to work the mine for close on one thousand years. In short we know next to nothing about the people of the Orme.

To gain a better understanding of the well organized and structured Bronze Age society that it is believed would have been needed in order for these mines to have been worked for such a long period of time, it is imperative that we determine where they lived, died, and farmed their land.

### Investigations:

The limestone bedrock of the Great Orme is magnetically silent. This means that in theory, geophysical surveying techniques, and in particular magnetometry, can be used to great effect, to find traces of habitation, burial and processing sites, if they still exist. The problem is that in common with other mine sites of this age, later mining practices have caused much early evidence to be

destroyed. With this in mind, and not knowing where the original Bronze Age surface may have been, it was felt that the initial investigation should look at those areas close to the mine where there was the possibility of picking up any surviving evidence. This was done in order that we might attempt to reconstruct the contemporary Bronze Age landscape.

In the Cromlech field, which lies to the South of the main mine complex in Pyllau Valley, there is an upstanding dolman and an associated mound that has always been regarded as contemporary with it. An aerial photograph taken in 1946/47 appeared to show evidence of at least one circular feature in the pasture away from the mound but lying to the South-west of the capped Victorian mine shafts. As this field had remained largely untouched since the photograph had been taken, it was decided to start a geophysical survey here. These possible features required investigation to either eliminate them or to confirm their association with the mine.

After completion of an initial standard field survey, remote sensing equipment in the form of a resistivity meter (RM15) and a fluxgate gradiometer (FM36) was used to survey the majority of the field. Following the establishment of a baseline, the field was surveyed in 20 metre squares over a period of several months.

The RM15 resistivity meter was the first to be used. This equipment measures changes in the resistance to electric currents passed between two probes that are inserted vertically into the ground of the area being surveyed. The equipment used stores the digital data obtained in a data logger where it is retained until it can be downloaded and processed by computer, using Geoplot 2 or similar software.

The readings were taken at 0.5 metre intervals on traverses 1.0 metres apart. It was used on medium auto-log speed, which whilst not being the fastest way of using the equipment, is the one recommended for use when close to overhead power cables. The frequency of 137Hz is carefully chosen to avoid power line operating frequencies and harmonics, thus giving the maximum rejection of power line earth currents whilst still providing a reasonably fast reading response with the twin array.

This equipment is particularly useful for locating buried walls and ditches, and when used in combination with a fluxgate gradiometer (magnetometry), should give the operator a good idea of the subsurface features.

Magnetometer surveys are usually conducted with a fluxgate gradiometer with digital storage and transfer facilities. Again this means that the data obtained is stored in the machine until it can be down loaded onto a suitable computer equipped with a software programme such as Geoplot 2. The readings were again taken at 0.5 metre intervals on traverses 1.0 metres apart. As the name suggests, the machine measures differences in the magnetic field strength, relative to the Earth's magnetic field.

Magnetometer surveys are known to be quite effective over most limestones, although the response over Carboniferous limestones such as those found on the Orme, is known to be less so. However, their main use is in locating areas where the magnetic field is likely to be quite strong, such as occupation areas, hearths and kilns or buried metal objects. It is at its most effective down to a depth of approximately 1 or 2 metres. As the soil cover on the Orme is generally thought to be fairly thin, features down to a depth of a metre or more should be capable of detection by this method.

### Results:

The results from these surveys have to date been both interesting and unexpected, as well as frustrating! The actual mound associated with the Cromlech, was found to extend for at least a further 15 metres to the Northwest, and a further 10 metres from east to west. This mound does not appear to be situated on top of a natural outcrop of limestone as was previously thought.

The whole of the extended mound is in turn surrounded by what appears to be a double ditch with a central bank. Outside the outer ditch are a number of areas, situated at approximately equal intervals, where the resistance is particularly high. This may be due to the presence of buried stone or post hole packing. As the area concerned is too large to have been a building, there is the possibility that what we are seeing are the remains of a henge monument.

Over laying the outer ditch, in an area corresponding to that seen on the aerial photographs, is a circular feature approximately 20 metres in diameter. This is in turn overlaid by regular, although faint traces, of ridge and furrow. As an added item of interest, when the last of these surveys were being conducted in late July and early August, the dry weather had caused patches of the pasture to die off in a number of places. Four of these were found to correspond to the areas that had high resistivity readings, although three others did not show any such correspondence. Recent work in the area has shown that the ridge and furrow now also show up well. This is partly due to the dry weather, and partly because the pasture has been well cropped by sheep.

### Interpretation:

The interpretation of these results have led me to the following conclusions:-

1. That the possible henge monument and the dolman were the original focus of this particular ritual landscape, during the Neolithic period.
2. That this feature was extended at some stage yet to be determined, by the addition of the ditches and the mound, and then continued in use for some considerable time possibly in the late Neolithic or Early/Middle Bronze Age.
3. Subsequently a third stage of use resulted in the circular feature that overlies the outer ditch and is therefore younger than it. This in its turn was eventually overlaid by 4th stage of use, medieval ridge and furrow.

This would indicate that the then existing monument of the mound and dolman continued to be respected, whilst the circular feature was not so treated.

My personal interpretation is that this ritual site, almost certainly a burial site during the Neolithic, was subsequently retained, reused and respected by those who came after. This was despite the changes in burial practices which became apparent in Britain and elsewhere in Europe in the Bronze Age. The extended burial of the whole corpse in the Neolithic, was largely replaced by cremation, with the ashes of the deceased being placed in an inverted urn. It then became the practice for Bronze Age people to insert secondary cremations into the sites of primary burials of the Neolithic period. This showed a continued respect for the site itself, although the actual rituals of burial changed.

I believe the site was enlarged at about the time of the mine's first intensive use, to meet the society's requirements and that it then continued to be used for the whole of the time that the mine was being actively worked. I must stress that this is supposition on my part and remains unproved, although I believe it would fit in well with both the evidence that we have of this site, and our current knowledge of the Bronze Age in Britain as a whole.

There is one area of the site, which lies almost due north of the mound which poses some problems. This area is one that could or might be interpreted as an entrance, and it is here that the magnetic readings are particularly high. Resistivity readings in this area are also high. There does not appear to be any surface anomalies at this point, but the readings may be due to buried metal, or to the presence of a hearth.

It is perhaps unfortunate, that the only way in which most of these results could be verified would be to dig a number of test trenches across certain carefully preselected areas. As this is not possible in this instance, no doubt the debate and interpretation of the findings will continue for some time.

I would like to thank all those people on the Great Orme who have allowed me access to and use of their land and have thereby enabled me to start this study. To the Great Orme Mine and staff who have been both helpful and supportive and in particular to other members of G.O.E.S. for their help and encouragement. Any mistakes or misinterpretations in the above are purely my own.

*N.B.* It is important to remember that the Cromlech and associated features are on private land. Anyone wishing to visit the site should obtain permission from the landowner at Pyllau Farm.

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Jo Jones, August 1996



## EARLY DAYS - PART 2

This is a continuation of Tom's story describing his early days and his recollections of Llandudno.

*(Part 1 can be found in the 1995(3) edition)*

A little further down the road from the Palladium on the corner of Gloddaeth Street and Deganwy Avenue a site now occupied by a large block of flats was a market garden. Called the 'Vinery', it sold home grown vegetables and fruit etc. Situated between New Street and Gloddaeth Street on low lying land and surrounded by a wall with a small shop window and a doorway fronting onto Gloddaeth Street it was patronised by the numerous hoteliers and boarding house landlady's. Eventually the Odeon cinema occupied the site, now demolished it has been replaced by a block of flats.

Before leaving those days I must say something about Madoc Street. Mostyn Street was the main road through the town with all the classy shops of those days, but in Madoc Street were all the craftsmen of their time. At the Lloyd Street end was a chemists shop, a gentleman by the name of "Gibson" who in the times when the NHS was unheard of helped many families when they could not afford a doctor. Stubborn colds and coughs, tell him your problem and he would prescribe, if you had no money; "pay when you can" he would say, I like to think every one did. Walking up the street in the direction of the Railway Station a little beyond the "Cross Keys" public house was an outfitters by the name of "Davies" this family catered for everyone. Many of the old residents in this town who were suffering hard times in those days must be grateful to this shop. Pay when you can was a ready answer and I am sure they did.

On the opposite side of the road was "Owen Roberts" the grocer. A shop such as one would find in a "Dickens" story, fitted into the front room of one of the original cottages built for local fishermen when they were removed from the beach area during the towns development. Packed with groceries, fruit and vegetables but most importantly, beautiful bacon and the best home cooked boiled ham on the coast. Cut to any thickness not by machine but a long thin knife in the hands of a master. Opposite across the road was the Circular office a free local paper advertising the shops etc. in town. This was a source of great interest to me, I used to spend ages just watching the printing machinery flashing backwards and forwards churning out the copies. The press was in a cottage to the rear of my Aunty's shop which allowed me some freedom of access. The shop was known as the "Red Shop" It sold newspapers and books, mainly Welsh religious tracts for which it was well known. My uncle was a lay preacher and used to travel up and down the Conwy Valley on a bicycle to various chapels. During the week he carried out his trade of cabinet maker and picture framer. I spent many happy hours in his workshop and learned quite a lot of useful hints and tips.

Eventually all those school days came to an end and I was let loose on the World !!. Two years in forms four and five commercial, typing, shorthand, book-keeping went by the board and I became an apprentice mechanic.

Five years apprenticeship on a weekly pay packet of 2s 6p rising to 15s in the fifth year. Find your own tools and overalls, not much one must admit, one thing I did get out of it was an experience that has lasted a lifetime. The firm was the "North Wales Silver Motors" a bus company that ran services to Penmaenmawr, Llanrwst, and the Colwyn Bay area. The garage and workshop was on the Mostyn Broadway next to the Grand Theatre as it was then in 1928. A fleet of mixed vehicles, mostly second hand reconditioned and several still on solid tyres. Llandudno in those days had several firms running coach or charabanc tours during the summer seasons using the Royal Red coaches, the Royal Blue, Deacons, Purple Motors etc. Only two, the Silver Motors and the Royal Blue ran scheduled services around the area. Competition between them was intense at times, practically racing one another to get to the bus stop first. The Silver buses were always in need of repair, mostly Dennis four-cylinder, always burning valves out or blowing gaskets. There was also a double deck Daimler, sleeve valved, and to repair it was a major headache. I think we had a couple of Tilling Stevens also. The workshop staff consisted of two mechanics, with three apprentices, one electrician, two body builders (both from Llanrwst) one blacksmith and one painter.

In the stores was a storekeeper with an assistant. At night two cleaners washed the vehicles and swept them out. Breakdowns were frequent, petrol and carburettor jets choked, magnetos overheating, and in the summer clutches slipping. Dennis clutches were simple cones with a leather lining. Hot engines leaked oil onto the lining and there was no grip. Our remedy was free, go on the bus to the West Shore terminus, take up the floor boards to expose the clutch, a handful of sand dribbled over the cone while the driver operated it and there you are, good for another week. Petrol was in cans those days; BP, Shell, and National Benzole all stacked up in an outside store. As the buses operating local services in Colwyn Bay were out all day we had to take about twenty five cans to meet them in Coed Pella Road every midday. A welcome break for we apprentices as it meant that on the way back the one chosen to go that day had a driving lesson.

The march of progress was inevitable, a petrol pump was installed on the outside forecourt dispensing Benzole, it delivered a gallon a time and was hard work to pump. A story is attached to this pump. The tank went into the ground and left over night, the hole left open until the pipes were connected, but alas the following morning it was back outside its hole. Panic, who did it? To us mere apprentices it was obvious, it floated out on a high tide. The water table is only just below ground level when the tide is high, the only way to keep it down was to fill it !!.

The price of petrol in the twenty's and early thirties was about ten old pennies depending where and what brand you bought. Facing south west with no shelter from the weather the Broadway was always a nasty road in a gale and should the front doors of the garage be open and the rear ones shut we lost some of the roof!. Trapped inside the wind just removed a tin sheet or two to get out and we apprentices had to chase them, usually on to the beach.

If the wind was blowing a gale and raining the drivers of double deckers with solid tyres had to be careful down the west shore end of town as the wind could spin a bus across the road if caught side on.

On occasion in the 20's and early 30's we had visits from the Royal Navy, a sort of showing the flag exercise. A flotilla of destroyers, cruisers such as the 'Tiger' 'Effingham' and the 'Barham' plus their escorts. The town was alive with the white topped caps of sailors on shore leave. Civic receptions were the order of the day. Local boatmen made a good living ferrying visitors out to the ships. I spent many a happy hour on board the destroyer 'Walpole' going out with with local boatmen delivering stores, mainly groceries, to the galley. Stay and mess with us they would say, and we did. We also had visits from the record breaking cars of the day, Seagraves huge red Sunbeam, Golden Arrow etc. On one occasion the airship R101 went over the town, quite low too. A marvellous sight in those days, it was lost shortly after in Beauvais. Sir Alan Cobham brought his flying circus here too. World War biplanes, Sopwith Camels, Spads, Avro's all taking passengers and for an extra fee would take you on a stunt flight!

The airfield was a flat stretch of grass running from the gas works to the Links Hotel, it is now the rugby field, Gwydir Road and a new housing estate. Mentioning the gas works reminds me of watching the coke they made there coming red hot from the ovens and then being dunked in a huge tank of water. Belching steam and a strong sulphurous smell, it was then taken by the overhead gantry and dropped onto a huge pile by the gate where it was picked up by customers. The old industrial site has now gone and the only gas tanks left are the calor gas tanks all shining white. About this time the old 'Silver Motors' was taken over by the 'Royal Blue' company in Llandudno Junction, an old established firm they ran a fleet of vehicles developed and built by the Birmingham Midland Red company called "S.O.S" . These vehicles were a revelation in those days; four and six cylinder, all repairs to engine, gearbox and rear axle could be carried out from the top. Lift the cylinder blocks up and big end bearings could be changed easily on the roadside. Could be done whilst a spare

bus carried the service for one trip to Colwyn Bay. In turn, that firm was taken over by Crosville of Chester.

A point hard to believe these days is that buses at that time did not have starter motors fitted. Large six cylinder engines on cold winter mornings are rather difficult to turn over by hand. Even diesels were started by hand. A short rope with a loop was slipped on to the handle and the handle engaged to its fitting then three or four men would pull or snatch together, second or third time it might go !!. If the ignition was too far advanced it might kick back just as you engaged it, hard enough to do some serious damage to a chaps ribs. Once it was warmed up and on service the driver had to swing it himself, it became an art after a while, lucky man whose terminus was on a slope.

In 1933 my apprenticeship ended and I was sent to a Crosville depot in Nantwich, Cheshire but as I managed to get home to Llandudno most weekends I did not consider that I had actually left. As I very often had to work late, catching a bus that would take me all the way was difficult so I took my push bike!! . I have been known to ride through Chester at midnight many times. One Xmas eve with ice on the roads I came off the bike and had to straighten the back wheel in a farm gate. Stopping in Bridge Street, Chester to have a drink from my flask of coffee and to get my breath back I was challenged by a local Bobby and had to give a full account of what I was up to. It took a long time to convince him that I was not Father Xmas on some nefarious expedition.

Llandudno has turned up in one or two places for me. In Fort St. George, Madras, India, there is a visitors book with the name W. Owen, Llandudno in it. I was behind him as he signed it on his way out. I signed and chased after him but never caught up, so, there's two locals who never met up. Are you still around friend ?

The visitors book is in the Garrison chapel if anyone calls there.

*Tom Stone, Llandudno, September 1996*



*Mostyn Street,  
Llandudno, in the  
early days taken from  
'Gossiping Guide to  
Wales'*



## INTRODUCTION:

The Society has for many years been undertaking surveys of the various discoveries of the Great Orme. This series of articles has been produced to give a brief introduction to cave and mine surveying at its simplest level.

Surveys are most frequently produced to show other explorers the size and layout of a particular system. Other uses include the presentation of scientific information or to show what caving equipment is required. The general principle is to prepare a survey by the representation of a line through the passages and then adding detail to show the shape of chambers and passage widths from this survey line. In the British Isles (and many other countries) surveys are usually graded to give the user an indication of the accuracy that can be expected. Details of the British Cave Research Association (BCRA) grades for this purpose are given in Tables 1.1 and 1.2.

## BCRA SURVEYING GRADINGS:

Table 1.1 Grading of the survey centre line

|           |                                                                                                                                                                |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Grade 1   | A sketch of low accuracy where no measurements have been taken.                                                                                                |
| (Grade 2) | May be used if necessary to describe a sketch that is intermediate in accuracy between grade 1 and grade 3.                                                    |
| Grade 3   | A rough magnetic survey. Horizontal and vertical angles measured to $\pm 2^\circ$ ; distances measured to $\pm 50$ cm; station position error less than 50 cm. |
| (Grade 4) | May be used if necessary to describe a survey that fails to attain all the requirements of grade 5 but is more accurate than a grade 3 survey.                 |
| Grade 5   | A magnetic survey. Horizontal and vertical angles accurate to $\pm 1^\circ$ ; distances accurate to $\pm 10$ cm; station position error less than $\pm 10$ cm. |
| Grade 6   | A magnetic survey that is more accurate than grade 5.                                                                                                          |
| Grade X   | A sketch that is based primarily on the use of a theodolite instead of a compass.                                                                              |

Table 1.2 Classification of survey detail

|         |                                                                                                                                                           |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Class A | All details based on memory.                                                                                                                              |
| Class B | Passage details estimated and recorded in the cave.                                                                                                       |
| Class C | Measurements of detail made at survey stations only.                                                                                                      |
| Class D | Measurements of detail made at survey stations and whenever necessary between stations to show significant changes in passage shape, size, direction etc. |

## EQUIPMENT:

The main equipment required is a compass, clinometer, tapes, string, chalk, field book and drawing equipment to produce a plan. A calculator will make the results easier to use.

**Compass:** Any compass can be used, however a compass with large scale divisions and sighting veins would be better. (The Society compass is a Suunto KB-14/360)

**Clinometer:** Necessary to establish the gradient of measured lines, enabling the true plan length to be determined. (The Society clinometer is a Suunto PM-5/360 PC)

**Tape:** One tape a minimum of 10 M long will suffice. However, it will be appreciated that several tapes varying from 3 M to 30 M would be useful.

**String, chalk etc:** Used to identify survey stations both on surface and underground, to enable surveys to be duplicated or extended from known positions.

## CALIBRATION OF INSTRUMENTS:

The most important type of error after human mistakes are small faults within the instruments themselves. Instrument calibration can vastly reduce the effect of these. The requirements of a grade 5 survey cannot be obtained unless the instruments are properly calibrated.

### COMPASS:

Compass calibration is by far the most important of the calibrations. It is not sufficient to find the average declination (i.e. the difference between magnetic and true north) from the local Ordnance Survey map and use this because it includes neither instrument errors nor local variations.

1. Choose two points on the surface that are visible from one another and can be located precisely on a large scale map. One of them close to the cave or mine and the other some distance away.
2. Check that there are no local magnetic anomalies in the area of the point that is close to the cave or mine. (The technique is described below)
3. Take a compass bearing from the point near the cave or mine to the distant one; repeat this several times to check the precision of the reading.
4. Determine the bearing between the two points as given by the map. This is done by drawing a line on the map between them and measuring the angle between this line and the north-south grid lines.
5. The calibration for that compass, that location and at that time (which in the British Isles, must be subtracted from every reading taken with that compass) is the difference between the figure obtained in steps 3. and 4.

One can check that there are no significant very local magnetic anomalies at the checking point by following this method. After taking the bearing described in step 3., move away from the original position for a distance of say 20 metres, but keeping in line with the two chosen points. Take another series of bearings along the line of those two points but from the new position. If these figures agree with the ones obtained originally then it is safe to assume that there are no anomalies around the original point. Should there be a difference between the two sets of readings then move away a further 20 metres along the same line and take a third set. Then if the first and third reading agree, again the original point is satisfactory, but if they don't it will be necessary to select a new position from which to carry out your calibration.

Using an Ordnance Survey map will have given the calibration with respect to Grid North and that is usually the most suitable in the United Kingdom. If a calibration with respect to True North is required one must look in the margin of the map to find the local difference between the two, it varies from zero to a few degrees depending on the part of the country and may have to be added or subtracted.

After the initial calibration for a survey of a particular cave or mine it is only necessary to carry out steps 3. and 5. provided that the same two positions are always used. It is essential to do it for each compass used, and on each surveying trip.

#### **CLINOMETERS:**

Here one only has to determine the scale zero error, if any. The procedure is:

1. Set up two stations (their location is immaterial), one higher than the other.
2. Take a reading from the first to the second, and repeat this to check the precision of the reading.
3. Repeat step 2. but from the second station back to the first.

The two average readings obtained from steps 2. and 3. should be equal, but of the opposite mathematical sign. That is, if one is  $+03^\circ$  then the other should be  $-03^\circ$ . If the second reading had been  $-05^\circ$  then the true result would have been the numerical mean (i.e. ignoring the + & - signs); in this case  $(03^\circ + 05^\circ)/2 = 04^\circ$ . There would have been a correction of  $+01^\circ$  added to every reading.

#### **MEASURING TAPES:**

Calibration will not be necessary provided that "Fibron" (or steel) tapes have been purchased and that they have not been misused. However, tapes should be checked occasionally against a good quality tape that is known to be in good condition and if this shows that the tape has become inaccurate it is best to discard it. Similarly if the end of a tape gets broken, throw the tape away and buy a new one.

#### **PRINCIPLE SOURCES OF ERROR:**

##### **HUMAN ERROR:**

In any form of surveying the human factor is often the cause of error. These errors include bad technique and practice, misreading instruments, mistakes in calculations and in general, lack of concentration.

It is difficult to eradicate human error in any survey but the surveyors must implement a complete checking procedure to reduce this risk.

##### **INSTRUMENTAL ERROR:**

This occurs whilst using instruments which have not been checked and if necessary adjusted and allowing instruments to be used in places where environmental factors are likely to cause errors. This is particularly important in the case of magnetic surveying where external factors are of great significance.

##### **PHYSICAL EFFECTS ON COMPASSES:**

Magnetic surveying relies upon the earth's magnetic field remaining constant. This is not the case. The magnetic north position changes its declination to the pole all the time and its position needs to be established for the date of the survey, if true north is to be marked on the survey plan.

In addition there are climatic variations which occur throughout the day that affect the magnetic needle. However, in all but the most accurate surveys these changes can be ignored.

It is possible to establish the current declination of magnetic north from the Ordnance Survey map for the area in which you are surveying.

In addition to these variations in the magnetic field there are infrequent magnetic "storms" which are rapid fluctuations in the magnetic field around the earth. At these times all magnetic surveying should be stopped. These times are easily identified by rapid and sporadic fluctuations of the compass needle.

Other factors influencing the compass reading would be the presence of Electro-Magnetic fields such as those induced by cap lamps; which must be kept as far away from the compass as possible, and in-situ iron and steel which when underground often takes the form of steel arches, rails, tubs and items such as watches and steel toe-capped boots. Care must be taken to minimise the influence of these features on the compass.

*To Come:*

*PART TWO Measurement techniques.*

*PART THREE Survey plotting.*

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, plus the recently discovered second incline.)

*Stephen J Lea, Glan Conwy, September 1996*

**INTRODUCTION:**

The Ty-Gwyn mine in Llandudno was re-entered by the Great Orme Exploration Society in 1985 after having been sealed years earlier during the construction of an electricity substation. It is known from records that the mine was closed in 1853 after a short production life of only 18 years from when its articles of partnership were drawn up.

During the years since the Ty-Gwyn was again open to exploration, members of GOES had surveyed the mine and in latter years spent many months clearing a blockage in the main adit and then attempting to make the connection through to the Tyn-y-Fron shaft. This dig proved to be extremely difficult and arduous with the mud and clay being continuously forced back into the cleared area on a weekly basis. When GOES finally left the Tyn-y-Fron connection to the mud and boulders the mine was only visited occasionally during the next year until early in 1995, when, having taken a group of people from another society down on a trip, it was remarked that there must be more to find in the Ty-Gwyn than we had so far discovered.

This article is an attempt to pull together the known facts from the past and marry them to the findings and observations that have been made in the last few years.

**Published Data:**

As mentioned above, the Ty-Gwyn mine, as a company, was set up in 1835 after Benjamin Edwards of Plas discovered traces of copper ore under a sod displaced by one of his cows. Only one year later, a 50 inch steam engine was needed at the top of what we now call the Ty-Gwyn shaft to de-water the lower workings. Eight years later the Ty-Gwyn was flooded for the first time. And nine years later the mine closed. All the information that we have on the mine has been obtained after painstaking research by the authors of the books on the subject, C. J. Williams and Don Smith being the most authoritative.

**Perceived Ideas:**

The historical facts detailed in the publications by the two authors are obviously correct, coming from various sources of the time. Yet, to gain a much better understanding of the workings of the Ty-Gwyn we need to exercise a little lateral thinking.

In order for there to be a need to install a 50 inch steam engine above the Ty-Gwyn shaft only one year after the mine started, the miners must have been below the area and indeed possibly below sea level. There is a distance of between 200 and 300 meters horizontally from the happy valley to where the shaft is situated and a height difference of approximately 50 meters. Was all this distance mined in the one year before the records say the shaft was dug?

The main tramming adit of the "Ty-Gwyn" from its portal near the start of the pier, through to the Tyn-y-Fron shaft

was 534 yards long and reportedly stopped short of the Tyn-y-Fron by only 8 yards. This adit passes within a few meters of the shaft and yet the miners did not connect the two. WHY? It would have been easy to do so while they were blasting the adit. Obviously there was no need, the shaft was not used for ore extraction at that time otherwise they would have connected it to make use of the newly laid rails.

The above points had not been discussed by the society in detail until late in 1995 from whence on, a resurgence in interest in the Ty-Gwyn brought them to the fore. As stated above, the very first recorded evidence of copper ore on the lower slopes of the Great Orme, in the vicinity of what was then a small village serving the mine workers from the Old and New mines, was found in Happy Valley purely by coincidence.

We do not know from our above or below ground research the exact location of this momentous occurrence, but, judging by the profits achieved in the relatively short life span of the "Ty-Gwyn" mine we can assume that the ore was of a high grade.

Would the discoverer have publicised his good fortune to all and sundry immediately, or as a follower of human traits throughout time, have tried to improve his financial position while he had a chance. He would not have had long of course, before the find was widely reported in the small mining community. Yet the gap of only one year, from the reported date of the discovery to the installation of the 50 inch steam engine above the Ty-Gwyn shaft, seems a very short time considering the work that had to be done to reach that point. Is it not possible that some mining was undertaken before the find was reported and the company set up?

From observations by the members of GOES while working below ground there appears to have been several stages of mining in the areas to which we now have access.

**STAGES OF MINING:**

- Coffin level entrance snaking its way past the Fireplace shaft.
- Lower level, now accessed from the Coffin level passage with tunnels to Ty-Gwyn shaft, Sims shaft and Market Hall well.
- Two inclines with a connection to the Coffin level passage.
- Ty-Gwyn shaft with crosscuts to Coffin level passage.
- Main Tyn-y-Fron shaft and tramming adit with cross cut to Fireplace shaft.

**Old Passages:**

After wading up the main adit, from the bottom of the manhole which is the present access, for 48 meters you encounter a tunnel crossing at an angle. To the right the passage snakes gently downwards towards the sea with a classic coffin level shape, ending in a blockage after 86 meters. On return it is noticeable that where this side passage enters the main adit it is at a lower level and continues at a lower level on the other side.

The floor of the main adit on which the rails are laid is appreciably higher and therefore must have been cut at a later date across this older entrance passage.



Main Adit

If this older passage is followed on a slight uphill gradient, after 12 meters there is a cutting going off to the right. This low ( 0.5 meter after excavation ) tunnel was filled to the roof with miners waste until GOES members spent 17 weeks digging it out during late 95 and early 96. Approximately 10 tonnes of spoil was removed and stored behind walls, built with the rocks that were removed, along the right hand side of the passage. Towards the end of the dig, when it looked as though the tunnel would just abut against the ginging of the main adit the diggers nearly gave up. With perseverance though, all the hard work finally paid off, when, with a tight squeeze a member managed to enter what appeared to be a chamber at the end of the passage, this seemed to have been deliberately blocked with a large stone. When everybody had crawled along 30 metres of tunnel and entered this space it was soon realised that this was a significant find. We were in fact in one of the two inclines that were reported to have entered the mine workings from behind the Belmont Hotel. We knew we could not be far from the main adit, and before we left it was discovered that verbal and visual contact could be made between the adit and the incline through the rubble, which turned out to be the back of the ginging in the adit itself.

This incline sloped down at an angle of about 30 degrees to the north west and stopped after 10 metres in a pool of mud at a large rock infall. This infall was later dug and

found to connect with the main tramming adit at a point just beside the collapsed shaft that GOES spent many months clearing and supporting, this connection has now been filled in as it was deemed too precarious to leave open. Going upwards to the right the incline again stopped at a fall, but this time after a little digging the following week, a squeeze, past a shaft on the right led into its continuation. This, after only a short distance stopped short at a stone wall built across the width of the passage. Through a small aperture in the bottom of this wall can be seen what appears to be a drainage pipe entering the mine workings. On the left, 2 metres before the wall, a fall of sand like debris caused a certain member to dig frantically, after a short time a way was found into a parallel incline. We had now found the "two, one-in-three inclines, in the side of the hill behind Belmont" recorded by C. J. Williams. This second incline again dropped down to the north west at approximately 30 degrees and ended at a tight series of squeezes which were found to come out directly above the ginging of the main adit. The upwards direction was blocked by a large amount of sandy spoil which GOES dug over a couple of weekends and only stopped when it was found to be close to the surface with tree roots exposed. This was left without breaking through into the open, so as to alleviate the need for a gate or wall to be built.

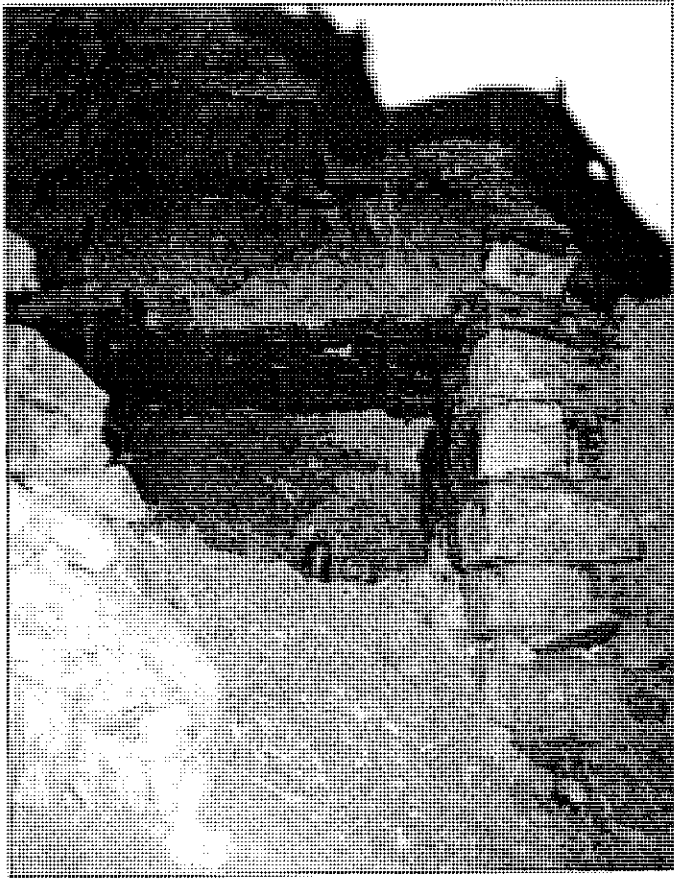
It is interesting to note that the first incline entered has a square to rectangular section of approximately 1.5 wide by 1.2 metres high, whereas the second is more ovoid in shape.

A lot of discussion has taken place as to the reason for there to be two inclines, separated by less than a metre of wall. Could it be that one was used for the extraction of ore and the other for man access to the mines, or did the second incline have a counterbalanced weight to assist in the hauling of trucks full of ore out of the mine.

If one continues along the coffin level passage, past the tunnel described above, one reaches two tunnels going off to the right, both of which enter the Ty-Gwyn shaft, and a hole in the floor through which it is possible to enter three more passages. One of these again connects with the Ty-Gwyn shaft. Proceeding in the opposite direction the passage ends at a substantial brick wall built across the tunnel. The top half of this wall was partially demolished by GOES and through the hole in the top can be seen the continuation of the passage, this has been backfilled at some time in the past and is impassable at the moment. The reason for the old miners to build this wall remains a mystery, yet from the survey undertaken over the winter of 95/96 it is found that this passage heads directly towards the old market hall which has only recently been demolished. During the demolition a well (possibly Tynypwll) was found, this could have been the source for the water, which according to the records was raised in that vicinity and pumped "uphill", to be used in the steam engines of the mine head workings. It is a great shame that this well was hurriedly filled in before any archaeological investigation could be undertaken.

The only other passage in this lower level goes off at ninety degrees from directly below the hole in the floor

for a distance of 58 metres before it ends at an infilled shaft. Five metres from the start of this passage there is an offshoot on the left hand side that extends in for a few metres before ending at yet another blocked shaft. This shaft though, seems to be of some importance, as the sides of the short entrance tunnel appear to have been built of stone with mortar in the joints and to have been "plastered".



*Fireplace Shaft*

Continuing, past the hole in the floor on the level above, after a few metres an area on the left opens up at a slightly higher level with a filled shaft (fireplace shaft). This shaft has been partially dug by GOES and is stone lined at this point. From our recent survey it can be seen that this shaft is the same one as that on the level below. We know from the Victorian rubbish recovered here that this shaft extends to the surface and from the trial dig already mentioned that it is stone lined and of a large diameter. It was therefore a major shaft at the time when these older tunnels were being worked. At this point there are two passages which one could take, the right hand tunnel extends for 47 metres and rejoins the main adit and must therefore be of the same, or a later date than the main adit.

The other choice of passage extends for 32 metres before ending at the stone lining of yet another shaft. The stone lining has a square hole facing you, much too small for a human being to pass through. It is noticeable that the floor in this section consists of a sandy or silty fill, being very easy on the knees when negotiating the passage.

Towards the beginning of this tunnel about 1 metre from the fireplace shaft, there are some stones placed across

the passage and the ground on the other side reverts to a type which is normal for this section of the mine. This could indicate that water was pumped through the square hole, flowed along the passage, over the small dam and any sediment in the water would have settled out and been deposited on the floor whilst the water that continued would be clearer.

At this point it is worth mentioning that if one retraces ones steps back towards the main adit and looks very carefully at the side walls one can see evidence of water erosion along the outsides of the bends. In addition it is possible to find stemple holes and ledges along this passage at a height of only 300 mm from the floor. Was a walkway placed on these stemples to allow the water to flow beneath without it being stirred up by the miners coming and going, or is there some other logical explanation for the height of the stemple holes?

#### **Deeper workings:**

From the preceding paragraphs it can be seen that the tramming adit we now call the Ty-Gwyn adit was driven at a later date than all, with one exception, of the other passages we currently have access to. The two inclines which are parallel and only 1 metre apart come down from the surface and through the roof of what is now the adit and continue on down through the floor to an unknown depth. They are heading in the general direction of the Ty-Gwyn shaft, as the adit does, although whether they both, only one, or neither connected we have at present no way of knowing. The fireplace shaft mentioned above could extend to lower workings and is of a sufficient size to indicate its importance. The shaft (Sims) at the end of the lower passage could also be of major proportions and would extend to the lower workings whilst the other shafts seem to be of lesser dimensions and could have been used for pumping water about the mine, as already mentioned.

#### **Ty-Gwyn and Sims shaft:**

The Ty-Gwyn shaft is located under the concrete car park, to the east of the Empire hotel, and was the first recorded shaft sunk to dewater the workings. Underground, as already mentioned, it is connected to the older passages by three different tunnels, on two levels, but not directly to the main tramming adit. The lower passage floods when the water level in the shaft rises, this seems to happen with a relationship to the tidal activity in the bay with an approximate 3 hour delay. From this lower level, when the water is clear, it is possible to see a tunnel going off the shaft in the general direction of the inclines discovered earlier in 1996. When this lower section floods the water runs back towards the brick wall discussed earlier. The wall though, was not built to retain this floodwater, as, at its base there is a square hole of about the size of the end of a brick, although it would have allowed the water to soak away gradually into the backfilled passage behind it. We must also remember that when the mine was operational there was a fifty inch steam engine at the top of this shaft, pumping out the mine and therefore this passage would not normally flood in the way it now does.

To the west of the Empire hotel, five years after the installation of the pump above the Ty-Gwyn shaft, the miners installed an 50/90 inch compound Sims engine to further help with the flooding problems. From careful study of the photos remaining from this period and from underground observations, the shaft for this pump can be said to possibly be in Tan-yr-Ogof terrace. Underground, this equates with the end of the 90 degree passage, below the hole in the floor, which has been mentioned previously as having an infilled shaft at its end. Coincidentally this lower tunnel runs parallel to, and almost directly below, the passage that leads from the fireplace shaft to the stone lined shaft with the small square hole. It is nearly twice as long as the one above, yet the shaft in the upper passage does not intercept with the tunnel below.

#### **Ty-Gwyn adit to connect with Tyn-y-Fron:**

The adit we now call the Ty-Gwyn adit should in theory more accurately be call the Tyn-y-Fron adit, as, from the proceeding paragraphs, it can be seen that the purpose of this adit was to connect with the deep Tyn-y-Fron shaft that was being sunk towards the end of the mines life. There have been two recent discoveries in the adit the first of which is that from a position just before the cross cut to the fireplace it is possible to see stemple hole and ledges along the sides of the adit at a height of approximately 1.6 metres and a spacing of 1.5 metres. These extend for a distance of 100 to 150 metres into the mine and could possible have been used to support timbers and allow some form of ventilation to circulate through the adit. The second most recent find is that of a filled Phreatic tube, entering from an elevated point on the north side of the adit 300 metres in from the portal and exiting to the south at a lower level. Upon examining the north face of this tube one can see the layers of sediment that filled it in some bygone time. In addition at a point high up in the roof not far from here can be seen the finger prints of the miners of old, where they have scraped clay from joints in the rock to use for sticking candles to the brim of their hats.

#### **Conclusions:**

The major conclusion to be realised from the above discoveries is that we actually know very little of the history of the Ty-Gwyn mine, or indeed any mine on the Orme and that there is still a lot of work needed to be done if we are to get a clearer picture of the history of mining on the Great Orme.

#### **What next?**

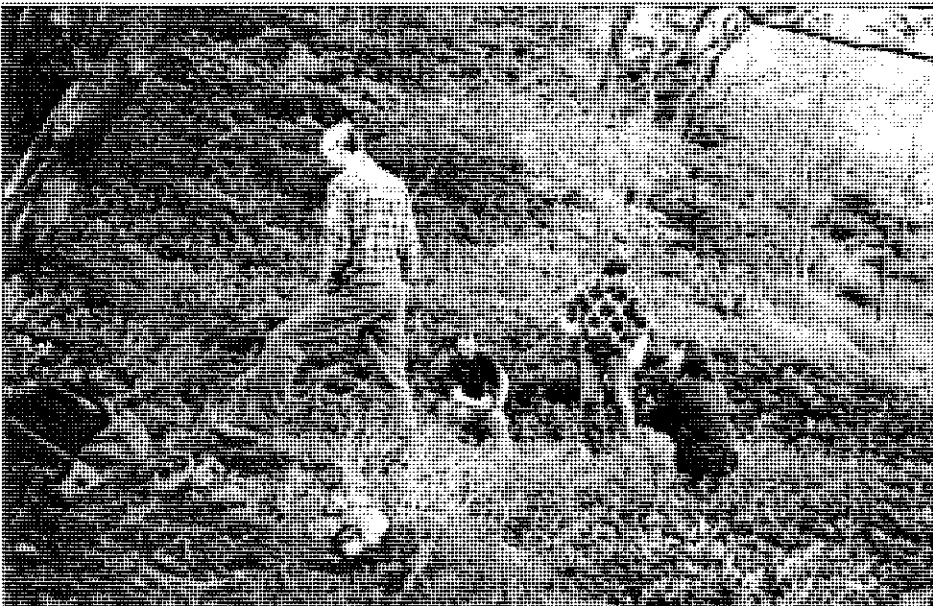
The diggers of the Great Orme Exploration Society have discussed a number of possibilities for future underground research including.

- Continue the beach adit dig. This could lead into older workings under the Happy Valley area and connect with the early Ty-Gwyn workings.
- Dig the large depression on the north western side of Happy Valley. This could be the top of a capped or filled shaft. ( If capped then it should be made safe ).
- Have another go at making the connection through to the Tyn-y-Fron side of the adit. (possibly from the Tyn-y-Fron side).
- Dig the fireplace shaft to connect with the level below. This will need supporting at some time in the future due to the poor condition of the existing timbers.
- Dig the infilled shaft at the end of the lower passage, this could prove or disprove the theory theory that it is the Sims shaft.

Finally I should like to thank the members of GOES who turn out to dig, in often unpleasant conditions underground, for all their hard work, without which this reappraisal would not have been possible. Not forgetting everybody else who has spent many an hour sat around tables discussing the discoveries, drinking the ale and generally making GOES such a great society.

#### **Bibliography:**

|                       |                            |                                                   |
|-----------------------|----------------------------|---------------------------------------------------|
| <i>C. J. Williams</i> | <i>British Mining No 9</i> | <i>The Llandudno Copper Mines</i>                 |
| <i>Don Smith</i>      |                            | <i>The Great Orme Copper Mines</i>                |
| <i>Various</i>        |                            | <i>Journals of Great Orme Exploration Society</i> |



*Large depression on the north side of Happy Valley*

#### **Postscript:**

The above observations have been discussed by the GOES diggers on many occasions. The conclusions reached here are my own interpretation of the facts we have to date.

*Tony Davies, Great Orme,  
September 1996*



# TY GWYN MINE

