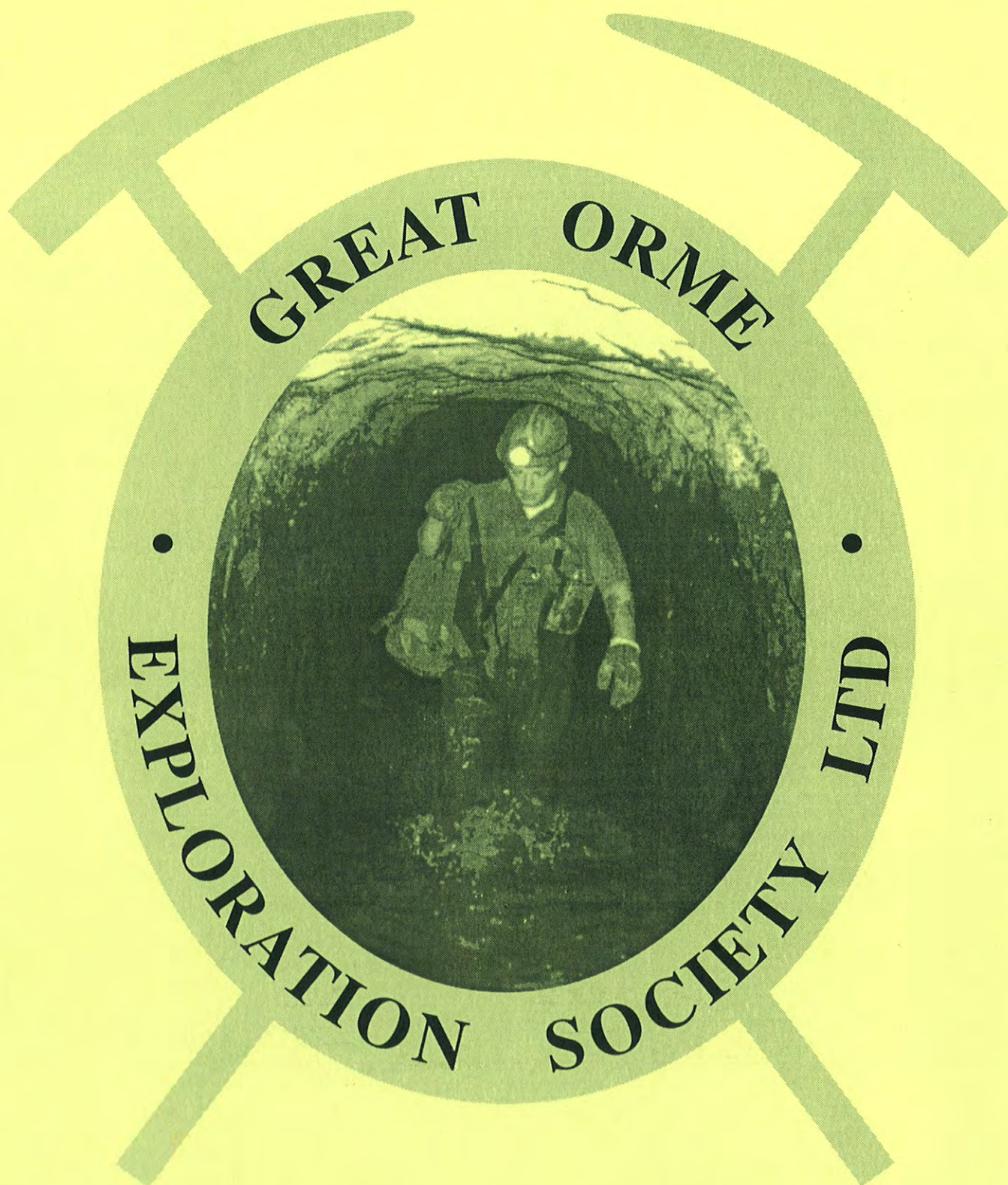


JOURNAL OF THE



Issue No. 2, 2000
£2.50 to Non-members

COVER PHOTO

Cover photo taken by Mark Beardsall and shows Dave Flowers in the drainage adit of the Penmorfa.

GOES 'AV ADIT AGAIN!

Access into the Penmorfa was regained on 27th August this year, after a lease between Mostyn Estates, Conwy Council and GOES had been drawn up allowing GOES access to all mines on the Great Orme (excluding those on the Great Orme Mines lease).

It had been 4 years since GOES last entered Penmorfa. The ginging in the main drainage adit had become very loose in places, and as a result contractors came and pipe jacked the whole adit with concrete pipe sections. When work was complete, GOES looked forward to re entry, but the mines inspector had declared the whole mine a working mine and unsafe for access.

Four years of sending letters backwards and forwards to the Council and Mostyn Estates followed. Dave Edwards and Steve Lea surely deserve medals for all their phonecalls, letters, meetings and general hard work battling to obtain the lease, which covers a period of 21 years from 9th October 2000.

CHRISTMAS DINNER

This years Christmas dinner will be held on Friday 1st December in the Kings Head. Sylvia has been very generous and has laid on two menus to choose from - one for meat lovers and a separate one for vegetarians. If you are interested in coming along then please complete one of the enclosed menus and return it, with your payment, to Alison Davies, 2 Plas Road, Llandudno LL20 2LU by November 17th at the latest.

The meal will conclude with a slide show of events carried out by GOES members during the year.

CONTENTS

A Dream Come True.....	2
Keen on Wales 'To Curing Gleeets'.....	3
Bull Pot Farm Caving Hut.....	5
Haulfre Gardens Trial.....	6
Noticeboard.....	7
Conways' Fruitful Days.....	7
Blast from the Past - An Excursion into the Penmorfa.....	8
Blast from the Past - Old Photographs.....	9
Potential & Realizable Ores from the Great Orme Mine.....	10
The Caving Code.....	11
Committee Members.....	11

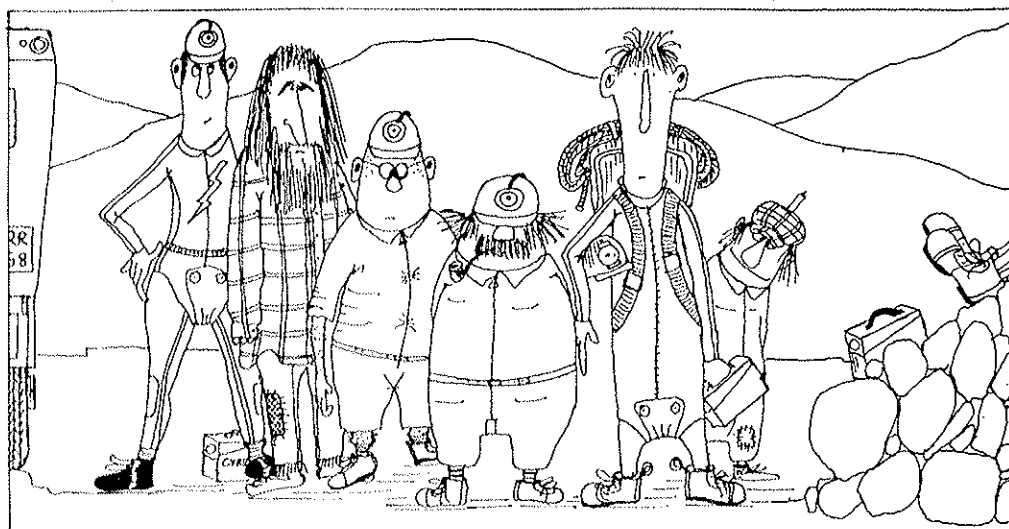
WEDDING BELLS

Tony and Ali, two active GOES members, are proud to announce that they were married at Conwy registry office on 12th August 2000. They managed to keep it a secret until 3 days beforehand, but once the news was out the GOES grapevine worked on super-turbo speed around North Wales. Thank you to everyone for your cards and good wishes.

Articles are always wanted! This Journal is important and depends on your contributions, so please put pen to paper for the next journal which is due out in April 2001.

GOES on the Web: www.gounder.welshnet.co.uk

This site is maintained by Steve Lea and updated on a regular basis - well worth a visit.



GREETINGS FROM.....

CAVECARD No.7.

A DREAM COME TRUE

After what had been a splendid Saturday evening at the theatre, and afterwards enjoying an agreeable pasta, washed down with a bottle of wine, sleep was creeping up on me quite quickly and as soon as head touched pillow I could hear sheep counting humans, and then nothing at all.

Muriel, my wife, had been brought up in the countryside close to the sea. I was envious as I was brought up near the gas works in Newton Heath, Manchester, where some days it was difficult to distinguish day from night as the smog lingered.

We had dreamed of living somewhere down the North Wales coast for years, possibly near Muriel's parents, who eventually found a house at the top of a hill in the Nant y Glyn valley, half a mile from Colwyn Bay. The views were outstanding, however actually arriving at the front door was an absolute nightmare. At the last count there were two hundred steps to the top of the garden, one hundred and sixty to the front door.

We had visited Llandudno on many Saturday afternoons and found our way to the Kings Head for refreshment before our journey to Wrexham, often in winter, where we found the atmosphere, and the smell of the log fire very pleasing.

Thursday night was an unusual night to venture outdoors, to smell the logs and enjoy the odd shandy at the Kings Head, but this was to become the first of many Thursday nights.

In a corner, hugging the fire, were a group of people who at first seemed quite ordinary, they were reading intently from perhaps the Investors Chronicle - of course this must be a local meeting of an investors club.

As the night wore on, I enquired of a local gentleman perched up at the bar who these people were, to be told in an accent not a hundred miles away from the Liver Buildings, that they were the..... well!, I only caught a few words, but it sounded like the Great Gornless Society. This wasn't too bad as I once belonged to a silly society, nice people though, where all the men wore blue and white striped boxer shorts under their trousers. Did we have some fun? It was just hilarious at area and national conferences. We did not sport badges, or give handshakes in recognition, we dropped our trousers. I had never seen so much trouser dropping before, even Muriel hadn't. I can still see poor old Jim who forgot he was wearing braces, propelled himself over a table and into the lap of the immediate past chairmans' wife. He spent the rest of the evening in casualty.

We were introduced to some very nice people, and we have met many more through our membership of the Great Orme Exploration Society (GOES). Soon our thoughts turned to underground, and when this was mentioned to us one Thursday, I remembered vividly my first trip underground. I was 4 years old. Getting out of a warm bed in the middle of the night to go to the toilet in those days was not funny. Descending a steep stair case, turning right at the T junction, passing the sideboard, don't knock the gramophone, open the back door, 10 yards to the outside loo shared with Alf and Doris, hope it's not engaged, and the job's done. However, I did not hang a right, and finished up going down

the cellar and spent the rest of the night underground, as I could not open the latch to get back.

I read with great interest the Journal of the Great Orme Exploration Society, first class articles written by knowledgeable members, also an article reproduced by a member entitled "The Origin and History of the Great Orme Goat" - how absolutely fascinating. Christmas social events, complete with flashing lights and slides of underground experiences, all absorbed with plenty of food and wine. Convivial atmosphere with good friends, like minded friends - who could ask for more?.

Muriel, who last year learned to count without using her fingers, was asked to go on a goat count. She has never, as far as I am aware, been on one before, and assuming there are not too many goats she should do well.

We have always been kept up to date on things that are of concern and interest within the Society, for which we are grateful as we are not active members.



Dennis and Muriel at the Victorian Extravaganza, April 2000

Finally, one memory will remain, buying a new pair of trainers because mine were ruined on a memorable Summer Evening walk to the Little Orme Memorial...the tide, as predicted by one of our members, came in too soon on the way home. The weekly walks are so good, and thanks must go to those who organise and lead them.

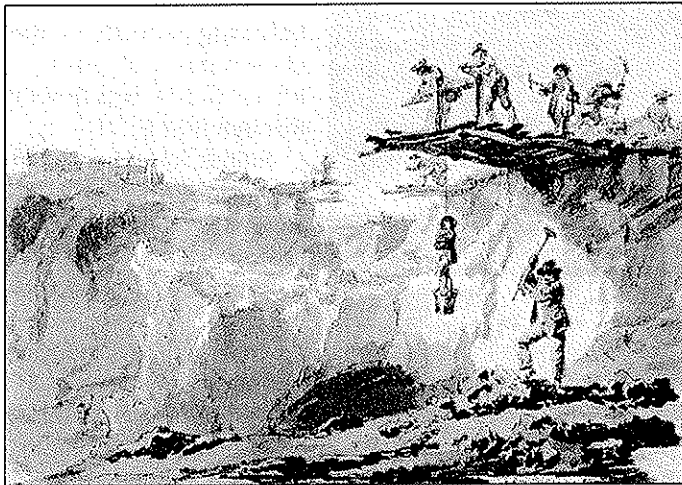
The radio alarm rings out, another day approaches, a nice day by all accounts as the sun streams through the window. The thought of getting up, eating breakfast, getting into my car, collecting a neighbour and driving into Wrexham for another uninspiring day at the office fills me with dread. I go to draw the curtains, and I see mountains, trees, the sea, boats and trains. Can this be a dream, or is it a dream come true?.

Dennis Abbot, Deganwy, October 2000

KEEN ON WALES TO CURING GEETS

Richard Keen explores the history and the tunnels of Parys Mountain, Ynys Môn, where copper has been mined since Celtic times:

It is a landscape that defies ambivalence. You either love it or hate it but you certainly cannot ignore it. Anglesey is not noted for the height and scale of its mountains but it can most definitely boast one of great significance.



The Parys Mine on Anglesey. Watercolour by Julius Caesar Ibbetson, 1792. (courtesy of the National Museums and Art Galleries of Wales)

Take the trouble to park near the top on Mynydd Parys and a short walk will bring you to the edge of one of the most impressive chunks of landscape in Wales. A huge open pit stripped of vegetation and glowing with a rich variety of colours confronts you. At its base, a deep blue-green pool, on the skyline the squat stumpy remains of a windmill and dotted around the precipitous sides of the pit are the ruins of buildings and strange structures.

This is a landscape of nightmares where sulphurous odours permeate from dank holes and towering outcrops of rock overhang deep chasms. It is the personification of the horrid and sublime. Not surprising that film makers seeking the most unreal and extreme backdrops choose the place to shoot a number of editions of "Dr Who" and "Mortal Kombat 2".

For a time during the 18th Century, Parys Mountain above Amlwch was known across many parts of the world. The reason for its fame was the huge deposits of copper that lay close to the surface. Thousands of tons of ore were excavated and exported via Amlwch to smelters in England and around the coast of Wales to Swansea. Such was the intensity of copper smelting along the navigable Afon Tawe that the town was nicknamed Copperopolis - but that's another story.

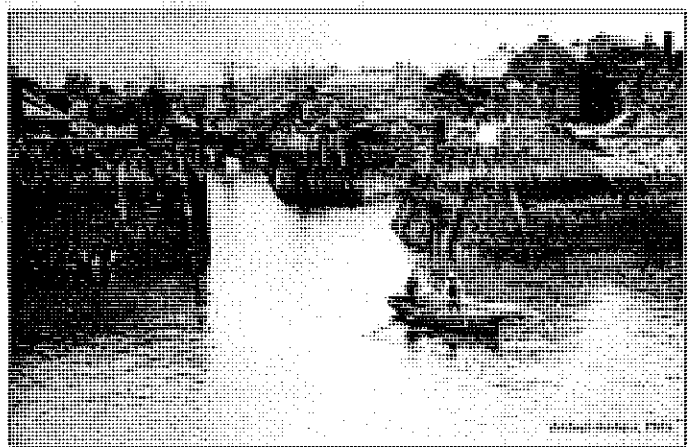
One of the individuals behind the exceptional entrepreneurial activity on Anglesey was a local man, Thomas Williams. He was born in 1737 and lived to the good old age - in those days anyway - of 65. Under his control, the great copper mines dominated world markets reaching a peak in the 1780s when thousands of men, women and children were employed in and around the mine.

He was nicknamed Twm chwarae teg ('Tom fair play'), for his fair dealings with his workers, and the "Copper King" because of his astute business acumen and entrepreneurial flair. His influence was such that he was able, for about five years, to control the sale and price of copper and he became solely responsible for the sale of Anglesey and Cornish copper.

In addition to his mines, he owned smelters and warehouses and acting in partnership petitioned the House of Commons in 1788 against the proposal to regulate "the shipping and carrying slaves in British vessels from the coast of Africa". This was a classic example of vested interest as he and his partners invested some £70,000 in works that manufactured a range of items for the slave trade. Particularly popular were highly polished plates and bracelets. No room for sentimentality; hard-nosed business prevailed.

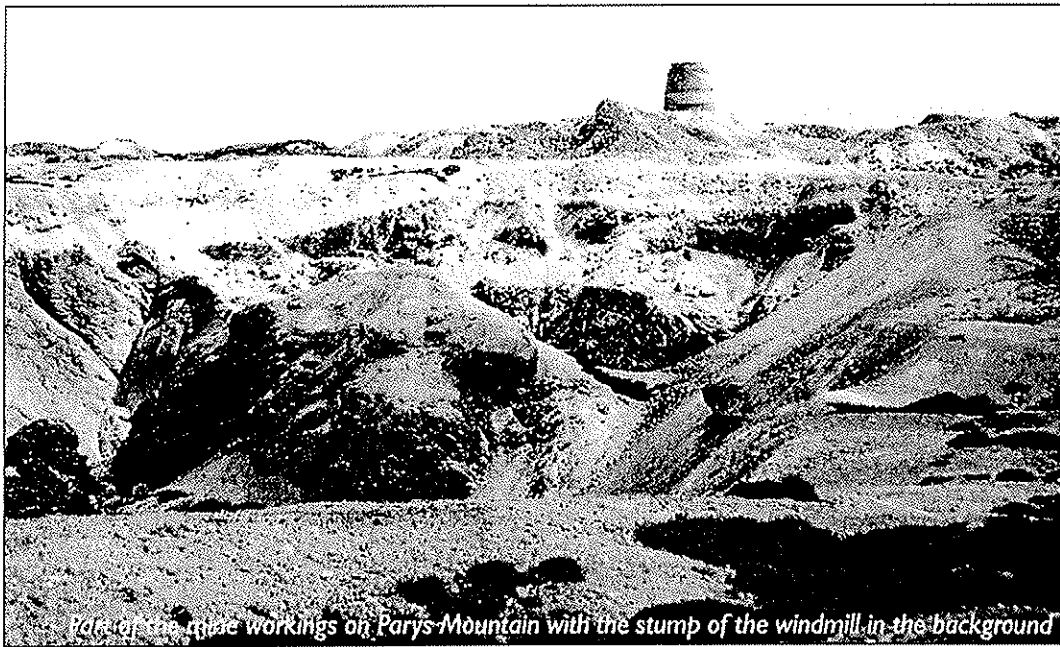
Besides serving the slave trade, finished copper was in great demand by the British navy. In the warmer waters of the world the voracious Teredo worm that could grow to 3 feet in length caused great problems by literally boring through ships' timbers. Sheathing the underside of the ships with thin sheets of copper plate solved the problem. This was so effective that the term "copper bottomed" was used to describe a good deal or bargain. Copper was also used to make nails and bolts providing excellent protection against weathering. Williams wrote in 1790, "I am in high favour at ye Navy Board. They have now discovered what they might long since, viz., that the Anglesey copper is superior to all other".

The actual mine workings on Parys mountain are quite extraordinary covering a huge area of land, and in the 18th and 19th Centuries attracted many visitors who were impressed by the spectacle and scale of the workings. Flimsy platforms overhung the sheer sides of the great opencast workings and from these platforms were raised the buckets of ore on hand operated windlasses. The Reverend Edward Bingley visited in 1798 and was obviously impressed with what he saw...



Amlwch Harbour, 1905

"Having ascended to the top, I stood on the verge of a vast and tremendous chasm, I stepped upon one of the stages suspended over the edge of the steep, and the prospect was dreadful Leaving this situation, and following the road, which leads to the mine, my astonishment again excited, the moment I entered.



Part of the mine workings on Parys Mountain with the stump of the windmill in the background

caves and mines of Wales (when my waistline was slimmer and limbs more flexible) I was prepared for the descent into Parys mountain, although I have to confess that the entrance was a little unorthodox. What looks like a drainage culvert set at an angle of 45° gives access to the mine. The culvert was behaving perfectly on the chosen day as the near torrential rain was flowing through it in good quantities. It had been many years since I had experienced the joys of cold, muddy water flowing down the back of my neck.

The shagged arches and overhanging rocks, which seemed to threaten annihilation to anyone daring enough to approach them, when superadded to the sulphureous smell arising from the kilns in which the ore is roasted, made it seem to me like the vestibule of Tartarus, described by Virgil. To look up from the situation and observe the people on the stages, 150 feet above one's head to see the immense numbers of ropes and buckets, most of them in motion; and to reflect, that a single stone casually thrown from above, or falling from a bucket, might in a moment destroy a fellow creature, a man must have a strong mind not to feel impressed with many unpleasant sensations".

Another visitor, Dr John Rutty, was equally impressed with the place but especially the water that drained out of the base of the mountain. This stream, a dark green in colour, he believed to have great medicinal properties as a cure for consumption that was such a killer then.

Dr Rutty was so convinced of the benefits to be derived from its consumption that he presented a paper to the Royal Society in 1760 in which he claimed that the waters would act as a "powerful detergent, repelling, bracing, styptic, cicatrizing, anti scorbutic, and deobstruent medicine, as hath appeared by the notable cures they have affected, not only by external use in inveterate ulcers, the itch, mange, scab, tetters eruptions, dysenteries, internal haemorrhages, in gleets, the flour albus, and diorhea [sic], in the worms, agues, dropsies and jaundice".

So should you suffer from any of the above complaints then a visit to the said water supply and several good draughts should solve all your problems in no time at all.

Water pumped out of the mine was conducted to a series of shallow pits that were filled with scrap iron. The precipitation process that eventually dissolved the iron produced a concentrate of copper. On a recent visit to the underground workings, one of my guides reckoned it takes just a matter of minutes for a knife blade to acquire a good coating of copper. I was warned to avoid the pools of standing water because of their very high acid content. Having spent many happy hours some two decades ago exploring the

My guides were members of the Amlwch and Parys Industrial Heritage Trust who have done so much in recent years to preserve the mines. They are a remarkable body of individuals passionate about this important bit of history. Working in partnership with the landowner, the local mining company and various statutory bodies, they have raised funds to carry out research and limited conservation work both on the mountain and at the neighbouring port of Amlwch where copper ore was smelted and exported.

If the surface of the mountain is spectacular, the underground workings are simply breathtaking. Narrow tunnels suddenly open out into huge chambers with still, wonderfully coloured pools of water. In the light of our cap lamps, the colours changed from deep red to bright blue. Everywhere are reminders of the people who worked these mines all those years ago - the old staging and crude scaffold-like structures, pick and drill marks and a labyrinth of tunnels and chambers.

Nothing, however, had prepared me for a turn in a tunnel that led to what seemed at first glance to be a solid wall. It was at this point that the miners had, sometime in the 18th or 19th Centuries, hit upon spoil deposits from earlier workings. They probably had little idea just how old the bands of clay and other debris were. Within these deposits are fragments of charcoal, leaves and acorns. Nearby, other deposits contained rounded stones on which can be discerned wear marks and signs that they were once used as hand held hammers.

What makes them so important is that they date from the Bronze Age nearly four thousand years ago. To think that I was standing, as it were, in direct contact with those ancient miners was a humbling and, at the same time, an exhilarating experience.

We think of industry as a relatively modern phenomenon yet here was clear evidence of applied technology in ancient history. The mining of the copper ore was, of course, the first step in a process that was followed by smelting and re-working into tools, weapons and other items.

The finds at Parys are part of a pattern of early mining across northern Wales and metal workings from the same period have been discovered at the Great Orme Mines near Llandudno. These are open to the public and visitors have easy access into the underground workings. During the pre-opening work, over 10,000 tools made out of antlers and hammer stones were discovered.

I am sure there is an argument for placing these mines in an international context in terms of their history and scale. Their contribution to human achievement is of such great importance. It is, perhaps, the human story that's so important. The mines at Parys in the 18th and 19th Centuries employed women and children to prepare ore before smelting. This involved breaking the copper away from the worthless rock, a job usually undertaken by the "copar ledis" (the copper ladies). The task of working twelve hours a day wielding a long handled hammer in draughty surroundings for about 10 pence per day was considered by the company to be a form of charity. We always have to be careful when making judgements based upon hindsight and present day standards. At that time the women could earn more than they could by working on the local farms and when they were too old or infirm to continue in the mine yards the company paid them a pension of about 18 pence per week. They wore black hats, known locally as a "Jim Crow", and a yellow spotted scarf tied around their head to protect their hair, part of their face and neck. To protect their left hand they wore a thick leather glove with iron rings around the fingers.

The ruins of the places where they worked are still there, and surrounding the great opencast are many other important buildings and structures that include the Pearl Engine House that has recently been repaired. It housed one of the earliest steam-powered beam engines (1819) to be used in the area. The windmill is the most visible landmark standing starkly against the skyline. It was built in 1878 to pump water from the mine and was unusual in that it had five sails. The machinery and the pumping rods have long since disappeared but the stone built base still stands.

If that's not enough the neighbouring town of Port of Amlwch on the northern coast of Anglesey is another important link in the story. The Industrial Heritage Trust has been very active in preserving some of the harbour buildings and opening a delightful and well-presented information centre about the port and its history. The famed scientist Michael Faraday visited in July 1819 and described the port as "A very pretty, useful place. Small as the village is, and so far removed towards the end of the island out of the line of communication between England and Ireland still it has above 5,000 inhabitants and more than 20 vessels belonging to it. It may be imagined then a pretty bustling place and we found every appearance of it being so. There were a number of vessels in port, some laden with copper or copper slag as ballast, and others unloading iron from London, Swansea etc, or coals from the North or East".

Besides the harbour itself with its large storage bins and copper smelting works, Amlwch was also noted for its ship building yards. The local newspaper reported in 1858 that the "shipbuilding yard of Mr Treweek busily occupied with a fine schooner in wood nearly completed, and another in iron - the first of that material ever constructed in North Wales".

All in all the mines and the port form one of the most important historic landscapes in Wales and well worthy of preservation. It says much for the enthusiasm of the Preservation Trust that so much has been retained but there is much more to be done to ensure the long-term survival of one of the most important places in British mining and technological history.

Information of the work of the Amlwch Industrial Heritage Trust can be obtained from the Secretary, Mr B. D. Hope, Oriel, Moelfre, Ynys Môn/Anglesey, LL72 8HN

This article has been reproduced with kind permission of Cambria Magazine, (Summer 2000 edition, page 18) and the author, Richard Keen.

BULL POT FARM CAVING HUT

Bull Pot Farm is the hub of the Red Rose Cave and Pothole Clubs activities. Visiting clubs and groups are welcome and the Farm facilities for visitors have recently been upgraded. We now have a new visitors and members self catering kitchens and dormitories with Alpine style bunks (sleeping bags required). The club had upgraded the showers, toilets and changing facilities for cavers. There is also a tackle and rope washing area and full central heating. The common room has also been refurbished with a new wood burning stove. Cooking is by butane gas and both kitchens have a fridge and microwave.

Club social events take place on some weekends in which guests are welcome to participate.

Situated high on Casterton Fell at the gateway to the Ease Gill system, Britains longest cave, it is an ideal base for exploring the many caves of the Yorkshire Dales.

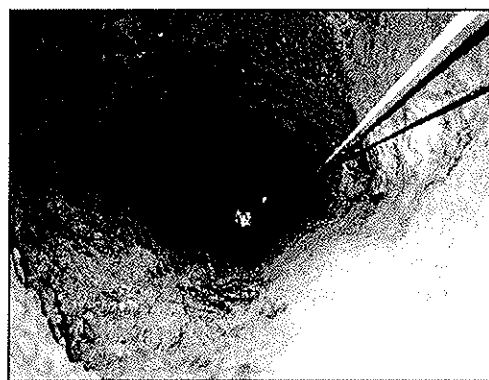
The cost to visitors for the use of the above facilities is £3.00 per person per night. A £10.00 deposit and stamp addressed envelope is needed to confirm a booking. A key will then be sent to you.

Bookings can be made by writing to:
Andy Hall
Hut Warden
66 Hampshire Road
Walton-le-Dale
Preston
PR5 4NH

For more information on the Red Rose CPC have a look at the Web site: www.redrosecpc.demon.co.uk

Andy Hall, June 2000

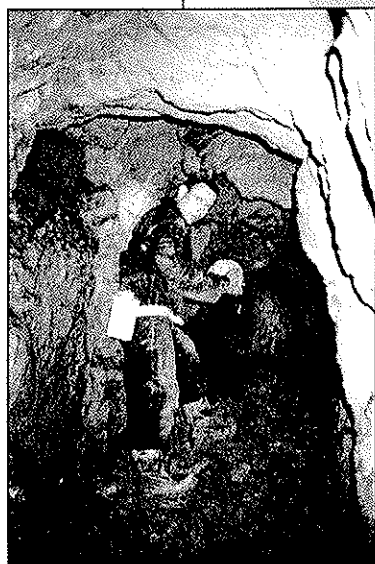
HAULFRE GARDENS TRIAL



Square cut shaft, blinded at the bottom. 27m deep.



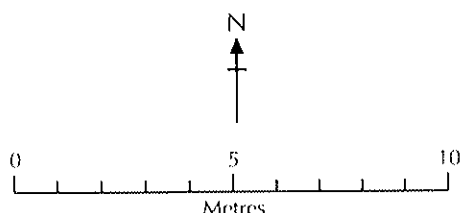
Possible badger sett in roof. Footprints seen in the clay.



The end of the main adit



Main adit (yes, that is a dog you can see!)



Ormesday Reference Site No.27, SH 7745 8252
 The adit entrance is located under a tree root system close to the top of Haulfre Gardens.
 The entrance is sealed with a cemented stone wall approximately 440 mm thick.
 The adit was generally dug on a bearing of 333° and has three small passages off it.
 The adit is approximately 2 metres high and on average 1.2 metres wide.
 A shaft was sunk in the floor of the main adit approximately 28 metres from the entrance. It is 27 metres deep and ends blind at the bottom.
 The mine was surveyed on 16th July 2000 by John Carpenter, Tony Davies and Steve Lea.

Entrance, now walled up beneath tree root system



NOTICEBOARD

Help your Society! Advertisements can be placed in the Journal for a cost of £5.00, which will go into the GOES funds to help with the cost of running the Society. If you would like to advertise (anything you want) then please contact Alison Davies on 01492 877960.



HEN BLAS CONSULTANTS LTD
CARTOGRAPHY

Cartography, Multimedia CD Presentations, Slide Scanning
Telephone 01492 877960

Penmorfa Photos

© Great Orme Exploration Society Ltd.

A selection of photos taken by Mark Beardsall
will soon be available on CD

for you to view on your home computer.

£2.50 to GOES members (£5.00 to non members)

All profits will be donated to the GOES funds

Orders being taken by Mark Beardsall on 01492 540640

CONWAYS' FRUITFUL DAYS

Before the introduction of hard-surfaced roads two centuries ago and the resultant increase in traffic, Conway was known for its flowers and fruit, as well as its honey.

In an age when travel was difficult, if not dangerous, people were content to stay at home. There were few amusements and distractions. Conway, within the walls, is now so built over that it is hard to realise that less than 200 years ago Thomas Pennant found "much of the ground within the walls being used for gardens".

SUPERIOR FLAVOUR:

Early last century Edmund Hyde Hall (whose 'Description of Caernarvonshire', 1809-11, is published by the Caernarvonshire Historical Society) mentions that travellers passing through the town were surprised by the display of fruit offered for sale. He adds "The peaches, nectarines and plums, however, raised within the walls possess a flavour and richness superior to what I have tasted elsewhere in Great Britain. The quality of the honey, also is particularly excellent."

When later in the century, the Town Ditch was filled in, it was for the purpose of using the land for gardens. What is now the Civic Centre, Bodlondeb, was originally laid out as a pleasance by Owen Holland of Plas Isa, who called it Arcadia.

The 'Cambrian Remembrancer' of 1787 writes, "Mr. Holland has judiciously planted and laid out in walks a little hill at the mouth of the Conway which he has called Arcadia". The name Bodlondeb appears in the Conway Councils' minutes in 1817- the home of Mrs Williams - perhaps the widow of the Rev. Hugh Williams who died in 1809.

HERB GARDEN:

Varieties of fruit are to be noticed. In 1599 the famous Elizabethan knight, Sir Richard Bulkeley, made a present of 'a basket of plums'. There is a reminder that large houses had a 'herber' or herb garden where plants were grown for medicinal purposes. One writer mentions that agrimony was 'everywhere' in season, and that hart's tongue and maiden hair abounded in Denbigh Castle.

It is almost certain that the land south of Plas Mawr was originally a formal garden, which stretched as far as the Market Place, now Lancaster Square. Sir John Wynn of Gwydir, following the custom of the time, had a 'town house' in Conway, but where it was situated is not known. One might hazard a guess that it might have been Plas Bach which stood across High Street facing the gatehouse of his soldier uncle's great mansion.

It was the custom of those days for relatives and intimate friends to exchange gifts, sometimes of venison or wine, but more often of fruit. The mine of information, the 'Calender of Wynn Papers', contains a number of references. Sir John Wynn was offered some nectarine and fig trees by Sir Francis Darcy of Brentford, whose daughter married Sir Johns' son, Sir Richard.

Just before Christmas 1618, the Kings' receiver for North Wales, Humffrey Jones, sent Sir John from Beaumaris some pickled quinces, six lemons, a dozen oranges and also 100 chestnuts and walnuts - the latter for Lady Wynn. Later, Humffrey Jones sent another gift of 100 prunes and some spices.

William Wynn wrote to his father from Chelsea saying that lemons sold at 6d. and 4d. a piece. Lemons were evidently a luxury, as elsewhere it states that they were kept "under lock in my lads' closet". Sir Johns' daughter, Mary, had married Sir Roger Mostyn, Knight, and writing from Mostyn Hall she sent home 500 walnuts, a bottle of salad oil and a bottle of claret.

Shortly before James the First died in the spring of 1625 Owen Wynn wrote home to his father stating that he hoped to send him "half a dozen French pears the King eats". During Charles the Second's reign Lady Mary Wynn, from her mother's home at Chirk Castle, sent a gift of one and a half dozen apricots.

POMCITRONS:

The year before the restoration a certain Thomas Beane wrote to Gwydir saying that a Dutch vessel carrying Spanish wine for Dublin had put in at Beaumaris. What follows almost savours of a green-grocers order. Beane went on board and purchased for Sir Owen Wynn 2 dozen lemons and 2 dozen Seville oranges at 1s. per dozen, two pomegranates at 6d. a piece, and two pomcitrons at 9d. a piece. It would be interesting to know whether modern fruiterers come across any 'pomcitrons'.

In the Conway Church register, gardeners are mentioned 19 times, the first entry being in 1755.

Ramon Rainford

POTENTIAL AND REALIZABLE ORES FROM THE GREAT ORME MINE

In the last journal (issue No.1, 2000) Rob Ixer wrote a very detailed article with the above title. There was reference in the article to a Table 1.... and if you were wondering where this table was, the editor forgot to print it. I hope everyone will accept my sincere apologies. Here is the missing table, so I hope all now becomes crystal clear:

Alison Davies (Editor), Llandudno, October 2000

TABLE 1:

	Main/Minor Ore Minerals	Trace Minerals	Tonnage, Grade, Continuity	Beneficiation and Results	Metals in 'Smelter Charge'
Bronze Age Ores					
1a Copper-veins	Chalcopyrite, malachite, copper-bearing limonite. Coarse-grain size. Few intergrowths	Copper sulphide-digenite, djurleite, covellite, spionkopite. Copper-oxides – Cuprite, tenorite. Native copper, sphalerite, manganese oxides.	High Tonnage, continuous. Approx. 10% Cu metal.	High grade chalcopyrite-malachite ± Cu-bearing limonite concentrate by hand-cobbing.	Cu, Fe, trace Ni, Ag, Mn
1b Copper-vugh infilling			High tonnage, discontinuous. 10% Cu metal or less.		
By-product Bronze-Age Ores?					
2a Copper ddu	Amorphous iron-copper-bearing oxides/hydroxides. Minor malachite. Powdery	None	Tonnes, locally, discontinuous. <5% Cu metal?	Beneficiation not possible.	Fe, Cu, trace Co, Mn, Ni As.
2b Azurite-shales	Azurite nodules <1cm, minor malachite.	Chalcopyrite, pyrite.	Very local. Continuous. < 2% Cu.	High grade Azurite concentrate.	Cu, trace Fe.
Non Copper Ore Assemblages					
3a Polymetallic disseminated sulphides	Chalcopyrite, galena, siegenite, pyrite, marcasite. Fine-grained, complex intergrown sulphides.	Cobaltite/gersdorffite, malachite, azurite, tennantite, sphalerite.	Very little? No <i>in situ</i> ore seen. <5% Cu	Fine-grained separate copper concentrate not possible.	Fe, Cu, Co, Pb, trace Ni, Zn, As.
3b Galena-veins	Galena, minor chalcopyrite. Coarse-grained galena.	Malachite, nickeliferous pyrite, marcasite, millerite, sphalerite.	Little tonnage. Continuous but localized. <1% Cu metal.	Lead concentrate by hand cobbing. Copper concentrate not possible.	Pb, Cu, Fe, trace Ni, Co, Ag, Zn.