

***JOURNAL OF THE GREAT
ORME EXPLORATION SOCIETY***



SUPPLEMENT 1

COUNCIL FOR INDEPENDENT ARCHAEOLOGY

LLANDUDNO, MAY 16TH, 1992

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The Great Orme Exploration Society welcomes the Council for Independent Archaeology to Llandudno for their North Wales meeting on May 16th, 1992. We are delighted to be asked to speak to the CIA. To provide more background information about the Society's activities we have collated these articles which have been published, or are about to be published, in the Journal of the Great Orme Exploration Society. They cover our interests in Bronze Age mining, some unpublished thoughts on Bronze Age smelting in this area, exploration of modern mine workings and restoration work in modern workings.

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THE FOUR AGES OF MINING IN THE GREAT ORME

The Great Orme has seen several periods of mining activity. Until recently, perhaps the best known were from 1692 to 1881^{1,2} and during the Roman occupation though the latter is not proven. A growing body of evidence has accumulated which indicates a more ancient origin to mining here than the Romans, in fact, it dates to at least 1600 BC in the early middle Bronze Age³.

The Old Mine is the common element throughout these periods and it is here that many artifacts, such as bronze fragments, bone and stone tools, were discovered by the miners during the last century⁴. They were attributed to the 'Ancients' or 'Romans' and remained undated until very recently.

We now know Bronze Age man began mining here around 1600 BC, or earlier, probably around the area of Vivian's Shaft where more than a dozen closely related copper veins in weathered dolomite were exposed. The tools they left behind tell us how they worked. For picking they used chisels made from bone or stag horn and round igneous rocks were used as hammers (mauls) to batter the rock or separate ore from waste.

They dug out trenches following the veins north and used a process called firesetting when the going was more difficult. A fire was set underground as close to the work face as possible and allowed to heat the rock, cracking it and making it easier to work. The Great Orme Exploration Society recently showed this method to be surprisingly effective in a small surface working.

Underground, the area around Vivian's Shaft is honeycombed with tight sinuous passages, rifts filled with surface spoil and ancient stopes within paces of typical 19th century workings. Here, lying as they were left, 60 or more feet below the surface, you can find bone chisels, stone hammers as well as the characteristic tooling marks they leave on the rock. Charcoal has been dated from here and in 1989 another bronze fragment was discovered which provided valuable metallurgical information.

This area appears to have been mined extensively for 500 years or more, long before the Romans arrived. However, we have found no evidence yet to suggest the ore was smelted here, perhaps this and other evidence will come to light soon.

BRONZE AGE DATES

Location	Year	Depth	Material	Date
Roman Shaft	1987	90 ft	Charcoal	c 1165 BC
Vivian's Shaft	1988	6 ft	Charcoal	c 1690 BC
Vivian's Shaft	1989	70 ft	Charcoal	c 1240 BC
Vivian's Shaft	1989	Surface	Bone	c 1590 BC
Vivian's Shaft	1989	70 ft	Bronze	c 1300 BC

The Romans were certainly in this area and had an auxiliary fort at Connovium (Caerhun) garrisoned by a cohort quingenaria equitata, a composite unit of around 480 infantry and cavalry. Not long after their occupation of North Wales they were mining Lead from the Clwyd mines (AD 64)⁵ using the Deceangli tribe as their labour force. They also mined copper at Parys Mountain where a number of bun ingots have been found, and, closer to home, a copper bun ingot bearing Roman markings was found near Caerhun.

Two large hoards of coins were found in the immediate area of Llandudno and several small collections have been found on the Great Orme. During the last century miners are said to have found coins in the Old Mine, unfortunately, no example or objective account survives. To date no Roman tools or engineering has been discovered relating to the mines and no trace has yet been found of a Villa Urbana or a less sophisticated Villa Rustica.

Although we lack objective evidence, the circumstantial evidence for Roman mining by either themselves or contractors cannot be ignored. It is hoped that in the course of continuing investigations new data may confirm mining activity during the Roman period.

Following the withdrawal of Roman forces the mines probably closed, or at best were worked intermittently and it was not until Elizabeth I^{6,7} that serious thought was given to mining. German mining engineers were brought across from Augsburg in the Tyrol and licensed to prospect in England and North Wales c 1564. In 1568 the Mines Royal Company was incorporated and given sole right to mine copper in eight counties of England and all of Wales. Copper mining and smelting began in Keswick and a little later smelting began at Neath. As yet, I have found no indication that anyone from the Mines Royal Society prospected or mined the Great Orme. The Mineral and Battery Works Society was incorporated in the same period and held the sole rights on zinc mining, brass manufacture, battery and wire production and rights on copper mining in the un-named counties. Between them they worked a cooperative duopoly.

The activity of the Mines Royal Society waned over the years and was never quite the same after the civil war as the Keswick works had been destroyed by Parliamentary forces and many of the shareholders were Royalists. In 1688 legislation was passed which allowed others to mine copper, zinc and other non-precious metals, and in 1692 the first mining lease for the Great Orme was granted to Sir Thomas Mostyn.

For part of the mid eighteenth century the mines lay abandoned once more, possibly because of the price of copper, but were reopened once again. By the early 19th century they had become organised into the Old Mine leased from the Bishop of Bangor and the New Mine leased from the Mostyns. The Tyn y Coed Mine was leased separately from local owners but was effectively part of the New Mine. Later, the Ty Gwyn Mine opened near the Happy Valley, and, although very productive for a few years, it was dogged by engineering problems and was forced to close in 1853. The New Mine was the next to close in 1864 and finally, after

being run down for some years, the Old Mine closed in 1881.

Mining techniques had advanced a great deal from those of the Bronze Age. The Romans had introduced iron edged tools and iron picks and hammers were common in mining when the Great Orme mines opened in 1692. Blasting became common place but was still labour intensive and time consuming as all the shot holes were drilled by hand.

The mines became more organised and the levels a more generous size. As they went deeper it became necessary to pump water from the workings and this problem was addressed in a number of ways. Water could be bailed out, pumped out with a horse powered pump, steam engine or water powered engine, or drained from below with an adit. All were tried, singly and in combination.

Due to many factors the fortunes of the mines changed, and, in turn, they closed. Cheap copper ore was being imported to Swansea from abroad and later, as foreign plants became established, they sent cake copper to Swansea for finishing. When smelters in the New World adopted the Bessemer process Swansea⁸ clung to the Welsh method of repeated roasts and smelts, becoming less and less competitive. The demand for copper had fallen as iron ships did not need copper sheathing to protect them from shipworm in tropical waters and the miners could find better work in Llandudno, which was by 1850 a rapidly growing town.

It is fitting that the Old Mine, which plays the leading role in this saga through the ages, should have been the last to close in 1881. In 1990, 109 years after its closure, the Old Mine is once again in operation and playing the leading role as the story of Bronze Age mining unfolds.

Don Smith, Ontario, March 1990

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PREHISTORIC COPPER MINES: AN UPDATE

Those members of **GOES** with ears to the archaeological ground will have already heard that the Great Orme is not the only place with a Bronze Age copper mine. Several other places in Wales, **Parys Mountain**, **Cwmystwyth** and **Nantyreira**, have produced evidence of Bronze Age opencast mining, with carbon-14 (C_{14}) dates in support. Parys Mountain indeed has produced the earliest date yet, around 2000 BC. Much the same has been found in Ireland; at **Mount Gabriel** (County Cork) consisting of no less than 31 shallow workings, with C_{14} dates ranging from about 1300 to about 1700 BC.

Other names may soon be added to this list, for example, **Alderley Edge** in Cheshire. Here stone mauls, those ungainly tools found in their hundreds in the Great Orme Mines, have been recorded over a number of years, and an exploratory dig is now being carried out by a team from the University of Bedford, in the hope of finding more definite evidence of a Bronze Age date. Stone mauls have also been found at **Bradda Head**, in the Isle of Man, and in a scatter of sites in Dyfed. They have also been reported from the **Tre Castell** lead mine in the Conwy valley and at two copper workings south-east of **Towyn** (Merioneth).

So it looks as if the hunt for Bronze Age mines is set to widen and by this time next year, or soon after, we may have quite a collection of likely sites scattered all over the 'highland' regions of the British Isles from Scotland to Cornwall. The same may be true of other parts of Western Europe; Austria has already produced a good example in the **Mitterberg** region south of Salzburg. Likewise Spain, especially in the **Rio Tinto** area in the south-west near Cadiz, and the area around **Los Millares** in the south east, north of **Almeria**. They have also been found, I am delighted to add, in my favourite foreign home-from-home, France, which used to be dismissed by archaeologists as having no domestic source of copper at all (they used to say the same about Wales).

I first became interested in the possibilities during the summer of 1988, when returning from my usual wine-sampling and sunbathing holiday in the Pyrenees. Pottering gently up the west side of the Massif Central, south-west of Poitiers, I happened to see a little sign by the roadside advertising visits to the 'Ancient Silver Mines' near the little town of **Melle**. Naturally, I made a bee-line for them, and very good they were too. However, the part that we were shown is only a tiny fraction of the whole system (60 kilometres of galleries). It was very well displayed with nice flowstone formations and good exposures of the main mineral, galena (lead sulphide) and also cerussite (lead carbonate). There was also some evidence of firesetting; the workings are certainly ancient, dating mainly from the 5th to the 10th century AD. They might indeed go further back still, to the Romans and even to the Celts or Gauls before them, although there is no actual evidence of that yet.

On the surface there is a little museum and while browsing around I met the curator. He knew of no local ancient copper mines but provided me with a reference of a detailed and illustrated report by one Monsieur Claude Dubois entitled 'Antique Mines of the Seronais' (Pyrenees of the Ariege). Unfortunately I

was unable to get a copy of this article at the time, but after my return home, I plucked up my courage to write to M Dubois at the University of Toulouse asking for a photocopy of his article, sending him, by way of encouragement, photocopies of articles by Andy, Danny and Duncan James on the Great Orme discoveries. In due course, M Dubois replied (in good English) enclosing a copy of his article but telling me that none of the Seronais mines were Bronze Age, alas. They were Gallo-Roman ie very late BC, roughly 200-0 and securely dated by the many bits of pottery found in the mines and spoil heaps. Most of these bits of pottery were from amphorae, giant wine jars imported from Italy, so some of the miners, at least, did not do all that badly for themselves.

However, this is not the end of the matter, because M Dubois did mention that he knew of two Bronze Age copper mines, both in the south of France, in the Cevennes, the hilly country north east of **Carcassonne**, and which happens to be one of my favourite spots (beautiful sunbathing and even more beautiful wine). He gave me brief details and advised me to get in touch with the excavator, a Madame Barges, in Marseilles. So I hastened to write, enclosing further photocopies of work by Andy et al, and in due course she 'came up trumps', with a whole sheaf of archaeological articles (in French) accompanied by a very friendly letter wishing us luck on the Great Orme.

From all this I learnt that the two mines were in fact within 30 miles of each other. One is at the bottom of a series of natural 'avens' (or swallow holes) called **Bouche-Payrol**, near the town of **Brusque** about 20 miles west of **Lodeve**. The other is just north of the village of **Cabrieres**, about 12 miles south of Lodeve. Bouche-Payrol, so Mme Barge told me is difficult of access requiring caving equipment but Cabrieres is easy. This was confirmed to me by David Gale, one of the archaeologists working for a while this summer on the stone mauls of the Great Orme. He had been there and gave me detailed instructions of how to find it so it looked as though Cabrieres at least was on the cards for my holiday in July.

Meanwhile, another article on the Cabrieres mine reached me, thanks to Dr. Craddock at the British Museum. This described in great detail several underground galleries (of unknown depth as the lower levels were flooded); some evidence of later Roman working (2 Latin graffiti) but enough bits of Bronze Age pottery in the galleries and mixed up with the spoil to establish its prehistoric date. There was also an obvious ore treatment site by the "**Roque Fenestre**", a prominent outcrop of rock about 400 m from the mine, once again proved by plentiful pottery finds to be Bronze Age in date, and supported by a C₁₄ date (charcoal) of 1950 BC.

Sadly, when I got to Cabrieres I found the mines closed, their entrances boarded up, 'Access Prohibited' signs outside and the archaeologists departed. Having sweated buckets getting there on a very hot day I wasn't going to leave empty handed so I took some photographs of the entrances. If GOES wishes to mount a French Copper Mines expedition at some stage in the future I can lead them straight to the spot, -provided it is spring or autumn, and not mid-summer!

G.C.David, November 1991

LOCATION OF BRONZE AGE SMELTING SITES

Early in 1991 discussions with members of the Great Orme Exploration Society brought out the problem of the location of the site or sites of Bronze Age smelting of ore from the Great Orme. A few visits to the Copper Mine site made it obvious that considerable ore had been removed in prehistoric times and although a volumetric survey of Bronze Age workings has not been done a figure of 50,000 tons has been suggested by an informed source.

This amount of ore when smelted would of course produce a large amount of slag, tens of thousands of tons. A lot of slag to be discovered. Experience gained whilst working in metalliferous mines in Northern Derbyshire and in association with Eldon Pothole Club, Peak District Mines Historical Society etc. caused me to consider the following:-

Pressure on local sources of timber in the 16th century, not only for smelting, but for props and firesetting, not to mention domestic requirements, made it necessary to transport lead ore over the Derbyshire moors with packhorses and carts, to more abundant fuel supplies.

This journey, though only some 16 kilometres, due to the rugged terrain is a strenuous one on foot in good weather, for which Derbyshire is not well known.

Fresh water for 'Buddling', (the washing and refining of ore) is also a problem in limestone areas due to the lack of surface water.

As the Great Orme is a fairly small area any local timber would soon be exhausted, not to mention the fresh water supply.

In recent times copper ores from both the Great Orme and Parys Mountain were taken by sea to distant smelting sites where fuel (coal) was plentiful. Even with coal, three tons of it was needed to smelt one ton of ore. Bearing this in mind it would not be unreasonable to propose that Bronze Age man would have also taken copper ores to smelting sites where fuel supplies were easier to obtain.

Bronze Age roads are an unknown quantity, as is any knowledge of the draught animals in that time. But as Victorian miners used sea transport and as a quarter ton can be transported in a very small and primitive boat with ease and safety I determined to examine local natural inlets and landing places which could have provided a suitable smelting site.

This of course had to take into account prevailing winds, currents, and runs of the tide. At one particularly favourable location I discovered a fair quantity of slag. Whether it is from Bronze Age smelting is open to question as much research is necessary in the field, laboratory and archive, before any conclusions can be reached.

Tom Parry and myself have already made some initial trips in the field as well as

references to various relevant documents with the result that slag samples of possible relevance have been found at two more sites. Two other likely locations have been brought to our notice and will be examined in the near future.

At present the results of the slag analysis are eagerly awaited. It is hoped that they will indicate the direction of further investigations. Whatever transpires they cannot however conclusively prove or disprove the original premise that Bronze Age smelting took place away from the mining areas.

Currently discrete negotiations are taking place to obtain permission from various landowners to carryout site investigations at several locations. It is hoped that permission will soon be granted and that field trips can be arranged for interested parties. Expert guidance and specialist knowledge would be greatly appreciated during these visits.

Further research: (not in order of priority)

- 1 To discover any other reason for slag or evidence of smelting on sites which come into a relevant category.
- 2 To build a theoretical model of a Bronze Age society of miners, smelters, and support industries such as farmers, charcoal burners, sailors etc.
- 3 Prove the feasibility of transporting ore to favourable sites by sea or other means.
- 4 Examine smelting methods for clues to finding and proving sites, ie subsoil analysis.

Nigel Bannerman, April 1992

EUREKA, HIGHER SHAFT!

When something starts ticking over in your head you just have to do something about it. Owen's shaft was doing just that, and not knowing much about it I decided it was time to explore for myself. The information available from sources such as Andrew Lewis was not over helpful, but having explored the lower level there was only one area left, and this winze was clearly flooded some of the time.

We shot down into the winze and were pleased to discover no boot-prints in the soft mud. The level went on and contained no sign of entry this century. "Oh, it doesn't go anywhere, its blind" was the response we got from CAL a little later; porky-pies perhaps? The following week Mat and I returned to the winze and made a thorough search of the system. From cramped 19th century workings we went north, passing through a flat where we found small typically 'ancient' mine rubble containing charcoal, and then back into cramped 19th century workings. The level ended in a sump just beyond a splendid windlass.

In this area I had the sense of deja-vu. I was convinced this was part of the Treweek workings. and so it turned out on the survey a few weeks later, the windlass and sump were a matter of 30-40 metres south-east of Treweek's shaft at about the 200 ft level. Retracing our steps we found a maze of interlinking passages, running north-south in an area of loose dolomite. After zig-zagging our way east and south we found Higher Shaft. Below, the shaft was open for about 20 feet and filled with modern rubble and to the south and north the mined out mineral vein was exposed in the shaft wall. Above, massive bungalow-sized blocks had slipped across the shaft and about 50 ft above the shaft was obstructed by a boulder choke. The shaft is perpendicular and has a square section, approximately 4m*4m.

I knew that on return to surface a certain individual would be miffed, all the more so because of the plaster-of-paris cast which prevented him verifying the find. Two weeks later a larger group, consisting of Dave Jenkins, Tony Davies, Danny Dutton, Mat Richardson, Don and Phil Smith, returned and surveyed the route from Higher Shaft back to Owen's shaft. Feeling somewhat mischievous I brought the party along the scenic, indirect route, as we progressed towards Higher Shaft. Dave Jenkins was well impressed with the flat, which he thought was very old, the windlass and the abundance of splendid azurite crystals and nodules we found on the way to the shaft. All were convinced that Higher shaft had indeed been found.

Having demonstrated the discoveries I, with Mat and Danny, headed for surface, leaving the remainder to survey the system on their way out. Being devious and fleet of foot I was tackled up and half way up the rope before Mat and Danny reached Owen's shaft. This, you might think, is it for now, until I stumble across something new and unexplored. But I don't stumble, everything is strategically planned in our office at the King's Head. This was just to whet your appetite, now I have a 'An Incredible Plan'.

Phil Smith, February 1992

THE TY GWYN TRAMMING ADIT: BLOCKAGE No 1.

The following article is a brief account of the problems encountered and the solutions involved in clearing the first blockage in the Ty Gwyn adit. This blockage was situated 100 meters beyond the manhole through which entrance is gained. Both sides of the blockage could be reached and it was estimated to extend at roof level for about 10 feet and anything up to 30 feet at its base. It consisted of rocks the size of footballs down to golf ball sizes, mixed with a large quantity of fines and mud.

It was obvious upon inspection that there was a lot of loose rubble above roof level, and at the north west end, that the side of the shaft had collapsed outwards. As there was a theory that this was the bottom of a ventilation shaft extending up to surface, this rubble would have to be supported and a passage dug below it.

After some lengthy discussions it was decided to drive 1 inch solid steel bars through the blockage at as high a level as could be managed, and then, as long as the other ends could be found these would be supported on acrows to allow the dig to proceed underneath. So the dig started in earnest, and hard work it was too hammering those bars through, as quite often they would hit a large boulder and either stop or veer off to one side or the other.

Finally, after many weeks work, all the bars were hammered home with about a foot left protruding to allow the supports to be positioned. We then had the problem of finding the other ends so that the north-west side of the blockage could be supported before digging commenced. After scratching about for a while the ends of four out of the seven bars were found and steel scaffolding poles were slipped over them to bring the supports out into the adit and away from the collapse.

Digging now commenced and proceeded at a good pace over many weekends, all the spoil removed was bagged and stored in the blind passage just before the blockage with the larger boulders being built into a wall of deads. The spoil was bagged in order that it could then be easily transferred to another location at a later date for use as walling or to lay on the floor to allow access across the "muddy bits".

The digging progressed and extra acrows were used to support the roof as it was exposed, until finally one day a small hole appeared in the top right hand corner of the spoil, this was it, we had finally broken through. Not much else was done that day as celebrations were in order. So, tired, wet and dirty, yet jubilant, we all retired to the nearest pub for refreshments and discussions.

The work proceeded apace now that we saw light at the end of the tunnel so to speak (no apologies for the pun), and it was not long after this that there was room enough for, yes you've guessed, Billy to clamber through. From this point the actual clearance work was soon nearly complete and our thoughts could be turned toward how to affect a permanent solution and free the acrows for future use.

By this time it was decided that the support structure we had built and underneath of which we walked would need to be strengthened and if possible raised as close as we could get it to the roof line before more permanent supports were installed.

A number of 9 inch wide steel channels were donated to the club and using the only two remaining acrows the first of these was raised up against the steel bars and tightened into place so releasing two more acrows to repeat the process. Eventually all the old wooden cross supports were removed and the project was beginning to take shape and look more presentable.

We still had the problem of how to raise the height and after trying to screw it higher using the acrows with no great success a portable 10 ton hydraulic jack was borrowed and little by little the channels were jacked up with the acrows being tightened up behind them. After a lot of hard work everything was as high as it was possible to get. Four lengths of heavy duty 5 inch by 3 inch "I" beam were purchased to be installed longitudinally as close to the side walls as possible. The borrowed hydraulic jack was again brought into use, this time to support a temporary "I" beam placed a foot out from the wall. This allowed the acrows to be lowered away from the channels and another section of beam to be lifted into place close in to the side and then re-supported with just two acrows.

This process was repeated until all four longitudinal beams were in position when the jack was utilised to level them as best as could be achieved. During this process we finally reached the limit of the jack, which gives an indication of the weight of rubble now being supported by the channels we had installed.

Due to this weight it was decided that eight uprights made from the same heavy duty "I" beam should be used as the final supports, each was measured individually and after purchase they were cut and plated top and bottom to the required lengths ready for installation. The final job was the placing of these uprights and that was achieved without too much difficulty by again using the jack to relieve the pressure on the acrows so they could be removed and replaced by the permanent supports. Until finally the project was complete!

This record of the progress of the clubs first major blockage clearance is as factual as it is possible to get without becoming too long winded. Credit must be given to all the club members who gave up their free time to get wet, dirty and tired during the project and they are to be congratulated on the effort put in and in the final appearance of the Ty Gwyn adit which is now passable all the way to the Tyn y Fron blockage a total distance of 465 metres.

Discussions will begin soon on what should be the next project to tackle, should it be the final Ty Gwyn blockage into the Tyn y Fron side of the mine, the Penmorfa ginging and mud slide or something else? I am open to suggestions but I am sure volunteers will soon be needed to get extremely wet, muddy and tired.

Tony Davies, February 1992

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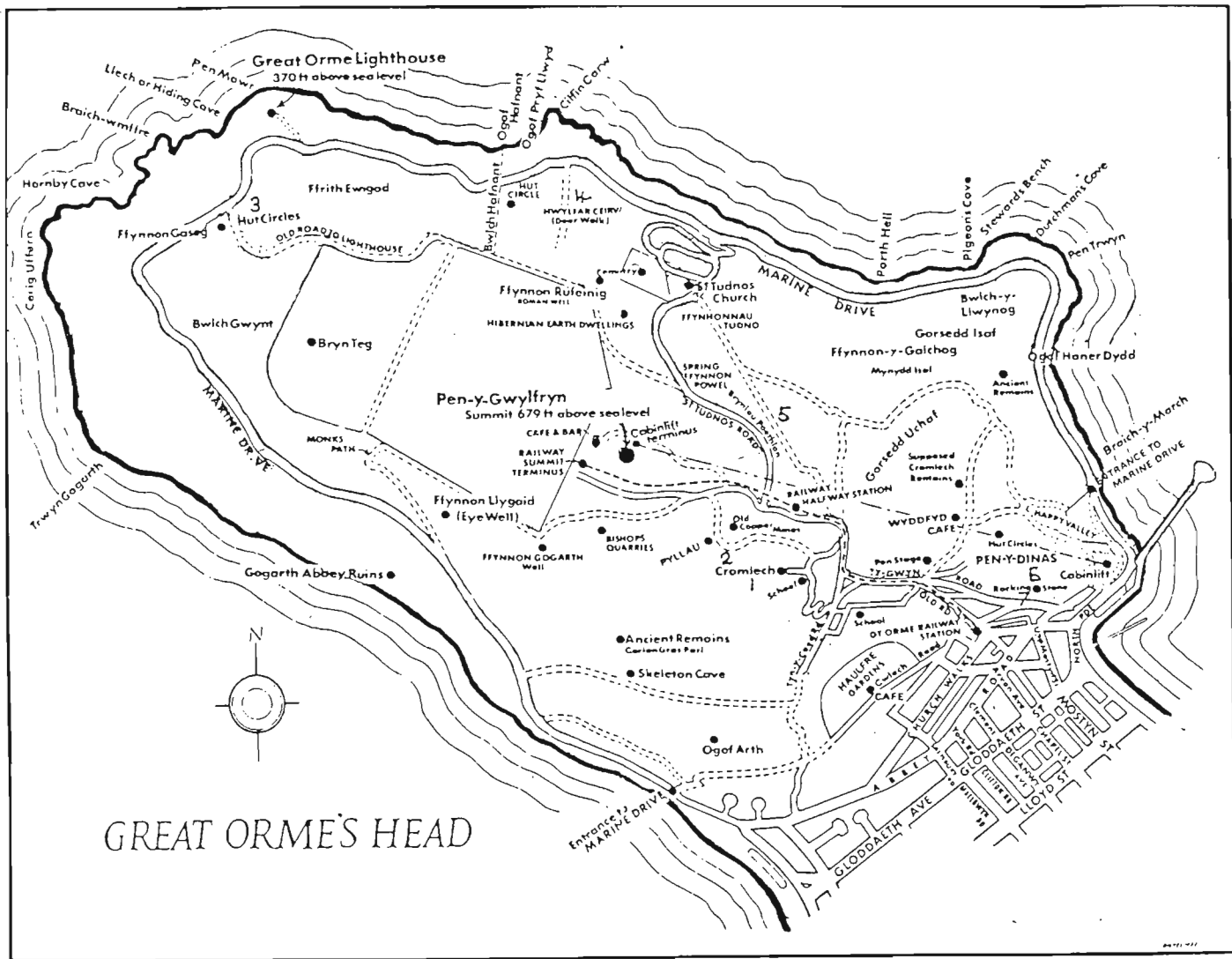
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SOME ARCHAEOLOGICAL SITES ON THE GREAT ORME

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| 1 <u>Lletv'r Filiast:</u> | Great Orme Cromlech, a Neolithic burial chamber. |
| 2 <u>Bronze Age mines:</u> | Bronze Age copper mining centre. |
| 3 <u>Hut circles:</u> | Remains of early settlement(s). |
| 4 <u>Hwylfa'r Ceirw:</u> | The Deer Walk, an avenue of stones. |
| 5 <u>Brvniau Poethion:</u> | An area of many unexplained mounds and hollows, medieval ridge and furrow marks, and bell-pits from nineteenth century surface mining. |
| 6 <u>Pen y Dinas:</u> | Iron Age hill fort with excellent examples of defensive glacis slopes. |
| 7 <u>Kendrick's Cave:</u> | Kendrick's cave has been C ₁₄ dated to 10,000 BP. This site is on private land and accessible only on formal application. |
| 8 <u>The Bishop's Palace:</u> | Ruins of the thirteenth century palace of the Bishops of Bangor. This site is on private land, permission to visit should be obtained from the Railway Convalescent Home in whose grounds it stands. |