

Radiocarbon Date for the Human Remains from North Face Cave, Little Orme's Head, Gwynedd.

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Abstract

The recent discovery of a fragment of a human maxillary bone from a cave on the Little Orme's Head, reopened the research into the earlier excavation of the North Face Cave. The bone fragment was a chance find, recovered from the disturbed back section of the cave by Nick Jowett from the Great Orme Copper Mines. Further investigation suggested that the eruption dates of the teeth was comparable to the 10-12 year old child recovered in the earlier excavation in 1964. Funded by the Great Orme Copper Mines, a radiocarbon date was obtained from the Scottish Universities Environmental Research Centre. Would this radiocarbon date from the maxilla give succour to the theory in the 2012 report that the human remains from North Face Cave represented the peoples that had taken part in the mining of the malachite from the copper mines on the neighbouring Great Orme?

Background

The North Face Cave was first examined when searching for hibernating bats in 1959; revisiting the cave in 1961 a number of human teeth were discovered. They belonged to a child and were located around the perimeter of a manmade hole in the stalagmite base at the back of the cave. This unexpected discovery led to a full excavation of the cave; a total of 73 human bones were recovered from the deposits but many bones remained embedded in the stalagmite base. The bones represented the remains of at least four individuals, with varying ages from 4 years old, 8-9 years old, 10-12 years old and an 18+ near adult. Evidence from the deposit sequence and the sparse number of artefacts suggested the remains were Bronze Age; the amber bead implying it could be Early to Middle Bronze Age. Similar shaped amber beads have been recovered from Glencurran Cave, Co. Clare in south west Ireland and assigned to the Middle Bronze Age.

A re-appraisal of the human material in 1980 highlighted the adult lumbar vertebra (No. 296), that showed excessive wear and degeneration of the centrum along with an unexpected degree of distortion. This was common to some of the other vertebra but not as pronounced as vertebra 296. This deformation suggested that external pressure from continually lifting/carrying heavy loads to one side of the body over a lengthy period of time has contributed to the compression and distortion of the centrum. The absence of any real explanation for this exceptional compression, other than heavy farm work, posed the question as to what had caused it and would remain unanswered.

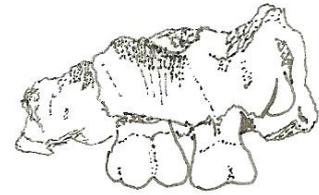
In 1986, an amazing discovery was made on the neighbouring Great Orme (5 kilometres from the North Face Cave) of a Bronze Age Copper Mine, could this new found discovery offer an explanation for the excessive wear and deformity to the vertebra? Without a radiocarbon date from the human remains there was no correlation between the copper mine and the remains and such a tenuous link could only be a tentative suggestion.

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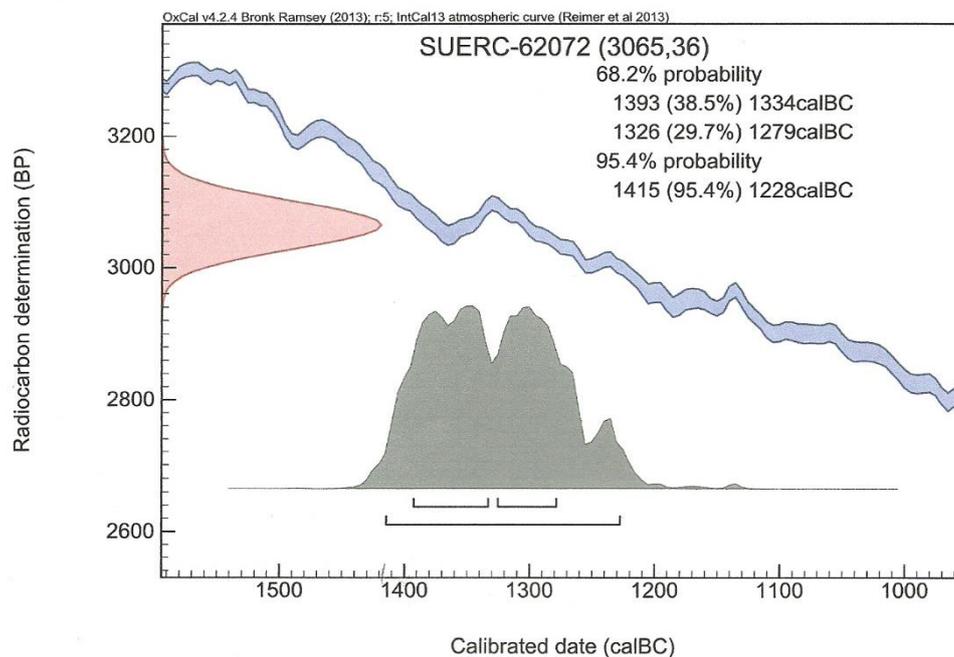
1.0 Radiocarbon Date

The right fragment of a human maxilla (Fig. 1) discovered in 2015, more than 50 years after the original excavation, is in reasonable condition, fragmented, but with some teeth still intact. The staining and condition of this portion of the upper jaw is comparable to the earlier human remains recovered from the North Face Cave. The eruption dates for the teeth, 2nd. permanent premolar, & 1st. permanent molar fully formed and in perfect condition, with no wear to the crowns, and the canine ready for eruption would estimate the age around 10-12 years old. A sample of bone (NFC0715) was removed from the maxilla and sent for a radiocarbon dating, the resulting Calibration Plot is shown below.



Human Maxilla. Figure 1

The radiocarbon determination is 3,065 +/- 36 BP



The calibrated date assigns the maxilla to the middle Bronze Age
3,365 BP – 3,178 BP with a 95.4% probability

2.0 Stable Isotopes $\delta^{13}\text{C}$ & $\delta^{15}\text{N}$

The analysis of the stable isotopes extracted from the human maxilla are as follows:-
 $\delta^{13}\text{C}$ relative to VPDB (Vienna PeeDee Belemnite) provided a value of -20.9 ‰

$\delta^{15}\text{N}$ relative to air provided a value of 10.8 ‰

Isotopes extracted from teeth reflect the diet whilst the teeth are developing, extracted from bone only reflects the diet over the last ten years. As this sample is from a 10-12 year old child it reflects the full dietary history.

2.1 Diet

The Little Orme, like the neighbouring Great Orme, is a large carboniferous limestone headland that juts out into the Irish Sea, south, is the wide estuary of the Afon Conwy who's smaller tributaries like the Afon Llugwy, originates amid the rugged mountains of Snowdonia. With such a wide range of sea fishing opportunities and salmon that have spawned in the upland lakes and rivers for millennia, it is surprising to find that this individual had an almost exclusive terrestrial diet. The isotope value of -20.9 ‰ is indicative of the farming communities that appeared during the Neolithic period when they adopted farming methods to produce their food. This isotopic figure is supported by the associated butchered animal remains recovered from the cave, Ox, small Ox, Sheep and Goat, and although many soil samples were removed for washing and sieving no fish bone where recovered from the excavation.

Earlier communities that had a marine diet and existing on fish and sea foods would have a $\delta^{13}\text{C}$ value of approximately -12 ‰, on the other hand the hunter gatherer of the Mesolithic who had a varied diet of fish and land mammals would have a $\delta^{13}\text{C}$ value somewhere in-between, around -16‰ - -18‰. The $\delta^{15}\text{N}$ value of -10.8‰ would suggest a reasonable balanced diet with adequate protein content.

Note: It's interesting that Blodwen, "The Lady of the Little Orme", the Neolithic skeleton found in a rift in the quarry in 1891 has a similar stable isotope value of 20.6‰

3.0 Mitochondrial DNA

The 1st. permanent molar from the maxilla was removed and sent to Harvard Medical School Dept. of Genetics for DNA analysis.

3.1 Gender

The skeleton of this 10-12 year old individual is represented by just 21 bones, with the exception of a patella, a few vertebrae and a metacarpal the remaining bones are fragmentary and in poor condition, all display a great deal of deterioration. Without a complete anatomical reference skeleton for comparison it is difficult to make a reasonable determination as to the sex of the individual, if at all possible on such a young person, however the nuclear genome test data suggests that the individual is highly likely to be female.

3.2 Ancestry

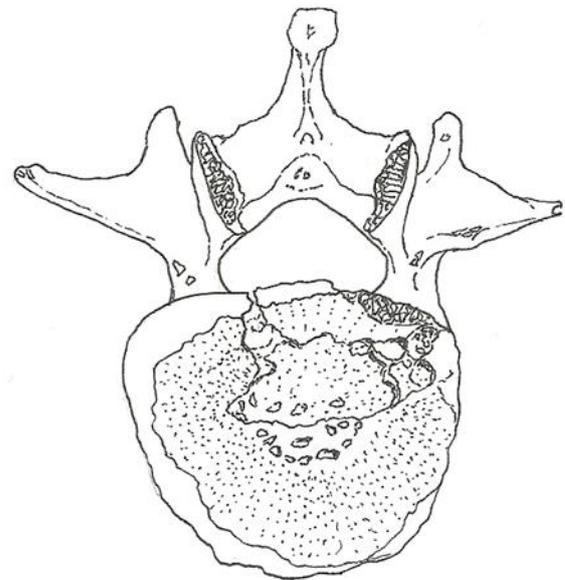
The mitochondrial DNA extracted from the tooth revealed that the individual belonged to haplogroup U5 a1a2b. The distribution and age of the U5 haplogroups were part of the initial expansion tracking the retreat of the Ice sheet. The early Palaeolithic hunter gatherers of Europe were the origins of the U5 group and are believed to have their roots around 50,000 - 30,000 years ago. U5a subclade is most common in north east Europe during the Mesolithic 10,000 BP. The rare human skeleton dating from the Mesolithic found in Gough's Cave, Cheddar Gorge belonged to this haplogroup. Subclade U5a1a2 represents farming communities at the end of the Neolithic, followed by U5a1a2b that originated in the Bronze Age/Iron Age 3,000 BP and is found in Britain, Scandinavia, Central Europe and Turkey. Currently there are 4 known samples from the subclade U5a1a2b, 3 from the UK and 1 from Sweden. 11% of modern Europeans and 10% of modern European/Americans belong to this group.

4.0 North Face Cave, Human remains

The re-evaluation of the human remains in 1980 entailed a detailed examination of individual bones, looking for evidence of trauma, dietary deficiency or any other abnormalities. Another area of investigation was to establish wherever possible as to the exact number of individuals the bones represented. The taphonomic analysis of the remains found that the four individuals represented, were spread throughout the length of the cave and the evidence suggested that this disarticulation took place in a relatively short period after their death. The majority of the bones from each individual were recovered directly from Layer III but, some bones from each of the four individuals were also found to be partly embedded in the underlying stalagmite base. In conclusion, without any duplication in the type of bone, fragmentary or almost complete, each age group represents just one individual, this can also include the latest discovery of the maxillary fragment of the 10-12 year old. Furthermore there is no reason to believe the remains of the different individuals aren't contemporaneous and given that the radiocarbon date obtained from the 10-12 year old has a figure of +/-100 years with a probability factor of 95.4% we could take it that the four individuals are from the same period.

The analysis of the bones and their subsequent interpretation threw up two main areas that required further investigation. Firstly, there was the abnormalities in the dentition which the initial x-rays revealed; it was felt that an exhaustive study could pay dividends. Secondly, an examination of the 19 human vertebrae recovered from layer III, showed some of them had varying degrees of abnormal compression to the centrum.

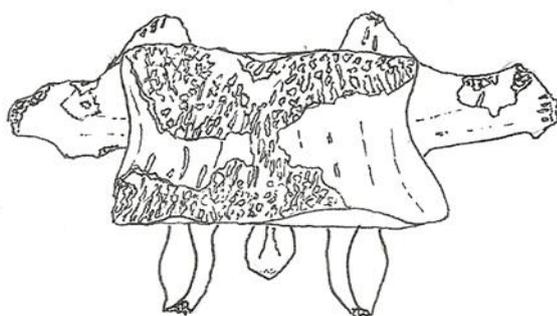
The deterioration of the bone in general and in particular the centrum, is quite severe. In many cases, because of the deterioration to the articular facets it is difficult to determine the true extent of wear or compression to the anterior and posterior surfaces of the body. The best examples we have is from the three adult lumbar vertebrae and in particular vertebra 296, it shows considerable wear to the posterior surface, as shown in the caudal view (Fig 2), with just a small area of the original bone still intact around the outer perimeter. Vertebra 296 also displays damage to the centrum inside the neural canal, though because of its general condition it is difficult to determine whether this is post mortem damage. The ventral view of the centrum (Fig. 3), shows that the uneven downward pressure applied to the centrum has distorted it to



Lumbar Vertebra Figure 2

such an extent that the anterior and posterior surfaces are no longer parallel. The compression on the vertebra has spread the body of the centrum at the posterior end, distorting the centrum to the left side of the spinal column. As can be observed in ventral view the anterior surface is much wider in the lateral plane than the posterior surface

This is indicative of external pressure from continually lifting/carrying heavy loads over a sustainable period of time and has contributed to the compression and distortion of the centrum.



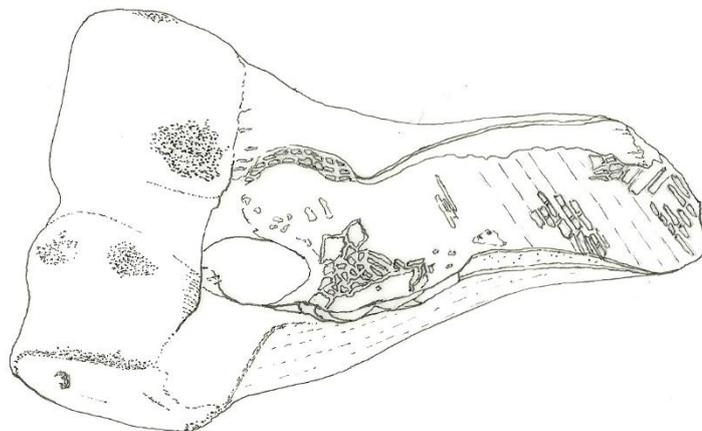
Lumbar Vertebra Figure 3

4.1 North Face Cave – Great Orme Copper Mines

Before the known existence of the Great Orme Copper Mine the only answer to this distortion of the spine was from extensive farming, possibly in the form of land clearance, though the destruction of the anterior and posterior surfaces would suggest something more excessive. The proposed theory that was muted in the 2012 report (page 47) suggested that the severity of the deformation of the vertebra was indicative of some heavy form of labour and could be linked to the Great Orme where malachite was mined ready for smelting to produce copper for axes, spears and ornamentation. The mining entailed hammering the malachite from the base rock using hammer stones, large boulders transported from the beach. Over 2,500 hammer stones have been recovered from the mine, some weighing as much as 30 kg. Transporting the stones from place to place in the mine and the hammering action itself would have been arduous work and without doubt would have both been contributory factors in compressing and distorting the spine. As this was just a theory it was difficult to make any association between the inhabitants of North Face Cave and the Great Orme Copper Mines until the radiocarbon date provided us with a link.

4.2 Radiocarbon Dates from the Great Orme Copper Mine.

The calibrated radiocarbon dates were obtained from charcoal and bones that had been utilised as tools. The bones, 35,000 of them, some complete but many fragmentary, belong mainly to cattle. Many, like the green stained sturdy humerus right (Fig. 4) show signs of wear, indicative of human use. It is assumed that the bones were used to separate the copper ore from the fragmented rock after the crushing process. The utilised bones are contemporary with the excavation of the mine and are evidence that



Utilised Cattle Bone Fig. 4

human activity in the mine took place at the same time that North Face Cave was inhabited. Many of the radiocarbon dates are in and around a few hundred years of the occupation of the cave (See chart below). Most recent evidence has shown the mine to have been in use for well over a thousand years from 2,600 BP – 3,860 BP

Some comparison of dates from Great Orme Copper Mine and North Face Cave
Calibrated OxCal version 4.2.4 Bronk Ramsey.

Lab Code	Location	Material	Determination	Cal. Date
¹ CAR1280	Surface workings GOM ⁴	Charcoal	2970 +/- 60	3342-3286 BP
² BM2752	Stope Spoils GOM ⁴	Bone	3070 +/- 50	3370-3148 BP
² BM2645	Underground workings GOM ⁴	Bone	3290 +/- 60	3596-3368 BP
² BM2802	Surface Workings GOM ⁴	Bone	3180 +/- 80	3565-3180 BP
¹ CAR1184	Surface Workings GOM ⁴	Charcoal	3370 +/- 80	3792-3400 BP
Lab Code	Location	Material	Determination	Cal. Date
SUERC ³ 62072	North Face Cave	Maxilla	3065 +/- 36	3370-3180 BP

¹University College Cardiff

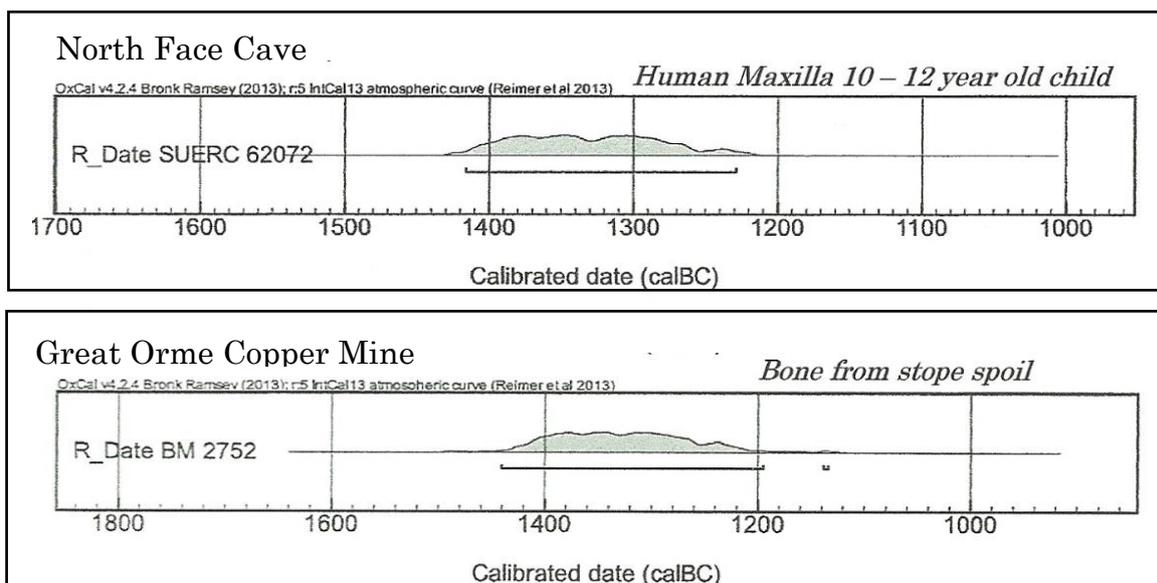
² British Museum

³Scottish Universities Environmental Research Centre

⁴ Great Orme Mine

4.3 Conclusions

The calibrated date for the cave inhabitants sits almost in the middle of the time span for the period of mine workings; the radiocarbon multiple plots below from OxCal, clearly show similar calibrated dates from the Great Orme Copper Mines and the human remains from North Face Cave. Bone from the stope spoil, lab code BM 2752, is the closest date to the North Face Cave maxilla, with almost identical dates. Regardless of the closeness of the dates it does not verify that the individuals found in the North Face Cave worked in the copper mine. It does however give credence to the theory that the inhabitants from the cave could have been mine workers and would certainly explain the anomalies in the human vertebra.



5.0 Background to Latest Discoveries

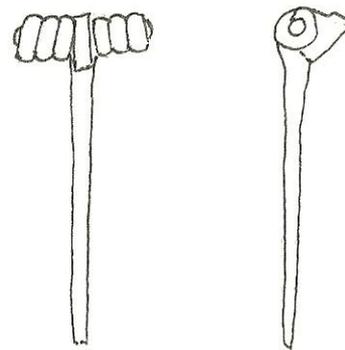
During the original excavation in the 60's a small gold ingot was recovered and was subsequently misplaced on the talus before being logged. Its dimensions can only be guessed at as it was not measured at the time of its discovery but was probably about 3mm-4mm square by 20mm long. The disclosure of the ingot and the description of an unnamed cave close to the North Face Cave that Nick Jowett was not aware of was enough to instigate a further examination of the cave and the surrounding area. A number of new caves were discovered by Nick, albeit along the dangerous sea cliffs, access to these well concealed caves is extremely hazardous and can only be gained by the use of climbing equipment.

A metal detector failed to find the ingot, however, it did pick out a metal object buried in the stalagmite base inside the North Face Cave.

5.1 Romano-British Brooch

The metal object revealed itself to be the badly corroded remains of a bronze Romano-British Fibula (Fig. 5). All that remains is the pin and the greater part of the spring mechanism including the hinge pin, what remains is coated in Verdigris and all three components are fused together. The corrosion is severe but its appearance would suggest it is a Trumpet type brooch, the bow is absent and has broken off at the weakest part of the casting, where the head meets the central hinge plate, leaving the hinge plate embedded in the central section of the spring. The pin is 44mm in length and the spring mechanism although distorted measures 17mm across. The length of the pin would suggest a large Trumpet brooch, typically dated to the 1st/2nd. Century. The drawing, (Fig. 5) depicts the remains of the brooch before the corrosion took place.

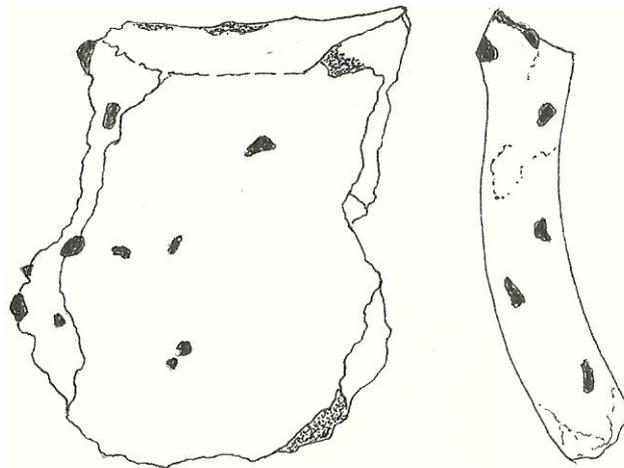
Note: It is not uncommon to find Romano-British Brooches in caves, examples have been recovered from Ogof-yr-Esgryn a cave in Powys that contained two Trumpet type brooches along with two Zoomorphic brooches in the style of a dolphin. Culver Hole in Glamorgan produced a Penannular Brooch. Merlin's Cave in Herefordshire produced another Trumpet brooch 6 cms. in length. In Maeshafn Cave, Clwyd, three brooches were recovered a Zoomorphic brooch in the form of a fish, a Penannular brooch and a badly corroded Trumpet brooch. Lynx Cave, also in Clwyd contained a magnificent example of a Trumpet style brooch in near perfect condition, cast in bronze with silver inlay and decorated with niello, (a compound of silver, lead, copper and sulphur) and red ochre. There are other examples but as can be noted from the list above most Welsh cave areas do have examples of Romano-British brooches



Romano-British Fibula Figure 5

5.2 Bronze Age pottery

Two substantial shards of pottery have been recovered from an un-named cave on the sheer cliff face, access today can only be made using climbing equipment. Fortunately both pieces are from the rim area giving diagnostic profiles. The smaller of the two pieces measures 45mm wide at the rim and 45mm in depth, the thickness varies considerably, it measures 15mm at the rim and tapers down to 10mm over a short distance. The surface is quite coarse with small hard particles contained within the clay and with small amounts of grog visible in cross section, the clay is a buff colour with the interior and the outer surfaces the same colour. The second piece (Fig. 6) is slightly larger measuring 40mm wide at the rim and 60mm in depth, the thickness at the rim is 12 mm and reduces to 10mm under the neck and remains constant for the remainder of the shard. The clay is a buff colour, the same as the previous piece but contains more grog, the interior surface is orange and the outer surface is black. Neither piece shows any evidence of decoration in the form of impressions, perforations or cordons. The thickness would suggest that the vessels are from middle sized containers or jars rather than bowls or cups. The rim shapes are similar to Mid Bronze Age pottery found on Rathlin Island. Both fragments have been identified as Bronze Age.



Fragment of Bronze Age pottery Figure 6

5.3 Fossilised Resin

A small sample of soil was removed from one of the sheer cliff caves to be sieved for further analysis. Surprisingly, many small broken fragments of resin, the smallest fragment barely a 1mm across to the largest pieces about 5mm-6mm were recovered from the sample. Much of this material has been exposed to the air for some time and has a thin cream coloured coating, the exposed fractured faces are honey coloured unlike the orangey coloured amber bead found in the North Face Cave. Whether or not these fragments are truly Baltic amber like the bead or whether they are simple pieces of resin that have been collected to be used as a bonding agent to adhere flint tools to wooden shaft is uncertain. Further analysis needs to be carried out to establish its true identity and possible origins.

Acknowledgement

In compiling this update the author would like to thank Nick Jowett and the Great Orme Copper Mines for funding the radiocarbon date and DNA analysis and sharing the above information with him. As way of a thank you the complete collection of human and animal remains from the North Face Cave along with the artefacts recovered from the cave have all been donated to the Greta Orme Mines Ltd. The human remains are now on display in the main reception area.



References

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|----------------------------|---|
| Blore, J.D. | Archaeological Excavation at North Face Cave 1962-1976 |
| Branigan, K & Dearne, M.J. | Gazetteer of Romano-British Cave Sites and their Finds |
| Dowd, M. | Living & Dying in Glencurran Cave |
| Ixer, R.A. & Budd, P. | The Mineralogy of Bronze Age Copper Ores from the British Isles:
Implications for the composition of Early Metalwork |
| Jowett, N. | Great Orme Bronze Age Mines |
| Scott, B.G. & Ó Néill | Bronze & Iron Ages of Rathlin Island, Co. Antrim |