

# NAMHO Conference 2019 Llanafan



# NAMHO 2019

Hosted by Cambrian Mines Trust in association with Dr Peter Claughton at Llanafan,  
Ceredigion - 4 to 8th July 2019

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# Introduction

Non-ferrous metal mining on the Central Wales Orefield in mid-Wales has a long and productive history. Copper was being worked in the area in the late Bronze Age but it was in the post-Medieval period, from the latter part of the 16th century, that mining for silver and lead increased significantly. In terms of silver production the early to mid-17th century perhaps marks the peak, with an annual return of just short of £10,000 for Cardiganshire in 1630/31.<sup>1</sup> By the mid-19th century lead was of much greater value than silver - 9,914 tons of lead concentrates, over 10% of United Kingdom output, being produced in 1857. After 1880 there was also an expansion in the production of zinc ores, but that never replaced the falling level of lead production.<sup>2</sup>

The Central Wales Orefield occupies the upland area of mid-Wales known as the Cambrian Mountains, reaching heights of up to 750 metres and stretching from the coast near Aberystwyth eastwards into the valley of the River Severn. It is drained by five of the major Welsh rivers, the Severn, the Wye, the Teifi, the Ystwyth and the Rheidol. There were around twenty major mines and numerous smaller workings in the ore field, each employing up to 300 men, leading to the expansion in upland settlement. Many of the miners employed were incomers to the area, bringing with them distinct identities - no more so than the Cornish whose non-conformist religious followings resulted in the building of large numbers of Methodist chapels which still survive close to the mines.

Power for the mines was, given the upland location and the high rainfall, predominately hydraulic - water wheels and, later, impulse turbines. But the intensity of working in the 19th century resulted in complex water storage and distribution systems to supply the demands of the mines in the area. The mines have also left a legacy of heavy metal pollution affecting most of the rivers in the area. Work to identify and remediate the worst of that pollution has been underway for the last twenty or more years, with what was the Environment Agency in Wales (now Natural Resources Wales) being one of the first authorities in the United Kingdom to address the problem.

All of these factors, the settlement pattern, the water management and the pollution, have had a significant impact on the landscape of this upland mining area. There is, however, within that landscape a vast underground archaeological legacy - reflected in the large number of underground trips on offer during this conference and investigation of that underground legacy forms the theme for the lecture programme.

In the last fifty years there has been an increasing level of interest in that landscape. The pioneers in the investigation of mining history in the area, men like David Bick who published the first of a series of detailed accounts of the mines in the 1970s,<sup>3</sup> and George Hall, who maintained a keen interest in the prospect of re-working some of the mines,<sup>4</sup> were to inspire a whole generation of investigation by groups such as the Welsh Mines Society and the Welsh Mines Preservation Trust, along with site specific groups such as the Cambrian Mines Trust which took over ownership of the Cwmystwyth Mines from Crown Estates.

The work of Natural Resources Wales is key to the survival of the mining landscape in the face of action to remediate mine pollution. As too is the attitude of the local authorities to the surviving

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<sup>1</sup> Boon, G. C. *Cardiganshire Silver and the Aberystwyth Mint in Peace and War*, (Cardiff: National Museum of Wales, 1981), p. 11

<sup>2</sup> Burt, R., Waite, P and Burnley, R. *The Mines of Cardiganshire*, pp. xxi - xxiii

<sup>3</sup> *The Old Metal Mines of Mid Wales, Part 1, Cardiganshire - South of Devil's Bridge*, (Newent, 1974)

<sup>4</sup> See, for example, Hall, G. W. 'Esgairmwyn: Some History and a Personal Story', in D. J. Linton (ed.) *Towards a Better Understanding: New Research on Old Mines*, (Llanaber: The Welsh Mines Society, 2012), pp. 1-12.

mining features, particularly the extensive waste heaps. Prior to the development of the *Spirit of the Miners* project by Ceredigion County Council in 2005, clearance was the primary objective with little regard for historic features with no statutory archaeological protection.<sup>5</sup> The project changed that attitude and the mining landscape was seen to have a value as an asset for tourism, something which has had long term benefits over the last decade.

With careful management, particularly with regard to the remediation of mine water pollution and the stabilisation of tailings, the mining features within the landscape should survive for generations to come. They are a key part of the cultural landscape of the mid-Wales uplands, something to be celebrated not destroyed.<sup>6</sup>

**Peter Cloughton**

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## **Geology and mineralisation - The Central Wales Orefield**

The Orefield occupies an important, albeit never dominant, place in the history of lead and zinc mining in Britain, producing between about 8-18% of the yearly UK total lead output during its heyday between 1840 and 1878 when improved pumping technology and high lead prices encouraged exploration far below adit drainage. Production was dominated by lead (galena) with very minor copper (mostly chalcopyrite); zinc (sphalerite) being an encumbrance until about 1880 when increased demand stimulated locally substantial production, notably at Frongoch and Cwmystwyth. The fall in lead prices in 1878 began a slow decline in the industry which became rapid after the fall in zinc prices in 1921. Large amounts of zinc ore remain standing in many mines. The galena was locally rich in silver, notably in the Cwmsymlog-Goginan area.

The country rocks at present day erosion levels and depths of mining are of late Ordovician to early Silurian age. They comprise mudrocks and sandstones (grits) which were deposited between about 450 and 425 million years (Ma) ago in a major fault-bounded crustal depression termed the Lower Palaeozoic Welsh Basin. The stratigraphy of the basin fill was set out in simple divisions in 1922 by O. T. Jones, who recognised four major rock packages characterised by variable amounts of grit, silt and mud. The basal unit, the Van Formation of late Ordovician age, comprises mass-flow siltstones and several horizons of grits which are locally conglomeratic. One of these grits is well exposed on and around the summit of Plynlimon. The succeeding early Silurian succession begins with the Gwestyn Formation essentially comprising dark mudrock and this in turn is overlain by lighter-coloured interbedded thin grits and thin mudrocks of the Frongoch Formation in the south-west of the Orefield. The topmost unit comprises the massive grits of the Cwmystwyth Formation which are found only in the south-east of the Orefield, their time-equivalents to north and west being developed in mudrock facies. In recent years new levels of structural and stratigraphic detail across the orefield have been provided in 1:50,000 scale surveys by the British Geological Survey.

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<sup>5</sup> Ysbryd y Mwynwyr / Spirit of the Miners [PDF file] URL [http://www.spirit-of-the-miners.org.uk/uploads/sotm\\_booklet\\_final\\_eng.pdf](http://www.spirit-of-the-miners.org.uk/uploads/sotm_booklet_final_eng.pdf) [accessed 3 March 2019].

<sup>6</sup> For more on the impact of historic mining on the landscape of Mid-Wales see Cloughton, P. 'From Penitence to Pollution', *Institute Europa Subterranea Yearbook* (2019), pp. 79-90 - copies available on request - P.F.Cloughton@exeter.ac.uk

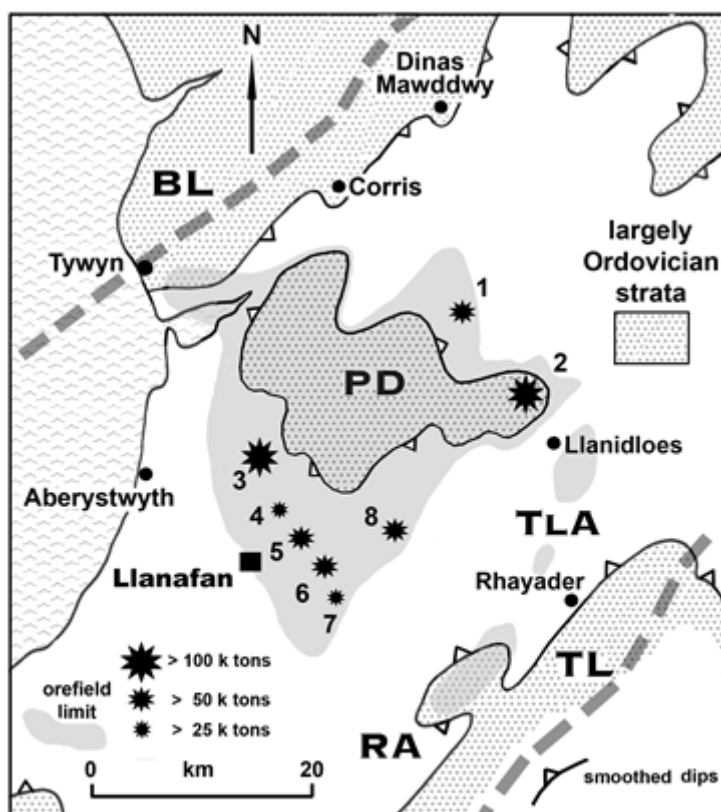


Figure 1: Simplified geological map of Central Wales showing the relationship of the orefield to structural culminations, notably the Plynlimon Dome (PD); BL, Bala Lineament; TL, Tywi Lineament. The principal areas of production of lead concentrates are named after their major mines: 1, Rhoswydol – Dylife; 2, Bryntail – Van; 3, Cwmsymlog – Goginan; 4, Cwmbwrwyno – Ystum Tuen; 5, Frongoch; 6, Grogwynion – Logaulas; 7, Glogfawr – Esgairmwyn; 8, Cwmystwyth; 9, Nantymwyn. Minor areas of production are also shown for the Tylwch Anticline (TIA) and the Rhiwnant Anticline (RA).

Around 400-395 Ma ago the basin fill was deformed by compressive tectonic forces leading to folding and uplift of strata and the imposition of a cleavage fabric which just to the north of the Orefield, from Corris to Dinas Mawddwy, formed commercially viable slates in the mudrocks. It is this folding, broadly along north north-east – south south-west oriented axes and with variable plunge, that creates the distribution of rocks of different ages at the present-day erosion surface. The Orefield is broadly centred around a major complex structural culmination, the Plynlimon Dome, which is cored by late Ordovician strata. However, the principal productive area, in Silurian strata, is strongly off-centred to the south-west with two major local exceptions; Dylife and Van to the north-east and Cwmystwyth to the south-east.

Recent work has highlighted the areally variable development of lode thickness / lateral extent which is now thought to relate to proximity to the sites of lode nucleation on three major massive turbidite sand bodies ('grits'). The distribution of the

principal centres of production can be linked simply with the distribution of these sand bodies which are not uniformly present across the orefield, moreover the thicknesses of mudrocks between them are very variable.

Mineralisation of the folded rock occurred first at 390 Ma during tectonic relaxation when faults formed as hydraulic fractures of rock in which the pore fluid pressure was very high and fluids transporting metallic ions originated from metamorphic dehydration at depth. During later episodes of mineralisation at 360-330 Ma and ca 240 Ma the fluids probably originated from saline surficial sources and were involved in large-scale convective circulation governed by variation in heat flow.

The ores occur as veins and breccia cements in narrow mineralised oblique-normal faults (lodes) which seldom exceed 20 metres in width and are commonly much less. Within the lodes the ore generally lies in steeply plunging high-grade 'shoots', but can also follow an internal fabric dictated by dip of the intersected country rock or relay faults which link approaching lodes en-echelon. Truly bed-parallel 'flats' in country rock adjacent to lode margins are very rare. Away from the shoots lodes may be economically barren over long distances. The apparent length of lode outcrop at surface is no guide to its behaviour in depth, the important control being whether the point of lode nucleation (often the maximum thickness and poroperm) lies above or below the land surface. In the

former case prospectivity will decrease with depth, in the latter it will increase until the nucleation point is reached and then decline, other factors being equal. Lodes not outcropping are termed blind. Widths of lodes vary from the negligible to ca 20 metres and displacements from the negligible to approaching two hundred metres. The great majority of the lodes are oriented WSW-ENE but a few are parallel to the folds in the country rocks (i.e. NNE-SSW): many display lateral 'jogs' where interacting with the dominantly WNW-ESE oriented joint system (which is broadly orthogonal to the fold axes). Virtually all dip between 55° and the vertical and they 'underlie', i.e. dip, to both north and south. Within the lodes the ore minerals may precipitate in solid veins or disseminated within gangue minerals, generally either quartz, calcite or ferroan dolomite.

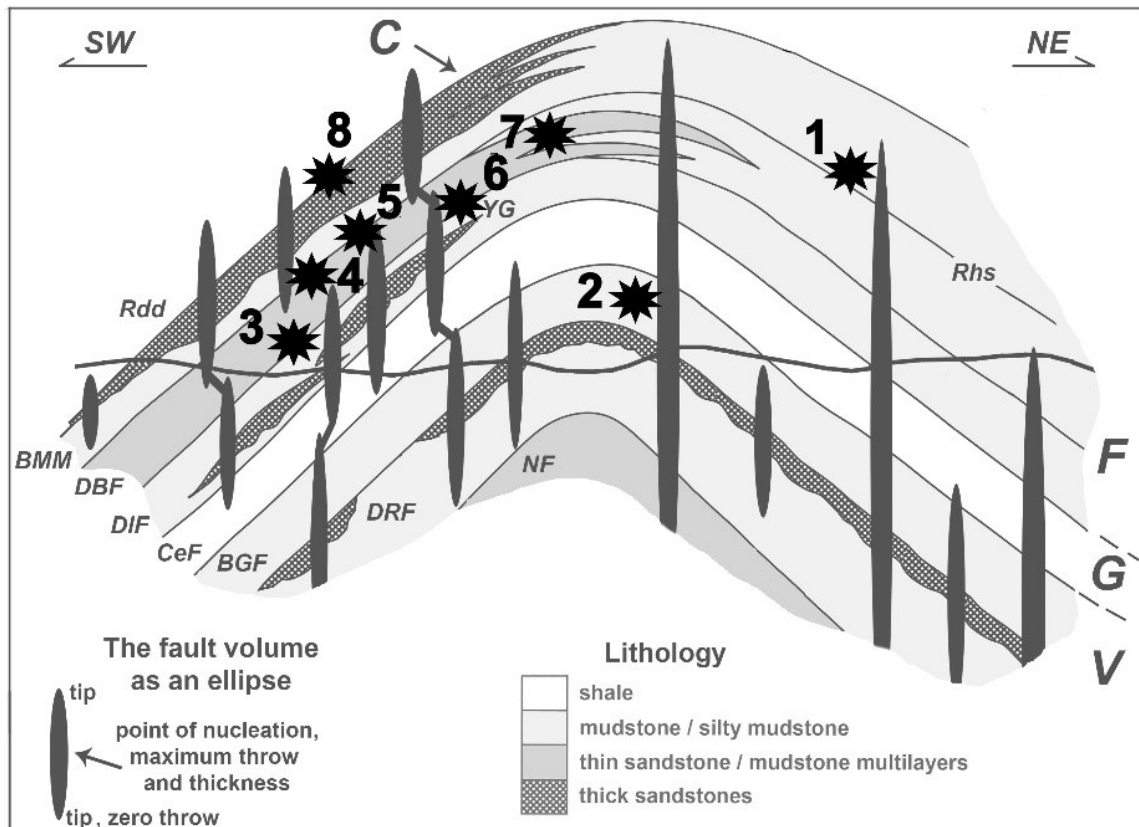


Figure 2: Cartoon section across the Plynlimon Dome. Principal stratigraphic horizons of production as Figure 1. Stratigraphic key: after Jones (1922); C, Cwmystwyth Formation; F, Frongoch Formation; G, Gwestyn Formation; V, Van Formation: after the British Geological Survey; BGF, Bryn Glas Formation; BMM, Blaen Myherin Mudstones Formation; CeF, Cwmere Formation; DBF, Devil's Bridge Formation; DIF, Derwenlas Formation, DRF, Drosgol Formation; NF, Nant y moch Formation; Rdd, Rhuddnant Grits Formation; YG, Ystrad Meurig Grits Formation.

There has been little discussion of the future potential of the Orefield but the narrow vein mineralisation that typifies it is not a major source of metals in the modern world. However global experience indicates that vertical extent of lodes is commonly on the kilometre scale: in contrast, most mid-Wales mines never reached 300 metres below surface and many not even 100 metres. As suitable lithologies for lode nucleation and development of poroperm exist far below mine bottoms it would be foolish to assume that the Orefield is exhausted.

**D M D James**

# The formation of the Cambrian Mines Trust

To Wardell Armstrong (Crown mineral agents)

From Roy Fellows

21<sup>st</sup> May 2008

*I am writing on the matter of the possible sale of the Cwmystwyth lead mines previously offered to the Welsh Mines Preservation Trust.*

*In furtherance of the objective of purchasing the mines I am willing to form a company limited by guarantee for the purpose of purchasing and managing the mines. I have given some thought to a suitable name and have provisionally settled on "Cambrian Mines Trust Ltd". In the event that a provisional agreement on the purchase of the mines is achieved, I intend to form this company without delay. ....*

It had actually started much earlier when a group of people including representatives of Welsh Mines Preservation Trust attended a meeting with Wardell Armstrong to attempt to find a mutually acceptable solution to the issue of access to the mines. It was suggested that a possible way forward would be the purchase of the mines by WMPT. However WMPT were unable to do this due to other commitments.

This matter was discussed at a NAMHO Council meeting and it was commented that it looked unlikely that a solution could be found. It was then that Roy suddenly announced to a stunned meeting "I will do it!"

The silence was deafening. Actually, the matter had been under consideration for some time, but no one else there knew this.

One way or another the matter then dragged on until 2012 when things finally started moving again, the trust was formed with Roy Fellows and a Maureen Burns as subscribers and directors. Later Prof David James and Hugh Ratzer joined the board following the resignation of Maureen. Later, Simon Lowe of aditnow, Simon Timberlake (Early Mines Research Group), and finally Ioan Lord (local mining historian, explorer, and author) would expand the board to six directors.

Cwmystwyth immediately presented a challenge. With the NAMHO 2013 conference only weeks ahead major underground workings were blocked off with steel grills. Sunday May 28<sup>th</sup> 2013 saw a group of supporters gather to help re-opening the mines. The day was saved by Dave Tyson who turned up with a petrol driven angle grinder and reopened Lefel Fawr, Taylors, Aldersons, and Herberts levels.

Since the acquisition, the trust has completed extensive underground support work in Lefel Fawr ensuring continuity of access and will shortly be commencing a program of surface works to improve the site for the benefit of the public.



## Conference timetable - Lisburne Hall

### Thursday evening - 4 July

18:00 - 20:00 - Reception open for camping bookings.

### Friday - 5 July

12:00 - 22:00 - Reception open for delegate registration.

19:30 - 20:30 - **Welcome to NAMHO 2019** - NAMHO Chair, CMT Managing Director (Roy Fellows), David James.

20:30 - Supper

### Saturday - 6 July

09:00 onwards - Reception open for delegate registration

09:30 – 17:30 – Lecture programme

19:30 – Dinner

### Sunday – 7 July

09:00 onwards - Reception open for delegate registration

09:30 – 17:30 – Lecture programme

### Friday to Sunday – 5-7 July

09:30 – 19:30 - Trade stands – Mike Moore Books and Starless River

## Conference timetable - Church Hall

### Friday to Sunday – 5-7 July

09:30 – 19:30 - Displays, including Cave Rescue, IA Recordings



Figure 3 - New Road, Cwmystwyth

# Lecture programme - Lisburne Hall

**Saturday morning - 6 July** - chair - Peter Cloughton

**09:30** Peter Cloughton - introduction and housekeeping

**10:15** John Barnatt - Using underground survey at historic mines.

**11:00** Tea/Coffee

**11:30** Mateusz Gil - The Role of Mine Exploration in the Protection of the Wieliczka Salt Mine

**12:15** Jennifer Protheroe Jones - [Under-] Ground-truthing historic mine plans: case study of Cwmystyth Mines, North Cardiganshire, 1704-1912

**Saturday afternoon - 6 July** - chair - Jennifer Protheroe Jones

**14:00** Alan Williams - A Bronze Age copper bonanza? The Great Orme mine in North Wales

**14:45** Rob Vernon - Gwydyr Forest metal mines: A story within a story

**15:30** - Tea/Coffee

**16:00** David James - Understanding the geological controls of mining history - the role of the informed mine explorer

**16:45** Mike Statham - Recent Work at Cystanog lead Mine, Llangunnor, Carmarthenshire

**Sunday morning - 7 July** - chair - TBA

**09:30** Ed Waters - The 18th Century Lead Mines of Sandford Hill, Mendips

**10:15** Tracy Elliott - A visual interpretation of Cornwall and Devon mining

**11:00** Tea/Coffee

**11:30** Peter Burgess - How Old are the Chaldon Quarries?

**12:15** Adam Russell - Setting the record straight – three Derbyshire case studies for the use of underground exploration in advancing knowledge about mines.

**Sunday afternoon - 7 July** - chair - TBA

**14:00** Peter Jackson - Working with government organisations in the North Pennines

**14:45** Chris Twigg - 3D modelling of Ironstone and Jet workings in Cleveland (on a tight budget)

**15:30** - Tea/Coffee

**16:00** Lynn Willies - Firesetting: how it works, how it is done and what it looks like.

**16:45** Peter Cloughton - closing comments and questions

# Abstracts

## Using underground survey at historic mines.

**John Barnatt**

Surveying underground mine workings can be used, and indeed should be, as a tool to aid understanding abandoned mines. While historic sources can sometimes tell us much, often other things go unsaid here. Often surviving documents such as mine financial accounts and reports to shareholders have biases in what they present, concentrating on ore or stone output and expensive equipment installed. Detailed survey of accessible workings can often go a long way to redress this biased picture, telling of day to day work and unanticipated phases of working and equipment installed.

All too often surveys done in recent decades by explorers only show what passages still exist; if these are used to also show archaeological detail their usefulness increases exponentially. This can include such things as: methods of extraction employed; those passages that are directly linked with extraction and others for access and equipment that were created to make this possible; the character of waste left by miners; and where machinery and other infrastructure had been installed. Sometimes simple things such as recording which direction shotholes point can turn conventional interpretations on their head. There is wide range of types of evidence to consider, as summarised in the speaker's recent book 'The Archaeology of Underground Mines and Quarries in England' published by Historic England.

Often, careful examination can show that specific parts of a working have been created using different techniques at potentially different dates; identifying phases of work is important. Episodes of undocumented extraction, not only of ancient mining but at others in recent centuries, can show that mines have had a much longer history than surviving documents would suggest. Combining the surviving records with careful recording of the physical remains can significantly increase our understanding.

## How old are the Chaldon Quarries?

**Peter Burgess**

The Reigate stone quarries of East Surrey exploited a narrow outcrop of the Upper Greensand immediately south of the North Downs, and were almost exclusively developed as underground workings. The best preserved of the workings currently accessible contains in excess of 17,000 metres of open galleries. The extent of the workings at Chaldon provides ample opportunity for determining the period of extraction using a variety of methods: artefact finds, radiocarbon dating, and inscriptions, alongside archival work. Long-thought to be largely medieval workings, the quarry is now believed to have continued as a significant source of stone into the late 17<sup>th</sup> century. Work continues to identify whether any areas of the quarry survive that were active prior to 1500, as suggested by the archival evidence, that have not been disturbed by later activity.

## **A visual interpretation of Cornwall and Devon mining**

**Tracy Elliott**

Due to the nature of the industry, there are not many photographs of underground mining in Cornwall and Devon. Over a few years, I have visited many mines in the west country and the one thing that always makes me stop and think, is that the old miners worked by candlelight, not being able to see what we see today.

Mining in the West country began in the Bronze Age, about 2150 B.C. The intrusion of the granite into the surrounding sedimentary rocks, gave rise to the metamorphism and mineralisation, which made Cornwall and Devon the most important metal mining areas in Europe until the 20<sup>th</sup> century. Originally the minerals were found in stream beds, but as these were followed, underground mines started as early as the 16<sup>th</sup> century.

This presentation shows what can be seen now underground in Cornwall and Devon and through this, it can be seen how and why the mines were originally worked and the geology and archaeology of our mining past.

## **The Role of Mine Exploration in the Protection of the Wieliczka Salt Mine**

**Mateusz Gil, Marek Skubisz, Rafał Zadak**

The Salt Mine in Wieliczka has operated since the 13th century. Over the period of more than 700 years, a huge labyrinth was constructed, including more than 2,300 chambers and about 245 km of galleries. The excavations are located at 9 levels reaching a depth of 327 m. The extraction of rock salt in Wieliczka using the shooting technique ended in 1964, and using the salt leaching method in 1996. The structure changed its function. The preservation of underground excavations became a priority, with particular attention paid to historical values of former chambers, galleries and mining equipment. Part of the excavations has been designated for museum and tourism, as well as treatment and rehabilitation purposes.

The Cracow Saltworks Museum in Wieliczka, established in 1951, plays an important role in research into and protection of the Wieliczka mine. A museum and mining team was formed in 1975 to compile an inventory of excavations in the Wieliczka mine. Scientific guidelines for inventory-taking were developed and criteria for the assessment of a mining excavation as a historical object were established. Systematic documentation of underground structures was initiated in cooperation with the management and technical inspection staff. The source materials collected and specialist assistance provided by the Museum resulted in entries of the Wieliczka mine in the list of historical objects (1976), the UNESCO World Heritage List (1978) and recognition of the mine as an object of historic importance by the President of the Republic of Poland (1994). The entry in the UNESCO World Heritage List was supplemented in 2013 with the Bochnia salt mine and the Saltworks Castle in Wieliczka (since then the "Wieliczka and Bochnia Royal Salt Mines"). Compiling of the inventory of historical excavations was resumed in 2017 with the aim of observing and recording changes that took place over recent decades, updating descriptions and producing new photographic and video documentation, using the advancements of contemporary technology.

Designing and implementation of mining and conservatory projects in the most valuable excavations in both historical mines have been preceded since the 1990s by historical and conservatory studies carried out by the Museum. The position of Conservator of Historical Objects in the Cracow

Saltworks established in 2017, together with specialist and organizational support provided by Museum's staff, ensures professional and continual supervision over all projects carried out in the underground zones of the historical mines in Wieliczka and Bochnia.

## **Working with government organisations in the North Pennines - An account of some experiences of working with government and contractors on metal mine sites and applying that experience to future relationships.**

**Peter Jackson**

The North Pennines Orefield has a network of abandoned mine workings which are actively drained by a network of adit levels. The adit network is mainly controlled by the pattern of the major orebodies and often connects vein workings running below adjoining valleys and higher ground. The consequent drainage pattern depends upon the historic workings, which were mainly abandoned in the 19<sup>th</sup> and early 20<sup>th</sup> centuries. Abandonment plans may show main networks but do not show drainage patterns. Explorers, historians and archaeologists have knowledge of the drainage flows, which has been shared with consultants and project managers. Underground archaeology can have unintended consequences when excavations cause diversion of water flows which may impact upon Environment Agency proposals for water treatment plants.

The Environment Agency Metal Mines project has a strategy for adit outflow treatment sites, which have used data supplied by mining societies. The agency has also completed work on several mine dumps in order to prevent the transportation of silt into rivers. Work on dumps may include SAMs and important historic sites. This work might have had major adverse impacts on some of these sites if mining societies had failed to provide information about the relative importance of some sites.

This paper explores the history of some of these projects and makes suggestions about how information and knowledge might be shared in more effective ways.

## **Understanding the geological controls of mining history - the role of the informed mine explorer**

**David James**

Mining history is determined by the geological nature of the subsurface resource, the social need for its use and the technology available for its extraction. It is argued that a correct understanding of the geology is commonly understressed in the mining history literature and that geological re-evaluation of old mines not only constitutes an essential determinant to understanding their success or failure but can offer great analogue value in planning future exploration strategies.

In times of stasis for commercial investment in mineral exploration, research by the amateur geologist / informed mine explorer may be the only way to maintain access and sustain the collection of pertinent data in sites that inevitably continue to degrade. Guidelines are offered for observation and recording of such data and examples of incomplete and conflicting geological understanding resolved by mine exploration are offered from Central Wales

## **[Under-]Ground-truthing historic mine plans: case study of Cwmystwyth Mines, North Cardiganshire, 1704-1912**

**Jennifer Protheroe Jones**

Ground-truthing of historic mine plans and longitudinal and transverse lode and stope sections from 1704 to 1912 of the Cwmystwyth lead-silver-zinc-copper mines, North Cardiganshire. A range of case studies of workings omitted, mis-located, distorted and shown (proposed?) on plans but not executed, analysed to suggest possible causes of these discrepancies coupled with a range of rationales for the compilation of plans, variously as working documents, abandonment records, or promotional tools. It was concluded that 19<sup>th</sup> century non-ferrous mine plans are generally highly reliable with regard to what they record, but that 19th century longitudinal stope sections can be somewhat generalised. The limitations of plans and sections in recording workings significantly pre-dating their compilation is highlighted. The benefits of combining historic plan data with underground exploration is emphasised, including the necessity of exploiting the full range of modern speleological and caving techniques to maximise access for data gathering. Limited comparisons with plans of other mines, including coal mines, are included. The conference presentation will be profusely illustrated with both historic and current plan extracts, and underground images.

## **Setting the record straight – three Derbyshire case studies for the use of underground exploration in advancing knowledge about mines.**

**Adam Russell**

Where access to underground workings is possible at mining sites, it can provide new insights into the history of the site in a number of ways. It can provide information to correct existing interpretations of the historical record, and can enable identification of features referred to in documentary sources that would otherwise not be possible. This paper looks at three sites in the Peak District where recent exploration has changed or expanded the state of knowledge about the site. At Field Grove Mine the information derived from underground exploration has enabled a complete reassessment of the existing published record. Secondly, at the Calver Peak Mines, it has proved possible through investigation of the accessible workings to exactly place the locations of some early 20th century underground photographs. Thirdly, the re-opening and exploration of Longcliffe Mine has provided information through which features referred to in 18th century reckonings have been identified, and also found areas of possible earlier working.

## **Recent Work at Cystanog Lead Mine, Llangunnor, Carmarthenshire**

**Mike Statham**

The talk will present a summary of the results of the work of a small group of enthusiasts spearheaded by Phil Knight who have over the last ten years opened up, photographed and surveyed this mine.

## **3D modelling of Ironstone and Jet workings in Cleveland (on a tight budget)**

**Chris Twigg**

Ironstone mining which took place in Cleveland between 1848 and 1964, generated an impressive paper trail of mine abandonment plans and company records. In sharp contrast, the death of Prince Albert in the early 1860s triggered an explosion in jet mining, which generated no plans and virtually no written records. The Heritage Lottery Funded 'Our Industrial Heartland' project investigated different methods to generate 3D models of these two sets of geologically adjacent workings. In the ironstone via geo-referencing of historic plans in GIS software, whilst in the jet workings, local mine and caving clubs used a DistoX paperless surveying system and Survex software. All this new data was combined with LIDAR data and Google Earth imagery to create 3D representations of the two sets of workings and visualise how they relate to each other and also how they relate to the new Sirius Minerals Transfer Tunnel currently being driven under the area.

## **Gwydyr Forest metal mines: A story within a story**

**Rob Vernon**

In 1970 when I first became interested in the Gwydyr Forest mines there was next to nothing written about them. Even that most lucid of sources 'The Special Mineral Resources Memoir' published by the Geological Survey offered scant detail.

It was fortunate that the last operators of Parc mine were not 'miners' but scientists, who used the processing mill at Parc to experiment on the automation of ore dressing techniques. In a similar manner, the mine became an underground laboratory for the Bidston Observatory to study the gravitational influence of the moon on the earth's crust. The mine therefore was relatively untouched after abandonment.

The location of any mine abandonment plan was unknown, but eventually an incomplete plan did turn up in a paper on diamond drilling. Prior to Parc being worked in the 1950s, a series of inclined boreholes had proved the main vein, the Principal Lode, as a viable proposition. A second brief paper provided the names of some of the other veins in the vicinity. So with that information to hand, and with the help of others, we conducted a simple tape and compass survey of the No.3 level. This survey ultimately provided the 'backbone' for all later information.

Eventually other mine plans recording 19th century working came to light, and they were duly added to the general plan of the Principal Lode workings. A complete picture started to emerge.

In 1975, I met John Bennett, and we pooled our information about Gwydyr. We soon realised we had enough to publish a series of books, in a similar format to those produced by David Bick for

Central Wales. I concentrated on the technical side; mine exploration, fieldwork, the later workings and mine plans. John concerned himself with the early history of the Gwydyr and the various individuals and companies associated with the mining operation. Eventually we started to put 'skin on the bones' (bones = mine plans) and the 'Mines of the Gwydyr Forest - parts 1 to 7' were produced.

My involvement with Gwydyr continued after their publication. For a number of years I had a historical input into 'mine reclamation' schemes initiated by the landowners, and others. I last went underground in Parc in 1989 when I took a mining engineering consultant to examine the blockage in the Parc No.3. It is located at a point where the Gorlan lode crosses, and displaces, the Principal Lode. During the winter months it had been noted that a significant head of water was building up behind the blockage. If the blockage had failed then the sudden release of water could have had disastrous consequences in the Conway Valley. The throttle dam in the No.3 level was the solution. Thankfully using the various mine plans and sections I had produced over the years, I was able to demonstrate that any solution to the problem should have the potential to allow access.

The paper shows how mine plan information, verified by underground visits, particularly on the Principal Lode, were plotted onto a composite plan, which had a variety of uses, but mainly to explain mine connections, and drainage patterns to those unfamiliar with the area, and mining, e.g. Local Authorities and Consultants.

## **The 18th Century Lead Mines of Sandford Hill, Mendips**

### **Ed Waters**

For the last 15 years a group of cave explorers from the Mendip Caving Group have been exploring the 18<sup>th</sup> Century Lead Mines of Sandford Hill in Somerset. These explorations have included the scaling of shafts, digging upwards through the "Old Man's" backfill and the emptying of a 25m deep surface shaft blocked in the 1970s. This work has regained access to extensive workings and natural caves, a large proportion of which are previously unrecorded to mine and cave explorers. They also provide an interesting insight into the methods and practices used by Mendip miners in the 1700s. There are also many challenges still remaining, including the hunt for the mythical "Gulf" of Sandford Hill and realisation of a connection between the mines at the top and bottom of the hill.

## **A Bronze Age copper bonanza? The Great Orme mine in North Wales**

### **Alan Williams.**

The Great Orme mine in North Wales is one of the largest Bronze Age copper mines in Europe but its size has always been attributed to small-scale part-time working over nearly a millennium based on claims that it only produced an unimportant low impurity type of copper. However, an extensive new interdisciplinary research project using chemical and lead isotope analyses has shown it produced a distinctive metal that dominated Britain from c.1600 to 1400 BC with metal reaching from Brittany to Sweden. This suggests that the Great Orme mine produced Britain's first mining boom and was more closely integrated into European Bronze Age trading networks than previously suspected.

## **Firesetting: how it works, how it is done and what it looks like.**

**Lynn Willies**

Firesetting is very old, widespread and often sophisticated technology used on both small and large-scale mines. The oldest example to be presented being from 2800 years BC. It was still in use for quarrying and well-sinking in India recently, and in mining in Africa no more than a few years ago, and in Norway a substantial level was driven somewhat over a century ago. It can tackle the hardest rock, which yield for several quite different reasons, by splitting, spalling or crumbling. It can be used to sink and rise vertically or at an angle, or can follow an excavation laterally. Many fireset workings show characteristic forms, not dissimilar to many vadose solutional cavities, but weakening of rock adjacent to the main effects makes it more susceptible to hammering or picking techniques, disguising its use. Throwing water or even vinegar on the hot rock is unnecessary and probably undesirable for safety reasons underground.

## **Field Programme**

### **General**

Our underground program offers a wide selection to cater for a wide range of capabilities ranging from easy walk-in trips to SRT. Our Health and Safety commitment is such that at no time will any delegate be exposed to unnecessary risk, or expected to do something not described in the trip.

### **Technicalities**

However, it is necessary for all delegates participating in field trips to be covered by the usual public liability (BCA) insurance. We will be arranging short membership with a participating organisation for those who do not have such cover.

Delegates booking underground trips will be expected to have personal equipment suitable for the type of trip they are booking on. Absolute minimum is a hard hat with chinstrap and attached electric lamp plus sturdy footwear.

Underground, the meet leader is in charge and anyone unsuitably equipped or demonstrating behaviour likely to be prejudicial to the safety of the group will be rejected.

Generally mines in the area are easy to explore and most can be done in waders or oversuit and fleecy, whatever. There are no winch trips, I'm afraid Ceredigion does not hold such niceties, and only 5 trips require SRT, although the upper ladder in Frongoch 18 fathom rise will require a lifeline. This is opportunity for the non-technical to explore some very interesting mines and being a 5 day event, it is well worth travelling a distance.

## Underground Trips

Please consult Reception in the Lisburne Hall for availability and access details on all underground trips.

### **IMPORTANT – Self-Led trips**

**Delegates should check-in with Reception before and after their trip to ensure their safe return is recorded.**

### **Frongoch**

This is probably the largest single mine in the area and exploration is a longish trip.

Entry from a manhole in the hillside by short easy fixed ladders into deep adit and thigh deep water. About 3/4 of a mile of adit to Engine Shaft with pump rods and other bits. 80 foot laddered rise to 18 fathom level.

Engine shaft with pump rods and remains of surface balance bob dragged down when the rods were released. Stope with clog prints, kibble and other stuff.

All day trips due to new additions. Start times will be from 10.30 hrs staggered for each party by about 30 mins.

**TECHNICALITIES:** Moderate but a longish trip with some stooping. No SRT but belay belt and jammer for lifeline on fixed ladders. Thigh deep water in places. Optional swims, plus a grotty crawl. Most of the mine can be seen without getting wet.

### **Bwlch Glas Mine.**

An interesting SRT trip (advanced) to the deep adit where there is a winze with cages in situ. Also optional very wet trip up deep adit to a winze with a kibble.

SRT down to Deep Adit with cages, artefacts etc.

**TECHNICALITIES** Trip 1 - Fixed ladders 60ft, vertical free-hanging 60 foot SRT pitch.

Access by kind permission of Mr Bernard Moore

### **Henfwlch.**

Not available in 2013. Access through CAL

Long straight adit leading to stopes and side passages. Ore barrow stope has an ore barrow in really good condition. Waterfall Stope is a handline descent of large stope with 2 waterfalls and some interesting 'mooches'. Belay belt and cowstail required. Further passages on main adit has clog prints and candle stubs. Possible round trip (optional) requiring SRT and waterproofs. Delegates can do as much or as little as they wish.

## **Talybont area**

The Forestry barrier at Talybont will be open for the duration of the event and so provide ample on site off road parking in a particularly pleasant shaded area surrounded by relics of past mining activity. This will enable easy access for anyone with some spare time to kill by an interesting self-led surface walk or easy underground walk in.

## **Alltycrib: Deep Adit**

**TECHNICALITIES** Easy SRT down a 40 foot slope of about 55 degrees, a free standing rebelay, followed by a 20 foot slope. 70 foot descent by concrete steps and fixed ladders. No life line needed. Thigh deep wading or optional deeper water heading outbye. Remains of horse whim and pumping bob plus flat rod supports. Remains of early wooden kibble and later iron kibble.

## **Alltycrib: Wilkinsons Level**

Easy walk in, non-technical, shallow water, short crawl as above. SELF-LED. The level starts as a cross cut and appears to be a modified earlier coffin level. A left branch follows Wilkinsons Lode to Western Engine shaft and the SRT winze. The shaft is completely run for all its depth. A right branch cuts Felix's Shaft which was the site of an oil engine and winch used in the last 1910 working, foundations to be seen. The level eventually reaches Steel Ore Lode stopes. An easy explore.

## **Alltycrib: Myddletons Level**

Easy walk in, non-technical, shallow water. SELF-LED. Interesting example of Elizabethan coffin level. I have only identified one shot hole. Was the site of an underground steam engine in the 1870s, bits of the flue and boiler plate can still be seen at the run in at the end where it originally cut Western Engine Shaft.

## **Cwmystwth: Lefel Fawr Trips -**

Easy access to the back workings by The Steel Road rather than the small plastic tube.

**TECHNICALITIES** Hands and knees short entry through roomy tube, water up to thigh deep. General mooch in the level with lots to see plus an all-day underground 'event' in Lefel Fawr with a series of underground talks with groups moving between leaders.

**#1** Underground Works, the challenges and difficulties by Roy Fellows.

**#2** Geology and Mine Exploration, Prof David James.

**#3** A self-guided tour on a 'one-way' system.

Short ladder of a few feet to look at the skipway.

## **Cwmystwth: Skipway SRT**

**TECHNICALITIES** moderate SRT down skipway to lower workings, about 80 feet.

## **Cwmystwth: Aldersons and Herberts Levels**

Easy walk-in, fairly dry. Will possibly be combined with a surface walk.

## **Cwmystwth: Taylors Level**

**TECHNICALITIES:** Water up to waist deep

## **Cwmystwth: Crossroads Adit (SRT Through trip)**

A nice, dry little trip.

### **Cwmystwyth: Rosa Level/Pugh's Mine (Advanced SRT)**

This is a day long, multi-pitch SRT trip for a limited number of enthusiasts. Rosa Level is high on the hill, above the Cwmystwyth Mill and the trip involves multiple pitches to reach approximately back to road level in Pugh's Mine (Western end of Cwmystwyth) and re-ascending via the same route. Those involved with this trip will need to be very experienced with SRT and be prepared to carry a lot of rope up to Rosa Level – need to be fit!

### **Cwmystwyth: Kings/Queens Adits (SRT)**

This is a comparatively short SRT trip but into a part of the Cwmystwyth system not often visited and with interesting artefacts. Access is into the adit below Kings Adit, high up on the Eastern end of the Cwmystwyth system. There is a free-hanging pitch of about 10m down to intermediate workings with artefacts and then an unconventional pitch descending to Queen's adit. There is no surface access to Queen's adit so exit is by re-ascending the two pitches.

### **Pantmawr Mine** (Stopes, minor artefacts and nice mineral formations)

**TECHNICALITIES:** Chest deep wading

### **Rhiwrugos/Erwtomau** (Stopes and minor artefacts)

**TECHNICALITIES:** Wellingtons only

### **Ystrad Einion**

Leader: Dave Seabourne

Site of the famous underground water wheel.

**TECHNICALITIES** Easy walk in, ankle deep water, fixed temporary aluminium ladder with lifeline to upper level, life lined traverse over flooded understope.

### **Level Fawr at Pontrhydygroes**

**TECHNICALITIES** Shallow water, some crawling and stooping, ladder to upper level.

### **Camdwrbach**

Mine of the black cave pearls

**TECHNICALITIES:** Handline down open cut, wriggle through hole into neck deep water.

This is preferably a wetsuit trip and is subject to access continuing to be physically possible.

### **New Level**

Extensive trial.

**TECHNICALITIES:** Open entrance but very wet, chin deep water in entrance.

This is preferably a wetsuit trip

### **Cefngwyn** (Self-Led)

**TECHNICALITIES:** None

Combined surface and easy underground. In dry weather the adit is bone dry! Although really a trial its and interesting easy walk in. Surface remains include flooded shaft with remains of bob.

## Surface Trips

### **Saturday 6th July 2019 10.30 Esgairmwyn**

Meet at Ffair Rhos Exact details to be arranged.

Leader David Sables

### **Saturday 6th July 2019 10.30 Cwmystwyth Copa Hill.**

Leader Simon Timberlake, Early Mines Research Group.

Meet at Nant yr Onnen **SN 809 748** There is limited parking there and opportunist parking along the road.

### **Sunday 7th July 10.30 Graig-goch - Brook Shaft Mine - Wemyss - Frongoch**

All day trip. Meet at **SN 719 743**

This is an all day trip led by a geologist and an industrial archaeologist, so a lot to see and learn about

Leaders - Prof David James and Robert Ireland



Figure 4 - Barrow - as it was abandoned - Henfwlch

# Mine descriptions

## Cwmystwyth

Cwmystwyth has been described as “the jewel in the crown” of the central Wales mining field. Its extensive remains being a sort of Mecca for the mine explorer, archaeologist, and industrial archaeologist.

The earliest mining is on Copa Hill where in the Comet Lode Opencast where carbon dating has placed remains to around 2100 cal BC, although it may be even earlier. Mining continued off and on from these early times right up to the 1950s.

The later phase of early mining was controlled by the Abbot of Strata Florida Abbey, which would have continued up until the dissolution of the monasteries by Henry the Eighth in 1536. Then the Society of Mines Royal which was the start of the first intensive mining, lease holders including the ubiquitous Sir Hugh Myddleton and Thomas Bushell. In 1759 the mines passed into the hands of Chauncey Townsend who engaged the services of Thomas Bonsall from Derbyshire to manage the mines. Bonsall stayed on after the death of Townsend in 1770 working the mines for Townsend's son who inherited the lease, later in 1785 he took on the lease himself.

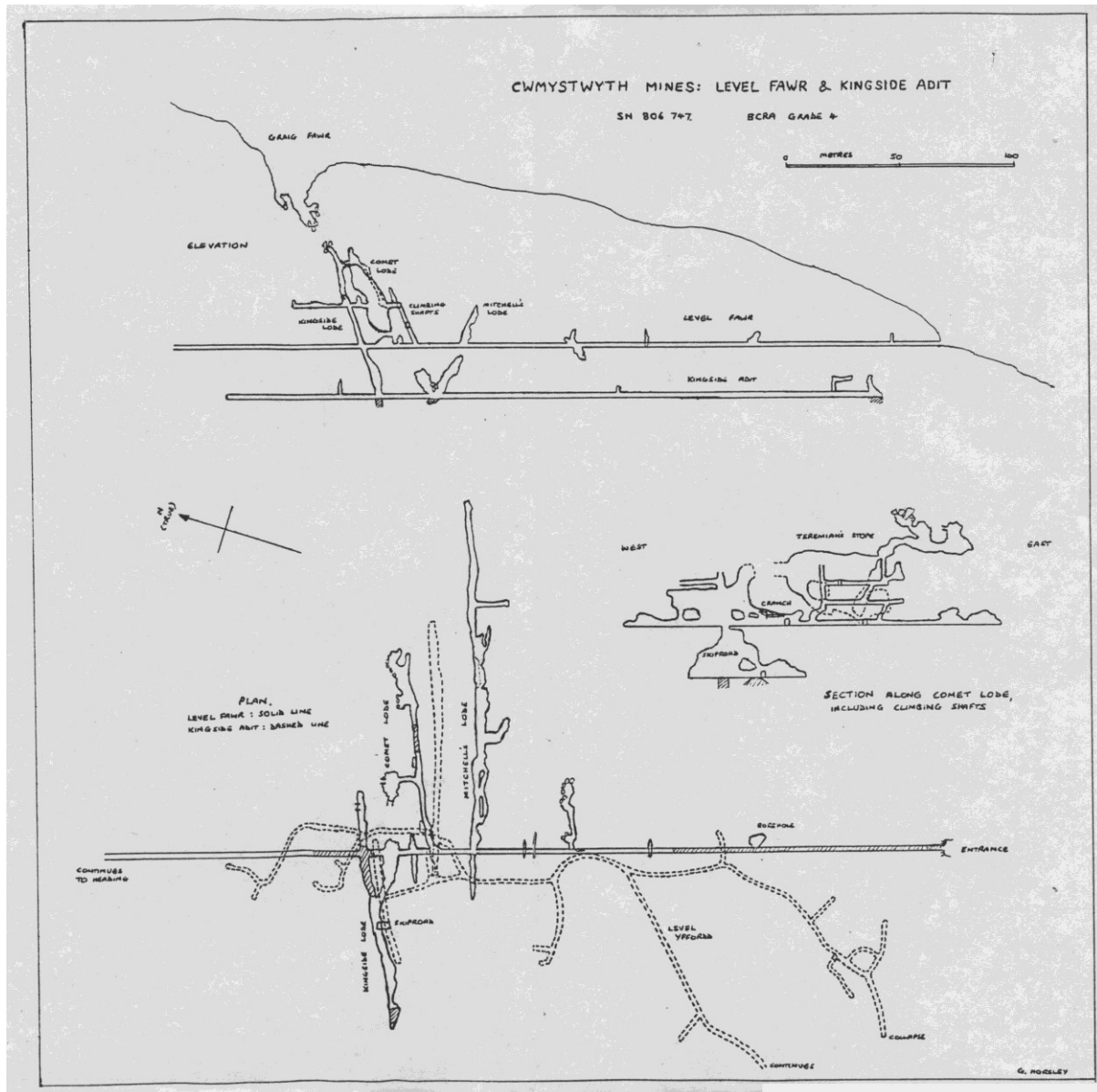
Bonsall did quite well out of the job regularly earning £2000 a year out of Cwmystwyth, Castell, and Rhiwrugos mines which he also owned. A lot of the well-known works are attributable to Bonsall, and towards the end of the 18th century his earnings had reached £2000 to £3000 a year from Kingside and Pughes mines alone. He was also responsible for Bonsalls level (Nant yr Onnen) and Level Fawr. Bonsall died in 1807 and the lease passed to his son, and then was taken over by the Alderson Brothers from Swaledale and James Raw who has local descendants.

Unfortunately the price of lead plunged in the 1830s and the Aldersons were declared bankrupt. The lease was then taken by Lewis Pugh of Aberystwyth who had the luck of the devil as metal prices started to soar immediately, and he made a fortune from stocks of ore in hand when he took over the lease.

In 1848 John Taylor of Norwich took over the mines, another for his collection. The mine was being worked on the cost book system and in 1885 after a period of poor output the mines passed to a new company 'The Cwmystwyth Company'. Almost immediately the mine was split between two concerns 'The New Cwmystwyth Company' and 'The Kingside Mining Company', who worked the mines until 1892 and 1893 respectively. As can be seen, in common with a lot of other mines in the area some operators would be made rich, while other poor. Such is the fortunes of mining.

In 1900 the mines were taken over by The Cwmystwyth Mining Company Ltd under Henry Gammon who poured a fortune into development work and investment in new plant and machinery; however the new company struggled badly to make it pay. In 1905 the company was reformed as Kingside Zinc Blende Ltd but still struggled to turn a profit. By 1909 Gammon had blown all his money in the place but managed to attract Brunner Mond to invest in his existing company. It is this company that very likely responsible for the reinforced cribwork to be seen today in Lefel Fawr above the skipway. It was probably considered a dodgy area, in effect it was last over a hundred years, finally starting to fail and releasing tons of rock in 2004. This effectively blocking the direct route to the skipway.

In 1912 the mine was again split into two sections, with part being taken over by The May Mining Company formed by one of the old mine captains John Howell Evans in partnership with a Charles Stocks. This company is notable in one of the few metal mining concerns that used Kell Drills developed by Moses Kellow of the Kelldrill Works at Croesor Slate Mine near Blaenau Ffestiniog. There is a photograph of one of these drill “ready for work” – May Mining Company. It was possibly used for publicity purposes. I (RF) have doubts about it being at Cwmystwyth at all, my money would be on Pryces level at Talybont. These drills were also used there by Talybont Lead Mines Limited. Both of these companies went bust in a few years and then the mines passed through several hands until final abandonment in 1950.



After this the mines lay idle, save for visits by scrap dealers in the 1960s who systematically started stripping out all of the rails and other gear. A collapse of the main portal may have stopped this work, one of the skips used in the skipway remains in the main adit near to the entrance, complete but minus one axle. Later the mine became a popular venue for mine explorers and industrial

archaeologist but after the ownership passed into the hands of the Crown Estate the underground workings were blocked off with metal grills. However in 2013 the whole site was acquired by Cambrian Mines Trust the present owners.

The trust was committed to preservation and maintaining the underground access, but upon inspecting the workings it was found that time had taken its toll. The skipway, and important route down to Kingside level and Lefel y forth was under threat due to some of the huge timbers forming a support for the massive stull in Lefel Fawr had become well and truly rotten and starting to visibly sag. Immediately a program of support work was instituted whereby the timbers would be supported by block work, filled with concrete behind, and the whole job faced with cladding to simulate a typical packwall. This work was completed in 2016. To make access to this area more sociable, a plastic tube which had been put in by local enthusiasts was replaced by a roadway to full walking height topped with steel girders and sides built up with concrete.

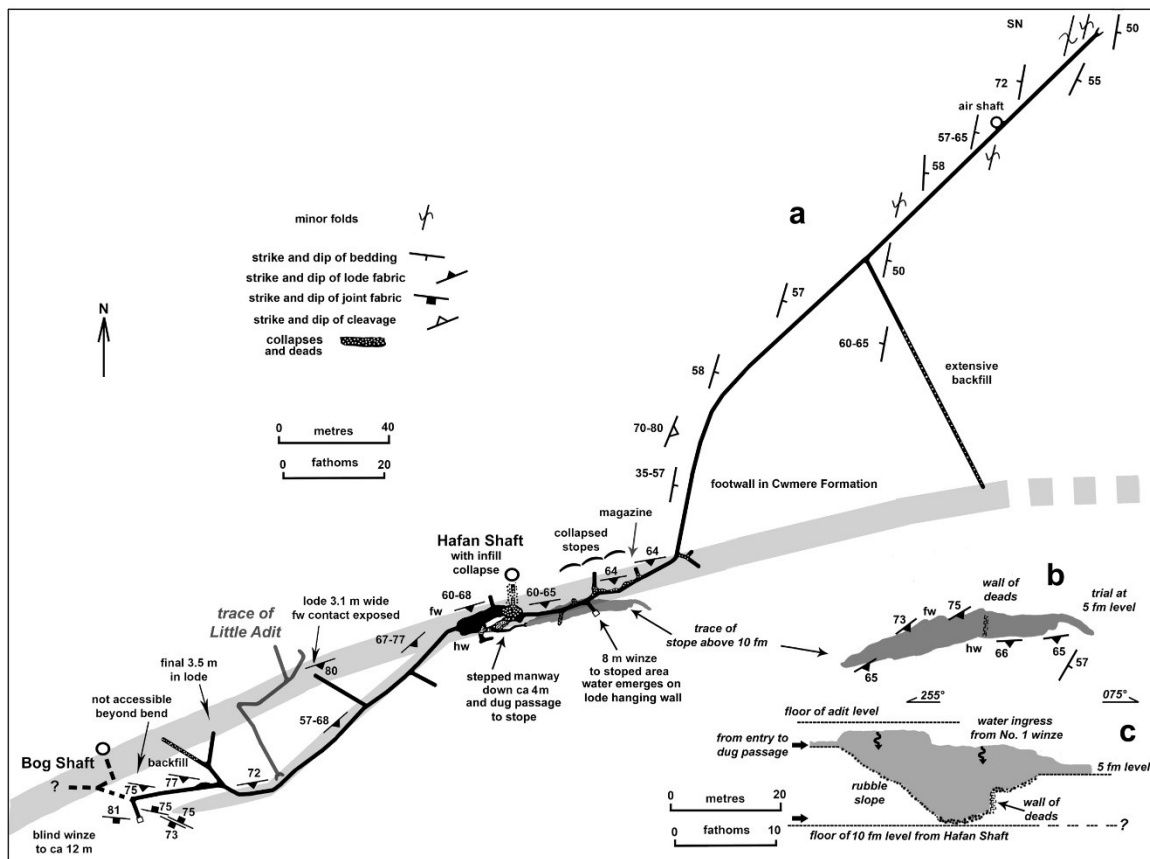
The trust remains committed to a program of preservation and careful management, and there still remains much to be done.

## Henfwlch

Although Henfwlch is only a small mine, its one of those little treasures there to be discovered in rural Wales for those taking the trouble to look. Situated near the shore of Nantymoch and just above the modern tarmac road, part of the old cart road can be seen immediately above. Looking across the reservoir the distant spoil tips of Camdwrbach are discernable, and immediately across on the foreshore the open New Level which was driven as a trial on the Hafan Lode.

The mine was worked off and on until the turn of the 20<sup>th</sup> century, its origins being unknown. It's very likely it was first worked by the Company of Adventurers in the 18th century and passing through different hands it was often worked along with the Hafan mine but it is thought that the two never actually connected. Regardless of this the mine definitely dewatered by the Hafan Deep Adit, the water seen leaving the adit portal is just emanating from feeders in the main drift, a long level of several hundred metres.

The mine was worked for lead, zinc, and copper, also a small amount of silver was produced. Little if any trace of lead mineralization is currently discernible, but there is plenty of secondary copper staining.



The level has always been open and probably visited by modern explorers over the years however was blocked by a collapse just past the main shaft. Although named as “Hafan Shaft” in OT Jones, it is more correctly called Strides Shaft. Towards the end and on the left a winze, now known to be No 1 Winze, was descended in 1994 to a large stope. However the poor light of the old bulb cap lamp made it difficult to appreciate the size of the place. The winze takes water from the drift, and being cold and wet was a discouragement to linger.

Towards the end of the level a gap in some boulders draughted strongly, and in 1997 this was dug through vertically and gave access to the inner reaches of the mine. A backfilled stope was gained and a short scramble leads to a stoped area with a very interesting artefact. A wheelbarrow made without any legs, in near perfect condition, an Ore Barrow. Beyond this a small maze of exploratory levels was gained with many tallow candles on the walls. Later the dug out winze was enlarged and lined with steel and concrete to provide the sociable roadway used today.

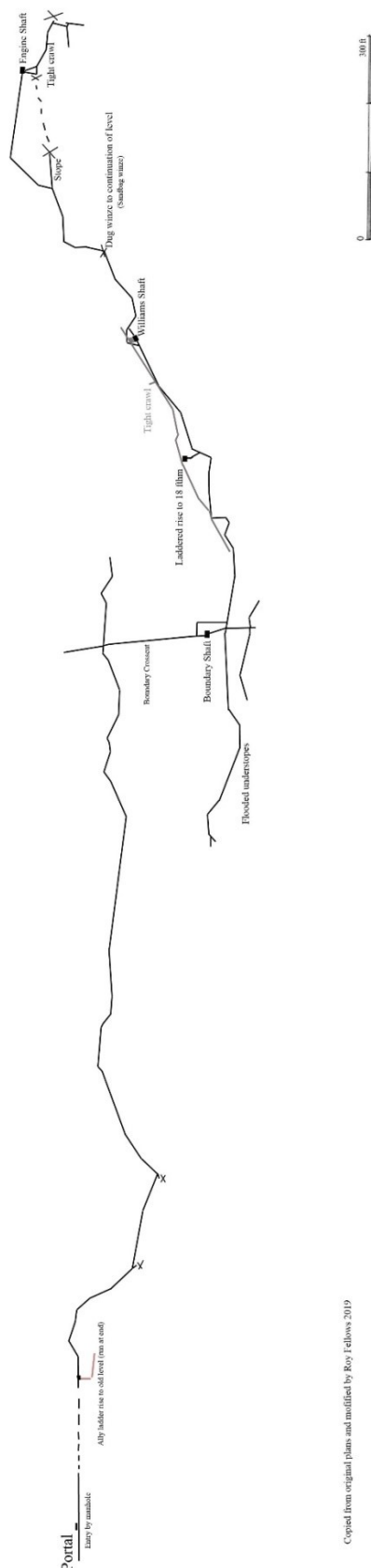
In 2018 -19 a road was dug through a slightly lower fall from Strides Shaft to give an easy and sociable access to the large stope discovered in 1994. It broke through to the head of a rubble slope so handline ropes were fitted. At the back of the stope a traverse line was fitted to give access to the workings above the bank of deads seen back in 1994. Here a winze kibble in near perfect condition was discovered along with other interesting features. Water enters at No 1 Winze and at another point which disappears into rubble in the floor. This must be exiting by the Hafan Deep adit. Also there is the frame of a ventilation door in the adit outbye, so a connection with Hafan looks more likely.

Today the mine offers a fascinating trip for the explorer and is possibly and ideal trip for NAMHO delegates less able to engage in technicalities.

# Frongoch

Frongoch Mine. Explorable Workings 2019

- Adit level, 24 ftm
- Adit level, 18 ftm
- Other workings above adit
- × Collapse
- Shaft, mine or rise



Copied from original plans and modified by Roy Fellows 2019

Mining at Frongoch started in the mid 1700 s, but large scale mining did not commence until 1834 when it was taken over by the Lisburn Mines formed by John Taylor. In 1899 a new company, the Societe Anonyme Metallurgique of Leige took over and spent a lot of money on new plant and equipment. This was driven by electricity produced by a generating station purposely built and just down the road a mile to the west.

The neighbouring mine of Wemyss was originally independent but was taken over by Frongoch mainly so as to be able to use the Wemyss adit for drainage. This was extended into the Frongoch workings and in one place had to be re-dialled which involved blasting out the floor, a feature to be seen in other mines in the area. Although originally a lead mine, its salvation in later years lay in zinc production with over 50,000 tons of blende being produced.

Underground mining finally ceased about 1910, although in the 1920s the extensive dumps were removed for re treatment.

The site is divided by a minor road with the main site being above on high ground. Originally, fine examples of Cornish style engine houses were to be seen but deterioration has rendered the site to ruin. Regardless of this vestiges of its former activity can still be seen on site, sections of power train, pump rods, and other metalwork lie amongst scrap tyres and other modern bric a brac.

Underground the workings have filled up with water to adit level, the lowest level of natural drainage. This was originally entered as a flat out crawl in running water but in 2002 members of Welsh Mines Society cleared out a small open gunnis and fitted it with ladders to form the sociable entry point seen today.

The adit was originally explorable for some distance to a fall. This was dug through in

1995 to give access to Engine Shaft. Here is a mass of sections of pump rod together with a balance beam and metalwork either from surface or a higher level. On original entry a fine iron reinforced timber box full of spare parts for maintaining the pitwork could be seen, and also part of a balance box. But these relics were later destroyed by roof fall. Just beyond the adit was blocked by more fall, and an attempt to dig through this had to be aborted.

In 2016 a rise of about 80 feet was laddered to give access to the 18 fathom level. A well decorated level leads through a crawl on backfill to Williams Shaft, however just past this point the level is blocked by a heavy fall.

The adit system has much of interest with remains of original duck boards upon which in places clog prints could still be seen in places up until quite recently. These are very much evident in a large stope just before Engine Shaft. The whole mine is a fine example of virtually unspoiled 19<sup>th</sup> C workings and is being constantly maintained to keep the access open. In 2005 a lot of re-timbering was done, again by members of Welsh Mines Society.

The mine has four levels above water, adit level which is the 24 fathom, a 20 fathom, the 18 or 14 fathom, and a 10 fathom. There is no doubt that the mine will continue to give up its secrets

## Talybont Mines

Alltycrib or Talybont mine is quite old with local evidence of early mining corresponding to early to middle Bronze Age, the attraction being the copper deposits which occurred over to the west. There are also very strong indications of Roman mining, but large scale mining only started in 1617 when Sir Hugh Myddleton took over the leases for the Society of Mines Royal. Later the mines were worked by Thomas Bushell whose name was given to the level commenced in 1637 and driven for a distance of 200 fathoms. This was to be the main working level of the mine for the next 200 years but unfortunately is not currently accessible.

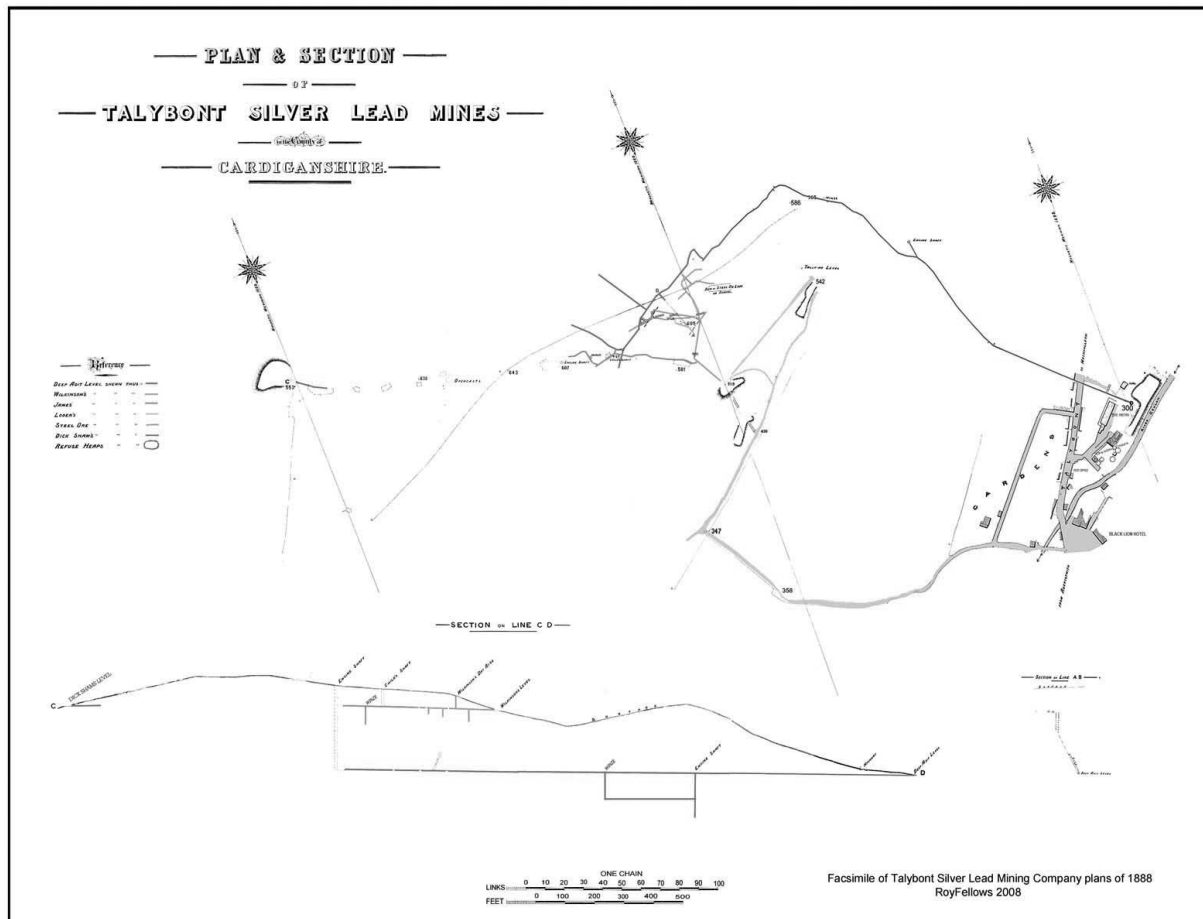
After Bushell left, little was done until the frenzy of the early 19th century when the Flintshire Smelting Company drove a deep adit from the centre of Talybont village. Although the portal is buried access is possible by Air Shaft on high ground above the village. After Flintshire company left a succession of companies took over the leases; unfortunately these included some pretty sharp characters. Notable is the swindler Joseph Fell who in consort with his lifetime business associate Richard Barrabee Fastnedge and the bent mine captain Thomas Glanville managed to con investors with what must be some of the most outrageous assertions ever made about the prospects of a mine.

The last company to work the mine was the Talybont Lead Mines Ltd formed in 1910 from a partnership of David Williams of Clettwr Hall and a mining engineer, ex shale miner named Archibald Simpson. The Talybont Company was responsible for the driving of a wide, straight crosscut level known as Pryces Level named after the mineral lords, the Pryces of Gogerddan. The entrance to this level is collapsed and so longer accessible but it had failed to reach anything anyway.

The site of the deep adit at y Wern had extensive dressing floors, but now all is gone and the site is a private garden.

The main assessable workings on the hill are Myddletons Level, a fine 'coffin' type level driven by Sir Hughes people, Wilkinsons Level, an early level enlarged and re-named in the 19th Century, and the air shaft, giving the only access to the deep adit.

Wilkinsons Level cuts Felix's Shaft which was the main working of the 1910 company and the fixing bolts for a small engine which worked a winch can still be seen. This was also cut by a lower level, Lodgers Level, but this is now lost. A left branch extended to Western Engine Shaft the main working shaft through the 19<sup>th</sup> C, but this is now completely run. However just before this point an internal winze forming a nice SRT trip giving access to some impressive stopes.



The left branch of Wilkinsons level was originally blocked at a point where it cuts Childs Shaft. This was dug through in the 1970s by some local people and an oil drum fitted. This corroded over time and in 2018 was partially removed and replaced by steel and concrete. A dangerous low, loose roof section just beyond was treated in similar manner.

The route down to deep adit was originally blocked but was dug through in 2005 by members of Welsh Mines Society. A dig commenced in the same year as an attempt to clear deep adit towards the west had to be abandoned. The access shaft was originally timbered, but this was badly affected by dry rot. In 2017 the rotten timber was all stripped out and replaced by concrete and steel.

There are many interesting underground features to be seen today, the remains of an underground horse whim, a kibble, and the remains of the pumping angle bob at the engine winze. A side level has the remains of a very early wooden kibble, unfortunately in two halves, which could well date back to the 18th century or earlier.

## Level Fawr, Pontrhydygroes

Level Fawr is the longest adit in mid-Wales; the great cross-cut penetrates the high mountains south-east of Pontrhydygroes for  $1\frac{1}{2}$  mile. Including the extensive drifts and workings on the numerous lodes intersected throughout the cross-cut, the total length of Level Fawr amounts to about 3 miles. It drained the mines of Logaulas, Penygist, Glogfach and Glogfawr. The adit was one of the great prides of the Lisburne Mines of the Trawsgoed Estate; it intersected twelve lodes, five of which were worked to great profits, and the tunnel gained a back of 742 feet at its deepest point below Pen Glogfawr.

Level Fawr was always regarded as part of the Logaulas sett until about 1872. John Probert became the leaseholder of Logaulas in 1785, when he commenced the driving of Level Fawr in order to intersect the Main Lode at 60 fathoms below surface. The cross-cut was started directly below the road from Pontrhydygroes to Ysbyty Ystwyth, and driven in a dead straight line for over a third of a mile. "The rock was hard and the progress slow, but for upwards of 30 years did the miners persevere, till at length, after piercing about 360 fathoms, a lode was cut." Job Sheldon was in charge of operations around 1815, when what was believed to be the Logaulas Main Lode was intersected. It was immediately deemed valueless, and this disaster led to the expensive adit being abandoned. The cost of driving it had been between £3/10 and £4 per fathom, but a report to the *Mining Journal* in August 1845 stated that Level Fawr had cost between £8,000 and £10,000 by the time it had reached this worthless lode.

The adit was not simply forgotten, and Matthew Francis wrote in 1867 "that Mr. Sheldon was cheated as to the length of the level; the end was always full of smoke and bad air, so that the agent could with difficulty reach the forebreast, and the man carrying the [survey] line used to turn round and wind it about himself. Such tales are current in all countries, but I suspect there was some hitch as to the dialling". In 1824, about ten years after the adit was abandoned, the lease of Logaulas along with several other Lisburne Mines passed to a company run by the Williams family from Scorrier, Cornwall. Their agent, Captain Harris, decided to drive Level Fawr onwards, in the hope of striking the Logaulas Main Lode proper beyond the current forehead. Ironically, the adit was blasted a mere 60 feet beyond the weak stringer previously thought to be the Main Lode, before it cut into an exceedingly rich vein of lead. Logaulas had been reached.

The forehead was over a quarter of a mile beyond Penygist in July 1863, and had about 800 feet more to drive before reaching Glogfach. From a point 85 feet east of the great Skinner's Shaft at Glogfach, the 118 Fathom Level there was driven north along a cross-course, towards Level Fawr which was still advancing south-east from Penygist. Around 1872, communication was made between the two levels, with the 118 Fathom breaking into Level Fawr about 16 feet above the floor of the latter. The 118 Fathom Level had been driven at a gentle uphill gradient so that it drained back to the pumps at Skinner's Shaft; after communicating with Level Fawr, the floor was stripped out towards its northern end so that the level drained into the adit instead. Therefore, the roof of the 118 Fathom Level, which also became known as Level Fawr, is about 10 feet high for a short distance.

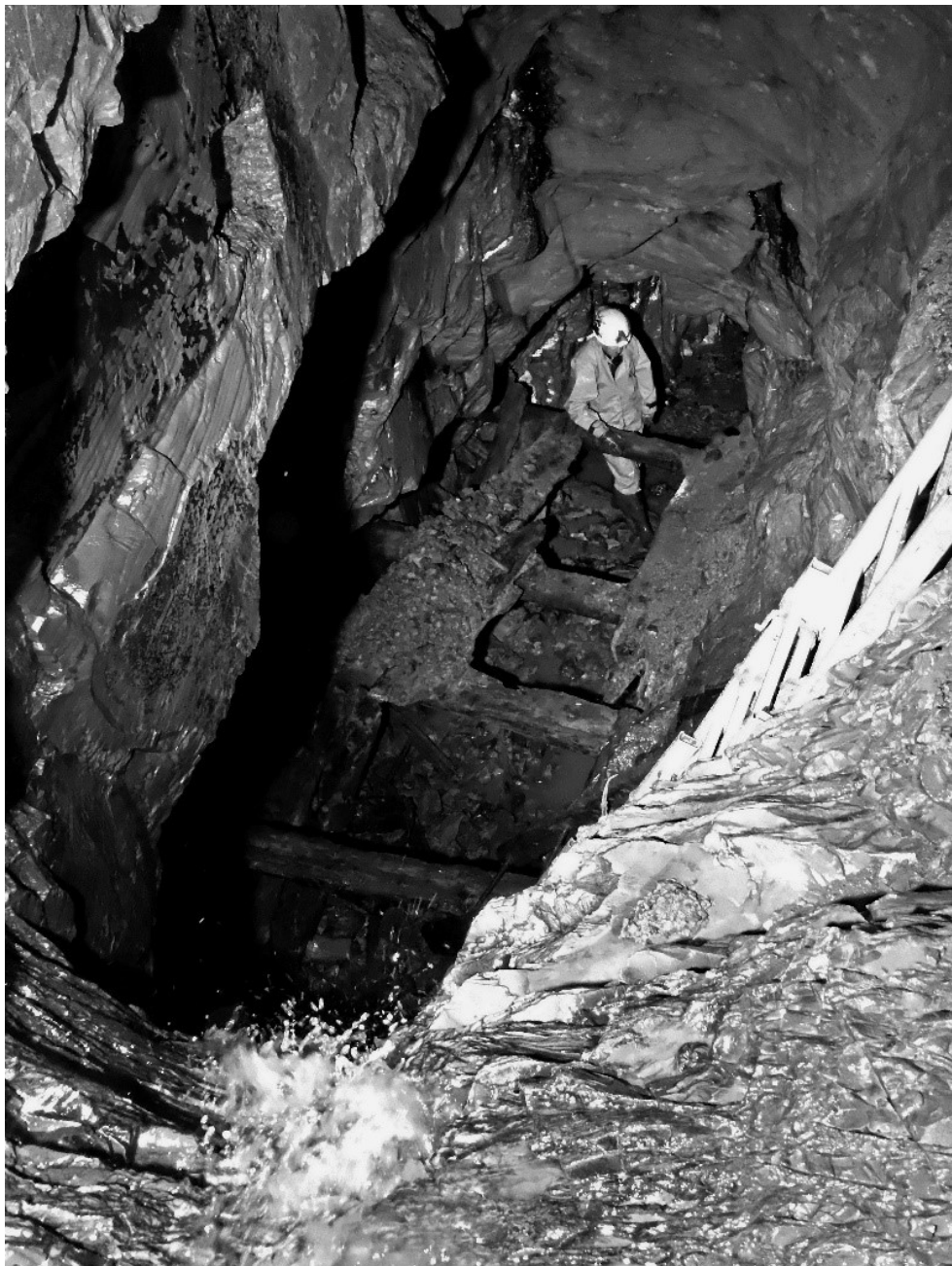
The great adit did not stop here either; it was continued a further  $\frac{1}{2}$  mile south of Glogfach, and had reached Glogfawr Mine by July 1874. Ore from Glogfawr was still being trammed to surface through the  $1\frac{1}{2}$ -mile-long cross-cut in 1887, for dressing at the Level Fawr floors at Pontrhydygroes. The Lisburne Mines Company collapsed in 1893, and Level Fawr was abandoned until the Lisburne Development Syndicate was formed in 1907, and commenced their operations at Glogfawr. Hereafter, the adit was only used for drainage, as modern dressing floors were erected by the syndicate at Glogfawr. Glogfawr was abandoned in 1920, but Level Fawr is still performing its original duty in draining some of the richest and deepest mines in the area.

Today, the Level Fawr cross-cut remains accessible as far as the Glogfach Lode, where a heavy collapse at the base of a rise to the 88 Fathom Level has blocked the cross-cut onwards to Glogfawr. Here the level is

708 feet below the surface. The extensive drifts along the Logaulas Lode are inaccessible, but those on the Penygist Lode remain open as well as an ore-chute which can be climbed up a stope to reach the Penygist 76 Fathom Level where a wooden-body tram wagon survives in excellent condition. Interestingly, it seems that this never ran on rails due to the very short level it carried ore along from one ore-chute to the next. At the western end of the 76 is the collapsed Penygist Shaft to surface.

Skinner's Shaft at Glogfach is also collapsed, but thundering water can often be heard cascading down it beyond the collapse where two wooden wheelbarrows lie. Altogether, over a mile of Level Fawr can still be accessed, with the possibility of further workings being made accessible through future digs.

**Ioan Lord, June 2019**



**Figure 5 - Workings linked to Level Fawr, Pontrhtdygroes**

