

Investigating Raw Materials

Teachers' Guidance Notes

Learning Objectives

- To discover the raw materials and industries that operated around the canal
- To understand the impact that the canal had on the industries
- To explore different materials and their uses in the past and today

Resources

- Raw material Fact Files: Clay, Iron, Limestone, Sandstone, Slate and Coal
- Map showing the main industries in the Dee Valley



Activity Instructions

Learners will research one of the raw materials found near the canal, using the fact files supplemented by their own research. They will locate where it is found, discover its history in the area and what impact the building of the canal had on it. They will then create a presentation about their raw material and present their findings to the class.

Starter Activity Ideas:

Discuss what raw materials are and which ones are found in the local area.



Can you find examples of how they have been used in the classroom, on the school building or other local buildings?

Further Activity Ideas:

Create and design a product using your raw material. Find some Victorian advertisements as an inspiration. You can be as inventive as you like.

Think about:

- What it will look like? Make some drawings.
- What will you call it?
- Who will you sell it to?
- What is special about your product? Include information about the raw material, using it as a good selling point.

Write or draw an advertisement for your product as if for a Victorian newspaper/magazine.



Brief for Learners:



- Choose one raw material, then read the Fact File and research further about your chosen material.
- Use the Fact File, your own research, photographs and drawings to create a presentation for the rest of your class.
- Include:
 - A brief history of your raw material and the related industry
 - Locations of your raw material around the canal (Mapping PowerPoint in 'How have Pontcysyllte Aqueduct and Canal changed over time?' may help)
 - Uses of your raw material
 - Photographs or drawings to illustrate your raw material and its end products
 - Explain the impact the building of the Pontcysyllte Aqueduct and Canal had on your industry
- You can report back your findings in a PowerPoint, virtual tour or display.

Map Showing the Main Industries in the Dee Valley

Key
- - - = Tramway






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Clay Fact File ①

What is Clay?


Clay is a type of mud often found near rivers. It is usually near the surface so it can be dug in open pits.

 **FACT:** It is made up of very small particles that stick together when wet. Water cannot pass through wet clay.




Why is it useful?

It has been used for thousands of years because it is soft and sticky when wet and can be moulded into different shapes but bakes hard when it is heated in a very hot oven called a kiln.

 **FACT:** The clay found near the canal turns a rich red colour called terracotta when it is baked.

What was clay used for?


As well as being used to make bricks, tiles and pottery, clay was also used during the construction of canals for lining the bottom to keep the water in.

 **FACT:** Cattle may have been used to trample the clay on the bottom of the canal to squeeze out any air to make a good seal so the water didn't leak out.



Which local industries used clay?

J.C. Edwards set up three local brick and tile works in the 19th century to make tiles and bricks that were used all over Britain. Others opened in the surrounding area too.

 **FACT:** The grand Bute Dock Pierhead Building in Cardiff was built in 1896 using J.C. Edwards bricks.

What was the impact of the Aqueduct and Canal on the clay industries?

A tramway linked Pen-y-Bont brickworks to the canal at Pentre enabling the bricks and tiles to be transported long distances cheaply until railway transport took over.

Clay Fact File 2

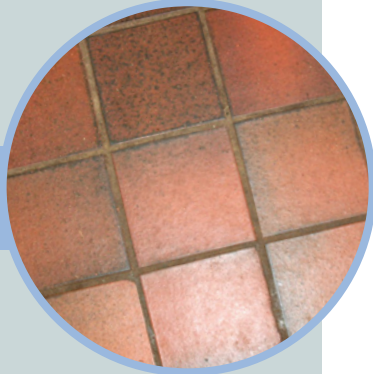
Clay in Use:



J.C. Edwards glazed tile

Courtesy of Cefn Mawr Museum
© David Heke

Terracotta floor tiles

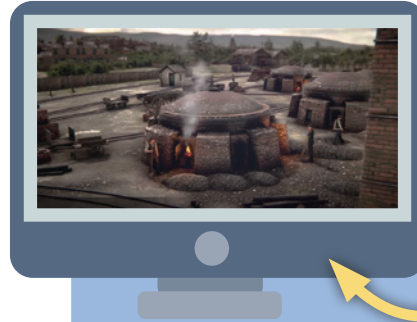


Brick houses in Acrefair

© Andrew Deathe

Bute Dock Pierhead Building in Cardiff

© Lilo Lil/Eiona Roberts



Images of the industry

Film showing brickworks and potteries in Buckley
(Courtesy of The Buckley Society)



© Amgueddfa Llangollen Museum

Workers at Tref-y-Nant brickworks

Links to other resources:

- [Making bricks by hand](#)
- [How are bricks made today?](#)

www.



Find out:

- [Can you find any brickworks on the old map?](#)
- What else was clay used for in the 19th century?
- What is clay used for today?




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Iron Fact File ①

What is Iron?

Iron is a metal. It occurs naturally in ironstone and can be extracted from the rock by mixing it with limestone and burning it at a very high temperature using coal.

 **FACT:** Ironstone is a common rock around Cefn Mawr. It looks rusty red when exposed to the air and you can see it in walls and buildings.

Why is it useful?


Iron is very hard and lasts for a long time. It can be heated in a coal-fired furnace and shaped into different tools and parts for machines.

 **FACT:** Prehistoric people were the first to use iron in Britain around 3000 years ago.



What was iron used for?

Iron was used to make tools, machines, buildings, ships, steam trains; anything that needed to be strong and to last a long time. People also used it in their homes for ovens and cooking pots.

 **FACT:** Being able to make iron in large quantities allowed new technologies to develop in the Victorian period, such as steam powered machines.

Which industries used iron?

There were a number of ironworks in the area including William Hazledine's Plas Kynaston Ironworks, Exuperius Pickering's ironworks where the links for Chain Bridge were made, and Acrefair Ironworks.

 **FACT:** The cast iron sections of the trough for Pontcysyllte Aqueduct were produced at Plas Kynaston Ironworks.

What was the impact of the Aqueduct and Canal on the iron industries?

The canal enabled the finished iron products to be transported cheaply to sell further afield. As a result, new ironworks opened up, along with more limestone quarries and coalmines, and existing ones expanded.



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Iron Fact File ②

Iron in Use:



Pontcysyllte Aqueduct

**Waterloo Bridge
Betws-y-Coed**

© Creative Commons, Ray Jones

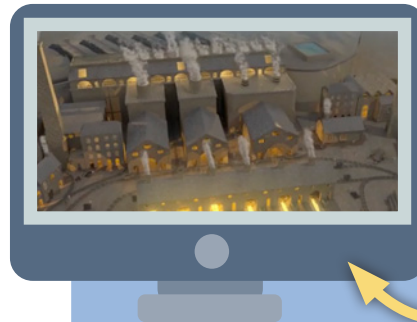


Iron Bridge, Shropshire

Creative Commons

Horseshoe Falls

© Creative Commons, Ian Capper



Images of the industry

Ynysfach Ironworks, Merthyr Tydfil 3D animated reconstruction



© Science Museum

Coalbrookdale at night.
Ölgemälde von Philipp Jakob Loutherboung 1801

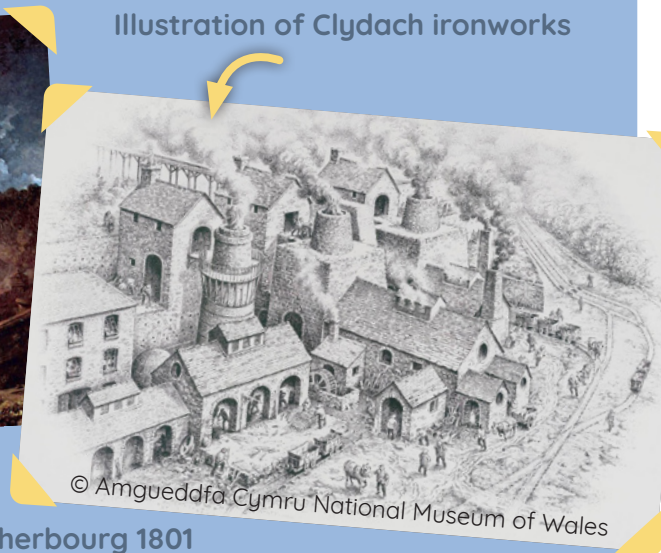


Illustration of Clydach ironworks

© Amgueddfa Cymru National Museum of Wales

Links to other resources:

- [Making Iron](#)
- [Chain Bridge](#)

www.



Find out:

- Can you find any ironworking on the old map? Tip look for smithy as well as ironworks.
- What new technologies were invented that used iron?
- What other industries were in the area?
- What is iron used for today?




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Limestone Fact File 1

What is Limestone?

Limestone is a rock that it is quarried out of the ground. It is made up from the remains of sea creatures that died millions of years ago.

 **FACT:** Sometimes you can see fossils of sea creatures in the stone.



Why is it useful?

Limestone is a good building material and can be used as stone blocks or in smaller chunks. When it is heated with coal in a hot oven called a kiln, it turns into a white powder called quicklime, which can be used in farming and industry.

 **FACT:** The Romans first used limestone to make concrete and cement.


What was limestone used for?

Limestone was used in iron production, as building stone and for making roads. Quicklime was used in plaster and cement for building or it could be scattered on fields as fertiliser.

 **FACT:** The Great Pyramid of Giza was built of limestone.

Which local industries used limestone?

Some quarries produced limestone for ironworking at local ironworks. Others produced quicklime in kilns, for agriculture. Limekilns at Froncysyllte were beside the canal but the kilns at Trevor Uchaf, were up the hill, near the quarries.

 **FACT:** The limestone from Froncysyllte quarries and the quicklime from Trevor Uchaf were transported down to the canal on incline tramways (see Incline Challenge activity).

What was the impact of the Aqueduct and Canal on the limestone industries?

Limestone quarrying grew in scale as the canal enabled iron goods made using the limestone, the quicklime and the stone itself to be transported easily and cheaply to new markets.



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Limestone Fact File 2

Limestone in Use:

Pyramids of Giza



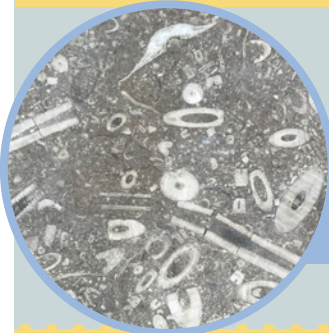
Rhosesmor Church



Font in Northop Church



Limestone worktop showing fossils © Jo Danson

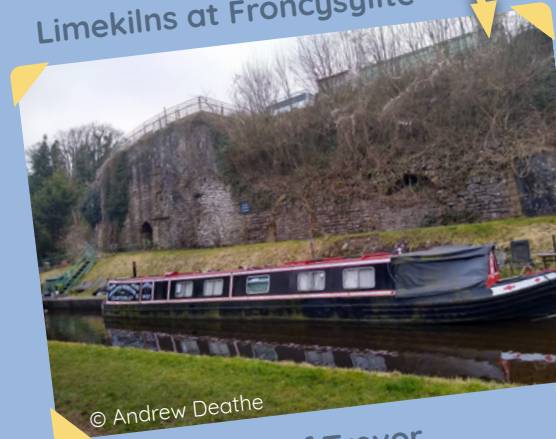


Find out:

- Can you find any ironworking on the old map?
- What else was limestone used for in the 19th century?
- What is limestone used for today?
- What other industries were in the area?

Images of the industry

Limekilns at Froncysyllte



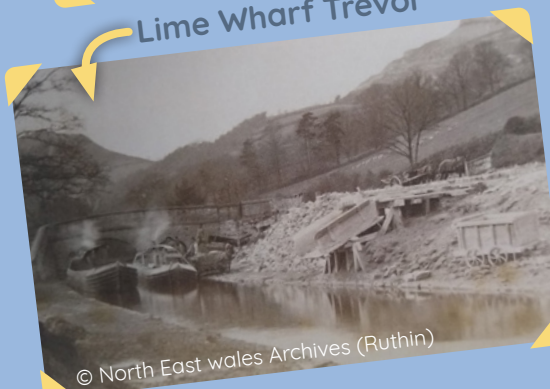
© Andrew Deathe

Limeworks Froncysyllte



© Neil Hayward

Lime Wharf Trevor



© North East wales Archives (Ruthin)

Lime workers



© Neil Hayward



Links to other resources:

Watch: [CGI of Limekilns at Waen y Brodclas](#) to show how quicklime is made.

www.





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Sandstone Fact File ①

What is Sandstone?


Sandstone was originally the sandy bed of an ancient river millions of years ago. As more layers build up, the weight causes pressure and heat which turn the sand into rock over millions of years.



 **FACT:** The village of Cefn Mawr near Pontcysyllte Aqueduct is built on a hill of sandstone.


Why is it useful?

Sandstone is a useful building material as it is strong, attractive and lasts a long time.

 **FACT:** The local football team, Cefn Druids, moved their ground to 'The Rock' in 2010 and play under the former quarry cliffs.


What was sandstone used for?

Cefn Mawr sandstone was chosen to build the supporting piers for Pontcysyllte Aqueduct as it is very long lasting and could be cut precisely to fit the careful design.

 **FACT:** Cefn Stone was so good for building that it was used to build famous buildings in Liverpool such as the Walker Art Gallery and St George's Hall.

Which industries used sandstone?

Sandstone was used in the building industry. There were many quarries around Cefn Mawr. Tan y Graig Quarry is the only one still working today.

 **FACT:** The sandstone was quarried out of the ground by hand using picks, chisels and wedges. You can still see chisel marks on some of the stone at Tan y Graig, made by the quarry workers over a century ago.



What was the impact of the Aqueduct and Canal on the sandstone industries?

The use of large amounts of stone in the building of Chirk and Pontcysyllte Aqueducts boosted business for the local quarries. The canal allowed the sandstone to be transported more easily and cheaply to other building projects further away.

Sandstone Fact File 2

Sandstone in Use:



St George's Hall Liverpool

© Creative Commons, Tony Hisgett

Chirk Aqueduct and Viaduct

Canal & River Trust

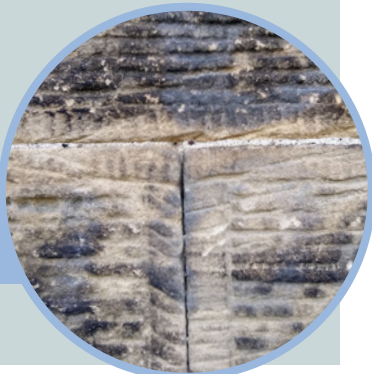


St Giles Church, Wrexham

© Creative Commons, Jeff Buck

Sandstone blocks, Pontcysyllte Aqueduct

© Andrew Deathe



© Courtesy of Cefn Mawr Museum

Workers at Chatham's Quarry, Cefn Mawr



© Andrew Deathe

Images of the industry

Tan y Graig Quarry Cefn Mawr



© Andrew Deathe

Chisel marks in stone at Tan y Graig

Links to other resources:

- [Cefn Mawr Heritage Trail](#)

www.



Find out:

- [Can you find any quarries or limekilns on the old map?](#)
- What else was sandstone used for in the 19th century?
- How was the sandstone quarried out of the ground?
- What is sandstone used for today?



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What is Slate?

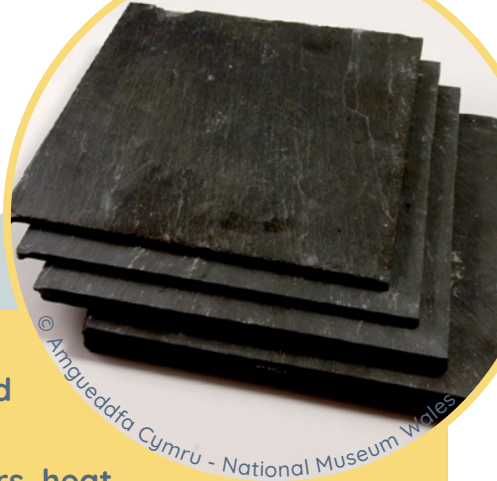
Slate is a stone formed from minerals that were originally mud at the bottom of an ancient sea. Over hundreds of millions of years, heat and pressure squeezed the mud into hard layers.

 **FACT:** The Berwyn and Llantysilio Mountains above the Dee and Ceiriog Valleys are good sources of slate.

Why is it useful?

Slate is durable. It is made up of different layers that allow it to be split into pieces of different thicknesses with a very flat surface.


 **FACT:** Slate from the Llantysilio quarries was used in big slabs rather than as thin slates because it didn't split finely.



Slate Fact File 1


What was slate used for?

As slate can be cut into very flat pieces it is useful for roof tiles, slabs for billiard tables, flagstone floors and writing slates. It was also used for building walls.

 **FACT:** Many local people had their gravestones made from slate slabs from the local quarries.

Which local industries used slate?

Moel y Faen was the largest of several quarries on the Horseshoe Pass that served the slate works at Pentrefelin. In the 1880s the quarry employed nearly 200 men. There were also slate quarries at Glyn Ceiriog.

 **FACT:** Slate slabs were transported on horse-drawn trucks along a tramway that linked the quarries then lowered down a long incline to Pentrefelin for cutting before being loaded onto canal boats to be sold at markets further away.

What was the impact of the Aqueduct and Canal on the slate industries?

The coming of the canal opened new markets for the quarries, as far away as London. Canal boats could carry heavier loads than carts and travel faster into the booming industrial cities.

Slate Fact File 2

Slate in Use:



Gravestones

© Andrew Deathe

Clock on St Collen's Church tower

© St Collen's Church



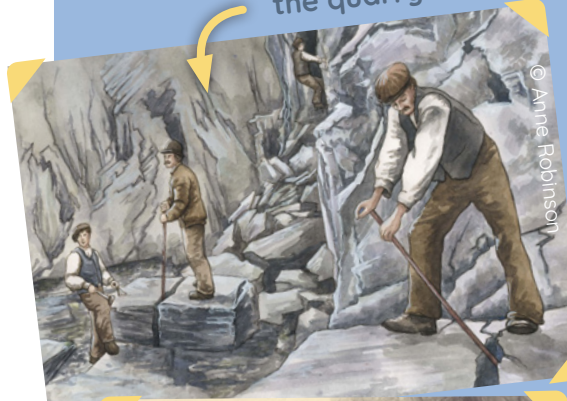
Roofing slates



Dry stone slate wall



Rockmen cutting slate in the quarry face



© Anne Robinson

Images of the industry

Cutting slabs in the mill



© Anne Robinson



© berwynslate.com



© RCAHMW

Links to other resources:

www.

- [Llangollen Museum: mining and quarrying](#)
- [Berwyn Slate](#)

Find out:

- [Can you find any quarries or limekilns on the old map?](#)
- Are there any slate quarries working today?
- What is slate used for today?



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Coal Fact File 1

What is Coal?

Coal is a black and shiny rock formed from the remains of swamp plants that lived over 300 million years ago.



 **FACT:** There were lots of collieries (coal mines) near Pontcysyllte Aqueduct and Canal that mined the rich coal seams, often deep underground.


Why is it useful?

Coal was an important fuel as it burns at a very high temperature and so gives out a lot of heat.

 **FACT:** A coal-fired forge can burn at almost 2000 degrees centigrade!


What was coal used for?

Coal was used in many industries. It powered machinery and was used as fuel in forges and furnaces to melt metal to make tools and parts for buildings, bridges etc. People also used it in their homes for heating and cooking.

 **FACT:** The coal mines operated 24 hours a day and, until 1842, could employ children as young as five years old.

Which industries used coal?

Local coal fuelled furnaces and forges in ironworks like Plas Kynaston, limekilns at Trevor and Froncysyllte and many other local industries.

 **FACT:** The collieries were sometimes more than a mile away from the canal and had to use horse drawn tramroads or railways to get the heavy loads of coal to the barges on the canal.



What was the impact of the Aqueduct and Canal on the coal industries?

Some of collieries at Cefn Mawr and Chirk used the canal to transport their coal to cities and towns in north-west England and the Midlands. The cheaper canal transport helped keep the price of coal low, which was good for the industries that used coal.



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Coal Fact File 2

Coal in Use:

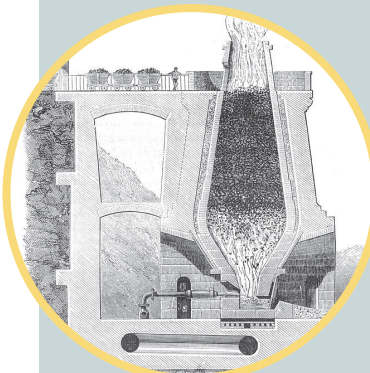


Coal on shovel, ready for burning © Andrew Deathe

A coal fire



Blast furnace using coal



Blacksmith's forge

© Stewart Mackellar



Images of the industry



© NWMAT

Plas Power Colliery



Coal boats at Hednesford Colliery, Staffordshire

Canal & River Trust

Links to other resources:

www.

- [What was it like for children working in the coal mines?](#)
- [An explosive combination: coal mining in north wales](#)

Find out:

- [Can you find any collieries or mine shafts on the old map?](#)
- What else was coal used for in the 19th century?
- What new technologies were invented that used coal?
- What is coal used for today?