

CEFN DRUM AND CWM DULAIS

COAL AND COAL MINING

Discover geology and landscape: walking trails in rural Swansea

SCRATCHING THE SURFACE

CRAFU'R WYNEB

CEFN DRUM A CHWM DULAIS

GLO A CHODI GLO

Darganfod daeareg a thirwedd: llwybrau cerdded yn ardal Abertawe

11 KM
4 HOURS
GPS COMPATIBLE



START
GRID REF.
SN 60 192 02991

at the roadside parking on the west side of the A48 just south of the Fountain Inn. Buses stop here and Pontarddulais is served by rail. Alternatively, park on open ground in Cwm Dulais (see map, SN 62200 04000); from here follow a path down the valley to C and continue the circuit.

PATH CONDITIONS

The trail follows clear paths which can be very muddy. There is a steady ascent between C and E and a steep descent between H and I.

MAPS



Ordnance Survey 1:50,000 map 159 (Swansea & Gower)
1:25,000 Explorer map 165 (Swansea)
Geological Survey 1:50,000 Sheet 230 (Ammanford)



REFRESHMENTS

Fountain Inn; cafes and pubs in Pontarddulais.

SAFETY

Be careful of traffic on roads. Grid references are for guidance only. Follow the Countryside Code (<http://naturalresourceswales.gov.uk>) and the Geological Fieldwork Code (www.rockwatch.org.uk/geological_code). Respect people, protect the environment and stay safe. Wear sensible clothing and footwear.

FURTHER INFORMATION

Local walking groups www.swansea.gov.uk/walking
Local geology www.swga.org.uk
For junior geologists www.rockwatch.org.uk
Geology and geological maps www.bgs.ac.uk
Gower Society www.thegowersociety.org.uk
Archaeology www.ggat.org.uk
Coal-mining history www.welshcoalmines.co.uk

The Geology of South Wales: A field guide by Gareth T. George (gareth@geoserv.co.uk, 2008)

Text and images: Geraint Owen, Siwan Davies (Swansea University)
Welsh translation: Dyfed Elis-Gruffydd
Design: iconcreatedesign.com

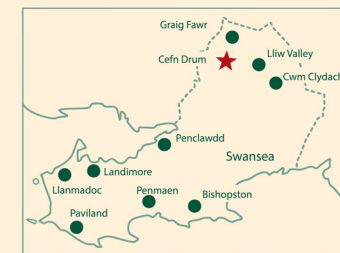
11 KM
4 AWR
YN CYDWEDDU
Â GPS

There is a long history of extracting coal from the rocks beneath Swansea. This trail explores Cwm Dulais and Cefn Drum and discovers how coal was formed millions of years ago, how it has been extracted, and how the coal-bearing rocks influence the landscape. The trail is about 11 km (7 miles); allow about 4 hours. An alternative parking area shortens the trail to 7 km (4½ miles).

Mae hanes hir i'r gwaith o godi glo o'r creigiau dan Abertawe. Mae'r daith hon yn archwilio Cwm Dulais a Cefn Drum ac yn darganfod sut y cafodd glo ei ffurfio filiynau o flynyddoedd yn ôl, sut yr aed ati i'w gloddio, a sut mae'r Cystradau Glo wedi dylanwadu ar y dirwedd. Mae'r daith tuag 11 km (7 milltir) o hyd ac mae'n cymryd tua 4 awr. Drwy ddefnyddio lle parcio gwahanol, gellir byrhau'r daith i oddeutu 7 km (4½ milltir).



Look for other trails in this series!



SCRATCHING THE SURFACE



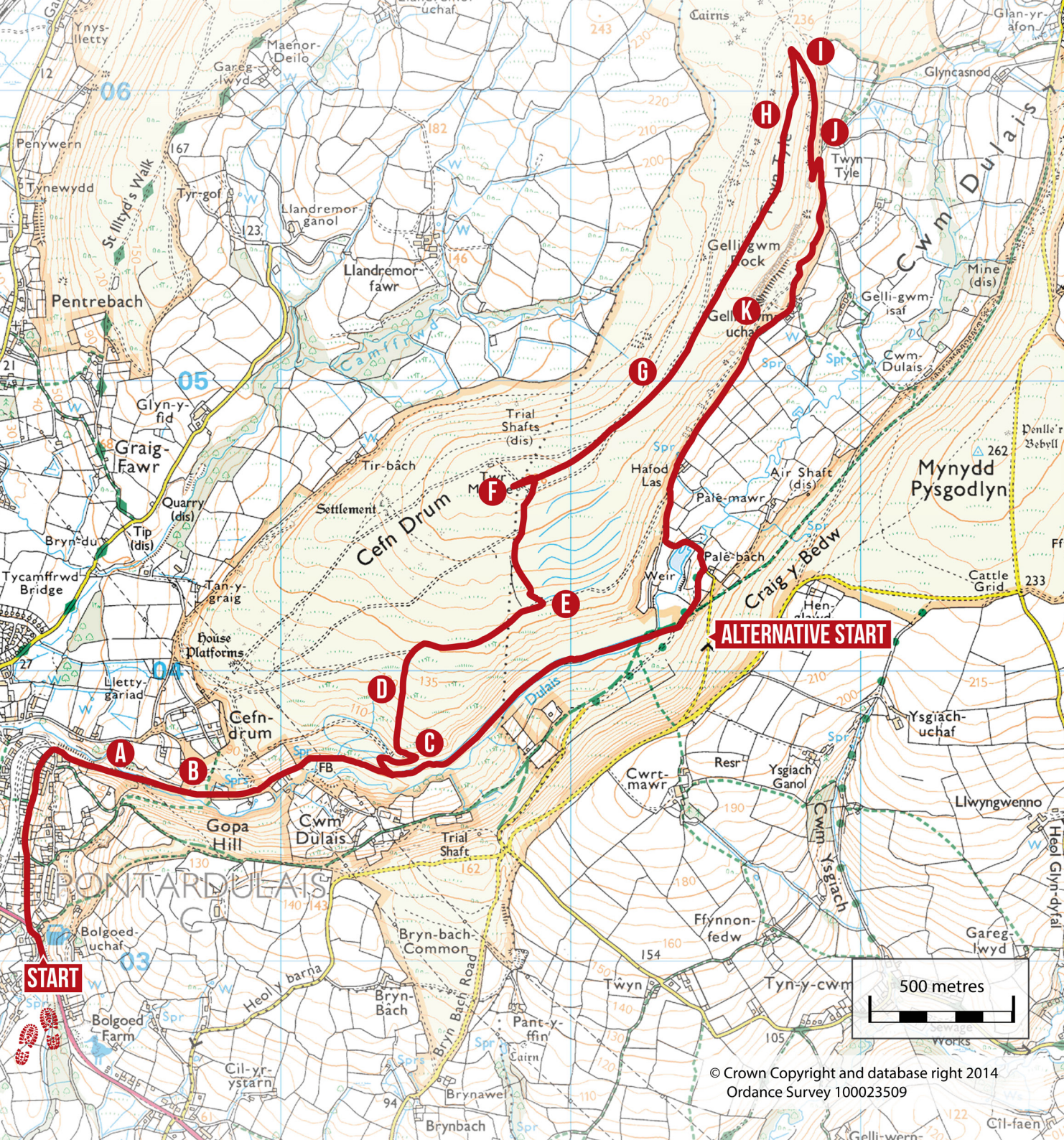
CRAFU'R WYNEB

Discover geology and landscape: walking trails in rural Swansea

Darganfod daeareg a thirwedd: llwybrau cerdded yn ardal Abertawe

© 2015 Geraint Owen and Siwan Davies (Swansea University)
email: g.owen@swansea.ac.uk #scratchingthesurface
<http://geography.swan.ac.uk/scratchingthesurface/>





Pass the memorial stone to the Rebecca Riots on the way to the Fountain Inn. Turn right after the Inn along Goppa Lane. At the end of the lane, turn right along a straight, level track. [SN 60533 03616]



Bedrock in the railway cuttings

A The track follows the line of a railway that served Graig Merthyr and Cefn Drum collieries. You can see bedrock in cuttings and ditches, most of which is dark grey, fine-grained mudstone. This breaks into sheets and is also called shale. Brown rock with visible shiny grains is coarser-grained sandstone. The rocks form layers (beds) which tilt (dip) gently to the south. Beds or seams of coal occur near here, although none are visible today. The mudstone, sandstone and coal are together known as the Pennant Sandstone Formation, which is over 1000 metres thick.

The rocks formed as horizontal layers of mud and sand at the Earth's surface 320 million years ago, in the late Carboniferous period. South Wales then was like today's Amazon basin - hot, humid and crossed by large rivers. The rivers deposited sediment, burying older deposits which hardened into rock. In a period of mountain-building (orogeny) 300 million years ago, the beds were tilted, pushed upwards and then worn down by erosion. Today's landscape has been carved into these deformed rocks.

The railway cuttings are well vegetated, partly by invasive alien species such as rhododendron and japanese knotweed, which flourish in our mild, wet climate. The gravel on the path is limestone brought here from quarries elsewhere.

Continue to a wider area before a house. [SN 60766 03567]



Superficial deposits

B In the banks you can see blocks of brown sandstone surrounded by earthy material. These deposits accumulated from the erosion of the bedrock during the last glacial episode, about 20,000 years ago. Superficial deposits like these cover the bedrock over most of South Wales.

The level track curves left past two houses and under electricity lines. After an open grassy area turn left, uphill, along a gravel track. [SN 61364 03660]

C The valley floor is the site of Graig Merthyr and Cefn Drum collieries, which worked until 1978, employing up to 700 men. The area is littered with mine waste, mainly blocks of dark mudstone. Look carefully for fossils, particularly pieces of the plants that grew here 320 million years ago. Flowering plants had not evolved, conifers were uncommon, and most of the trees were ancestors of simple plants such as today's horsetails and club-mosses.



Plant fossil: root



Plant fossil: stem



Plant fossil: root

At times, plant remains built up an organic deposit, peat. When buried, peat becomes coal, which is black, shiny and less dense than mudstone. There are lots of small pieces of coal here, mostly anthracite, a very carbon-rich form of coal. Coal is a fossil fuel, having stored energy from ancient sunlight. It forms over geological timescales of millions of years, not on the human timescales in which we use it: its use is unsustainable.

Follow the stony track uphill through two hairpin bends. [SN 61415 03839]

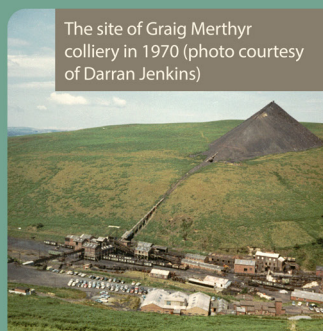
D The track is surfaced with pieces of imported limestone. You can find fossils of animals that lived in the seas covering South Wales 350 million years ago and shiny white crystals of the mineral calcite.



Calcite crystals

There are also many blocks of sandstone and mudstone here. Pale grey or brown blocks are sandstone; look closely and you can see sand grains cemented together. The brown colour comes from the weathering of iron oxide. Look for plant fossils in darker blocks of mudstone. The dark colour is carbon from the decay of fossil plant material.

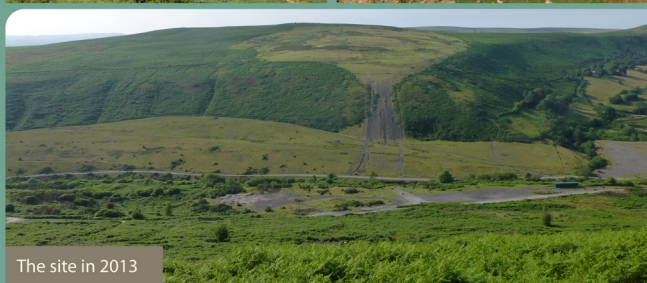
The track turns right and continues on the level to a junction. There are fine views towards the Loughor estuary and the Gower peninsula. [SN 61901 04237]



The site of Graig Merthyr colliery in 1970 (photo courtesy of Darran Jenkins)



The site in 1990



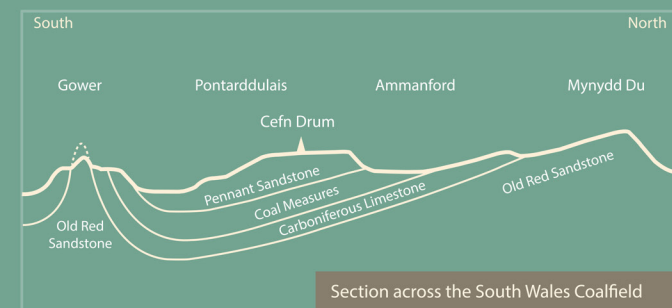
The site in 2013

E Notice several rounded white boulders made of sand grains and small pebbles cemented firmly together. This distinctive rock is Twrch Sandstone, which is older than the coal-bearing rocks and underlies them in the rock succession. The closest outcrops are over 10 km north of here. The boulders are erratics, carried by glaciers and ice sheets about 20,000 years ago in the last glacial episode and left behind when the ice melted, forming a deposit called till.

The ground ahead becomes more grassy and in summer has less bracken. This is where waste was dumped from the collieries below. Conical spoil tips used to be a common sight in coal-mining valleys. This is a good area to look for plant fossils.

Follow the track uphill, crossing drainage ditches from the old tip. At the highest point, turn left to the cairn on the summit of Cefn Drum. [SN 61819 04630]

F The cairn is made of blocks of brown Pennant Sandstone and white Twrch Sandstone. There is a great view across the South Wales Coalfield. About 300 million years ago the rock layers were squeezed into an elongated basin, or syncline. This has since been cut through by erosion, like slicing the top off an egg, exposing the youngest rocks (Pennant Sandstone) in the centre and older rocks to the north and south (Coal Measures, Twrch Sandstone, Carboniferous Limestone and Old Red Sandstone). You would find Old Red Sandstone here if you drilled a borehole several kilometres deep!



Section across the South Wales Coalfield

Rocks vary in their resistance to erosion. Highly resistant Old Red Sandstone forms hills on the Gower Peninsula (south) and the Brecon Beacons and Mynydd Du (north). Coal Measures are readily eroded; they underlie the Loughor estuary and north Swansea (south) and the Gwendraeth and Amman valleys (north). Pennant Sandstone resists erosion, forming the uplands where you are now.



Retrace your steps for 70 metres and continue along the path following the hill crest. Stop at the lowest point between Cefn Drum and Twyn Tyle. [SN 62293 04956]

Loughor Estuary and Gower peninsula from Cefn Drum.

G Looking ahead, notice a line of old excavations along the western (left) slope of Twyn Tyle, where coal was extracted from shallow surface workings. You will see these more closely at I. You may see wind turbines on the high ground to the north and east. Harnessing renewable energy such as wind power is an alternative to using unsustainable fossil fuels, but brings its own environmental issues.



Old coal workings in the Graigola seam along the flanks of Twyn Tyle

Follow the path to the top of Twyn Tyle. [SN 62763 05950]

H Notice the shape of the skyline ahead and to the right. Shorter, steeper slopes face north (left) and longer, gentler slopes face south (right), reflecting the gentle tilt (dip) of the rock layers to the south. Beds of mudstone and coal have been worn away, forming long dip slopes along the sandstone beds and steeper, north-facing scarp slopes cutting across the sandstone. On the other side of the Coalfield syncline the beds dip to the north, so scarp slopes in Kilvey Hill and Townhill in Swansea face south.

Notice how land is used in Cwm Dulais. Farms are sited just above the valley-floor woodland. Fields on the lower slopes give way to open commons for summer grazing on higher ground. This is a traditional style of land use in rural areas.



Scarp and dip topography from Twyn Tyle.

Half-way down the northern scarp slope of Twyn Tyle, a path on the right follows a line of excavations like those you saw from G. [SN 62824 06032]

I These excavations follow the Graigola coal seam, also known as the Swansea Three Feet seam. At each hollow, coal was dug from the hillside until the excavation became unstable. This is an old, small-scale form of coal mining. The Graigola seam separates the Pennant Sandstone Formation into the Hughes Member beneath and the Swansea Member above. It is one of many coal seams in the area.

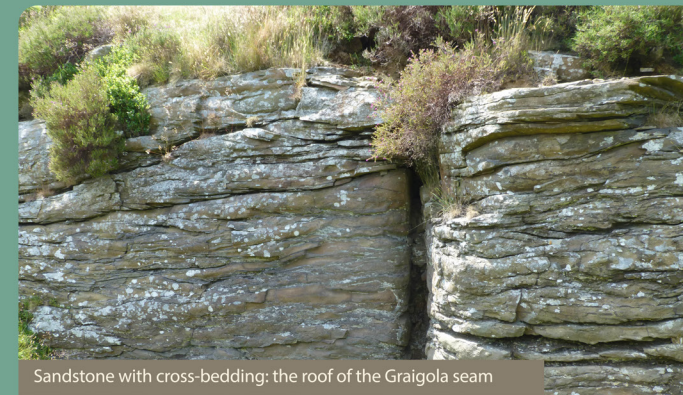
The path follows the workings gently downhill, following the dip of the coal seam. This meets the valley floor and continues under the ground further south. Later, larger collieries mined it from beneath the hills on either side of Cwm Dulais and further to the south.



The Graig Merthyr mine site

A few hundred metres along the path, stop at an excavation on the right with large blocks of rock. [SN 62826 05849]

J The blocks are sandstone, which formed a strong roof to workings in the Graigola seam. The bedding is nearly horizontal. Layers at an angle to the bedding are cross-bedding, which formed when flowing water 320 million years ago built sand grains into bars on a river bed. The cross-bedding preserves the downstream face of the bar and shows that the rivers flowed to the north.



Sandstone with cross-bedding: the roof of the Graigola seam

The path zig-zags down to a surfaced lane. Turn right, pass a farm on the left and look at the cliffs on the right. [SN 62779 05389]

K The cliffs, known locally as Y Darren, expose the sandstone you saw at J. They are the scar of an old landslide and the hummocky ground where farms have been built is slumped material. Large landslides are common in the South Wales valleys. During glacial episodes, ice eroded the valley sides and floor as it flowed from higher, colder areas to areas further south where it melted. When the glaciers wasted away due to rapid global warming after 20,000 years ago, they left steep, unsupported valley sides, which collapsed on weak layers of mudstone and coal. Water draining through the sandstone comes to the surface where it meets these impermeable rocks, forming spring lines that add to the instability. Most landslides happened soon after the ice melted, before extensive vegetation cover developed, in what are known as paraglacial conditions.



Landslip on the south-east flank of Twyn Tyle

Continue down the lane. After crossing the Afon Dulais, turn right to join the gravel track along the old railway track back to the start.

FINISH