
Little Neath River Cave

[SN 912 142]

Highlights

The caves of the Afon Nedd Fechan provide an excellent example of the progressive underground capture of a surface river in a limestone karst. They contain passages in all stages of development, including immature vadose inlets, a large main streamway, an active phreatic, partly and completely abandoned high levels, and truncated fragments beneath the active part of the surface river bed.

Introduction

The caves adjacent to the Afon Nedd Fechan, west of Ystradfellte, include the Little Neath River Cave, Bridge Cave, Pwll y Rhyd, White Lady Cave and Town Drain (Figure 6.1), (Figure 6.10). The underground drainage is developed largely in the Holverian Dowlais Limestone, which dips south at less than 10°, and is broken by a number of dip faults. Draining south from the Old Red Sandstone slopes of the Fforest Fawr mountains, the headwaters of the Afon Nedd Fechan (Little Neath River) sink at various points across the Carboniferous Limestone outcrop. All the water from the sinks in the river bed rises from deep fissures at Pwll Du, where the top of the limestone dips beneath the sandstone of the Namurian Basal Grit.

The morphology of the Little Neath River Cave is well documented by Norton *et al.* (1967), Standing *et al.* (1971) and Mullen (1987, 1988, 1990), and all the caves are briefly described by Moore (1989) and Stratford (1995).

Description

In dry weather the entire flow of the Nedd Fechan sinks within 200 m of leaving the sandstone outcrop into impenetrable riverbed fissures. The first open sink is the Flood Entrance of Little Neath River Cave. The main sink of the river is also choked, but drains into Bridge Cave, which has a dry entrance in through a doline. The water then flows through a short sump, and east along a wide bedding plane canal into the Main Stream Passage of Little Neath River Cave (Figure 6.10). This is the trunk route through the cave system, which has nearly 9 km of mapped passages, including the small joint-controlled tributaries from the Flood Entrance.

Much of the gently graded Main Stream Passage is 10 m high and wide, but it is broken by a series of shallow phreatic loops, each up to 200 m long, which are permanently flooded. The faulted and fractured limestone walls break away in numerous large collapse blocks, and there are some extensive banks of clastic fill. Abandoned oxbows and high-level passages leave and join the streamway at various points, and some of these carry invading tributary streams. The Old World and the New World Series are both complexes of old passages, at an elevation of about 260 m, close to the cave river level at the upstream end but 40 m above at the south end of New World; they include tall avens and collapse chambers containing extensive calcite speleothems. The present limit of exploration is 600 m from the resurgence, at a point 27 m deep in Sump 8, whose water surface level is the same as that of the resurgence. This flooded passage appears to pass through a downfaulted block, 400 m wide, in which the top of the limestone is below resurgence level. The faulting is more complex than the surface outcrops shown on (Figure 6.10), and Sump 8 may lie on or very close to the underground line of the main fault.

The bed of the Nedd Fechan continues south of the sinks into the Little Neath River Cave, and takes flood overflows as far as the open rift of Pwll y Rhyd (Figure 6.10). This is an unroofed, phreatic rift, exposed across the river bed. From its floor, a network of small phreatic rifts and tubes extends beneath the west bank, and carries flood waters to the fine elliptical tube which returns to daylight as White Lady Cave. Between Pwll y Rhyd and the White Lady flood rising, a narrow limestone gorge has breached the old phreatic caves; it is dry other than in exceptional floods, and represents the

surface drainage route prior to underground capture. Town Drain, beneath the east bank, carries flood flows through immature rift passages which probably drain to the nearby inlet in Little Neath River Cave.

Interpretation

All the caves of the Nedd Fechan show strong geological control, with passage development along bedding planes, joints and a number of small faults. In plan, the main cave drains almost straight downdip, though it is deflected slightly to the east by the faults. In profile, it climbs steadily through the stratigraphy, by way of small phreatic lifts; the sinks are close to the base of the limestone, and it finally resurges from fissures which carry the flow to the top of the sequence. The lower end of the cave occupies a phreatic loop which extends beneath the downfaulted block of sandstone. The severe flooding which occurs in the lower reaches of the known cave suggests that this phreatic loop may act as a sediment trap, which restricts flow to the resurgence.

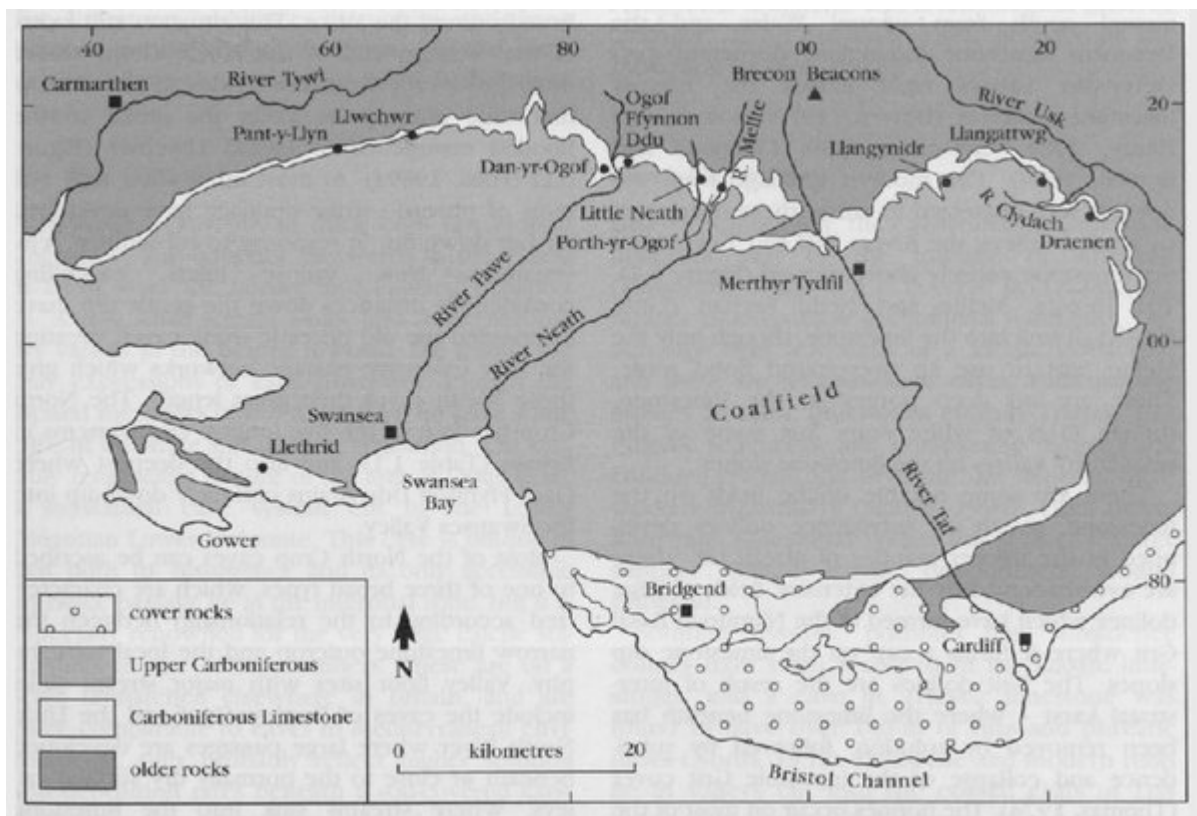
The Little Neath River Cave has a more complex morphology than many other valley floor river caves, such as Porth yr Ogof and Ogof Hen Ffynhonau, which are developed mainly at one level. Passages up to 30 m above the present streamway indicate a complex history for the cave. The main passages in Little Neath River Cave drain east of south, away from the surface river course, and it has been suggested (Moore, 1989) that early phases of the cave fed a resurgence in the Mellte Valley, 2 km to the east (Figure 6.1). It is more likely that the passage orientation is a feature of the local geology, and the resurgence has always been to the south-west (Mullen, 1990), even though the limestone outcrops are at lower level in the eastern valley. The New World Series represents the earliest underground drainage route, active until it was captured by the present streamway. These large old passages were subsequently filled by extensive sediment deposits, which have only been partly removed by the present streams.

Cave development has also been influenced by changes in the surface topography and drainage imposed by the Pleistocene glaciations. The Nedd Fechan, Mellte and Hepste originally flowed southeast as headwaters of the Cynon catchment, until they were captured by Pleistocene excavation of the Vale of Neath (North, 1962). The rejuvenated rivers entrenched into their present steep gorges, exposing the limestone at lower levels and rapidly draining previously phreatic sections of the karst aquifer. The Nedd Fechan gorge, entrenched along a fault zone west of the caves, is a youthful feature which may postdate the main downcutting of the Mellte and Hepste valleys. Its course across the limestone was probably excavated by high meltwater flows in cold stages of the late Pleistocene, creating the site of a new outlet for the cave water in subsequent warm stages. Any diversion of the cave drainage, from an earlier route to the Mellte, has not yet been dated, but the Nedd Fechan gorge is pre-Devensian as its lower reaches contain glacial till. This relatively late incision also accounts for the breaching of the caves at Pwll y Rhyd.

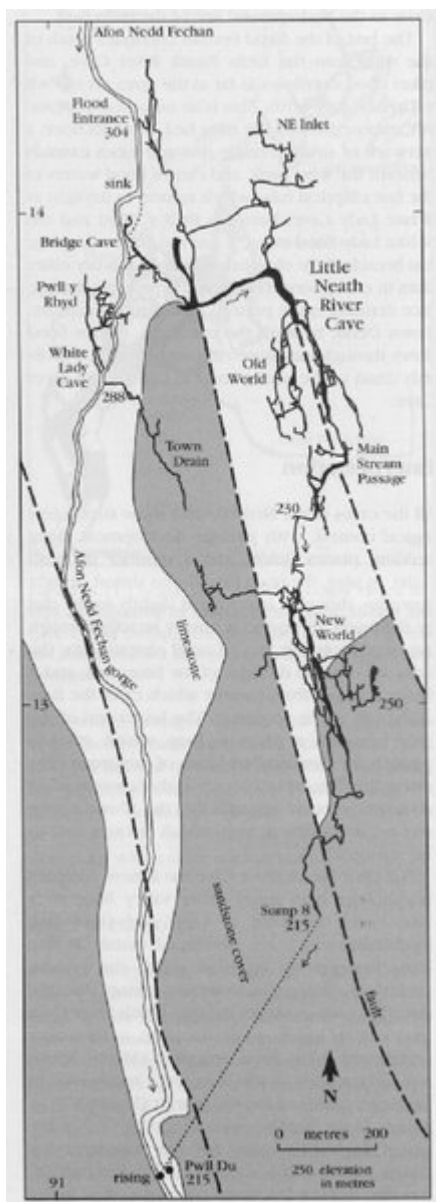
Conclusion

The caves of the Afon Nedd Fechan constitute an excellent example of karstic development beneath a large river valley crossing a narrow limestone outcrop. Their multiple phases of vadose and phreatic passages represent an early capture of the surface drainage, flow patterns dictated by geological constraints, and a diversion of the outlet path in response to surface rejuvenation.

References



(Figure 6.1) Outline map of the karst areas around the perimeter of the South Wales coalfield, with locations referred to in the text. The cover rocks in the south are Triassic and Jurassic mudstones and thin limestones.



(Figure 6.10) Outline map of the Little Neath River Cave, its surface geology and the adjacent caves of Pwll y Rhyd (from survey by University of Bristol Speleological Society).