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# Afon Teifi at Cenarth, Carmarthenshire

[SN 269 416]–[SN 276 418]

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## Highlights

Glacial infilling of entrenched valleys, with subsequent fluvial erosion of new bedrock gorges, has produced distinctive narrow incised sections on some lowland Welsh rivers, of which this is an excellent representative.

## Introduction

Gorges are a persistent feature of the middle and lower Teifi Valley (Figure 3.9) and (Figure 3.10). There are nine major gorges (Allt-y-Cafan, Llandysul, Craig Gwrtheyrn and Llanllwni studied by Price, 1977; and Kenllan, Newcastle Emlyn, Cenarth, Cilgerran and Cardigan mentioned by Lear, 1986). In his 1965 paper, O.T. Jones has described each gorge and divided them into two general types: those that are cut through a rock spur projecting into clay-filled meanders, of which the Cenarth site is an example, and those that lie on the valley flanks. The importance of these gorges for fluvial geomorphological studies in Wales arises from the numerous references to these landforms in the literature about the Quaternary Period, starting with the work of Charlesworth (1929), and their significance in the development of certain valleys during the Pleistocene. The Cenarth Gorge has featured in studies by Francis (1964), Jones (1965), Bowen (1967), Price (1977), Bowen and Lear (1982) and Lear (1986).

## Description

The Cenarth Gorge is 800 m in length and reaches a maximum depth of almost 50 m. Upstream of the gorge, the river is meandering across a confined floodplain. There are examples of abandoned meanders to the north and south of the gorge (Figure 3.11). Seismic investigations of these meanders revealed that the level of the rock floor in the northern meander was at –10 m OD (Francis, 1964). These meanders were formed by rejuvenation following uplift in the region and the incision into the valley floor, which was then followed by a period of deposition. The Cenarth Gorge and its associated meanders are the most studied and most spectacular of the features of the Lower Teifi. The gorge is 120 m in width at its rim, with a river width varying from 25 m at the upstream end to 80 m at the downstream end, where a rock platform fans out, creating a series of waterfalls. The river is tree-lined through the gorge, creating stable banks. The gorge section continues downstream to the bridge, from where the flood-plain recommences.

## Interpretation

There are two schools of thought regarding the formation of such features on the Lower Teifi. Firstly, Jones (1965) and Charlesworth (1929) postulated a Lake Teifi, which was impounded by the Irish Sea ice sheet at the mouth of the Teifi Valley. The subsequent melting of the ice-dam barrier led to a rapid surge of meltwater from this lake which, it was suggested, would lead to the formation of such gorges by erosion through the valley fill (chiefly lake clay). Jones (1965) estimated that between  $28 \times 10^6$  and  $33 \times 10^6 \text{ m}^3$  of rock was removed during the formation of the gorge. There are depositional features in the Teifi Valley which would confirm the presence of such a lake (e.g. in the Lampeter area; Bowen, 1967), although Price (1977) suggested that there is evidence for the existence of more than one lake in the Teifi Valley. Jones' hypothesis of the emptying of the Teifi lake and the erosion of the gorges has been questioned in subsequent studies, notably that of Bowen (1967).

Evidence from the Fishguard area, where Jones (1965) has described ice-marginal overflow channels, suggested that such features were part of a more complex drainage network that was initiated subglacially (Bowen and Gregory, 1965). This led Bowen (1967) to suggest that the gorges of the Lower Teifi were formed subglacially by the superimposition of

englacial meltwater streams. Bowen disagreed with Jones' overflow hypothesis for the formation of such gorges for three reasons. Firstly, it was suggested that there was no evidence for an Irish Sea ice sheet trespassing across mid-Wales in this area. Secondly, such a model assumes that the Teifi Valley was ice-free during this period of Irish Sea ice advance. The third point of contention was Jones' hypothesis that meltwater ignored the existing preglacial valley floor. In addition, although deposits exist which provide evidence of glacial ponding of meltwater in the Teifi basin, there was nothing to suggest the existence of just one lake. Bowen's theory of subglacial erosion suggested that the englacial streams would take the most direct and steepest route down valley and ignore meander loops, and thus the extreme flow would erode a gorge.

Price (1977) mapped a 10 km length of the middle Teifi Valley upstream of Cenarth and looked at the origin of the Allt-y-Cafan, Llandyssl, Craig Gwrtheyrn and Llanllwni gorges. She substantiated the idea of glacial ponding of meltwater. It was suggested also, from evidence of the Allt-y-Cafan Gorge, that Bowen's theory of subglacial initiation of the gorges of the Teifi was preferred and was thought to have occurred during the deglaciation of the Teifi Valley. This, it was suggested by Bowen, occurred when the Irish Sea and Welsh ice were confluent over the present catchment during the Devensian. This ice sheet covered the whole of the area. Evidence for this deglaciation exists in the vast thickness of till in the abandoned meanders.

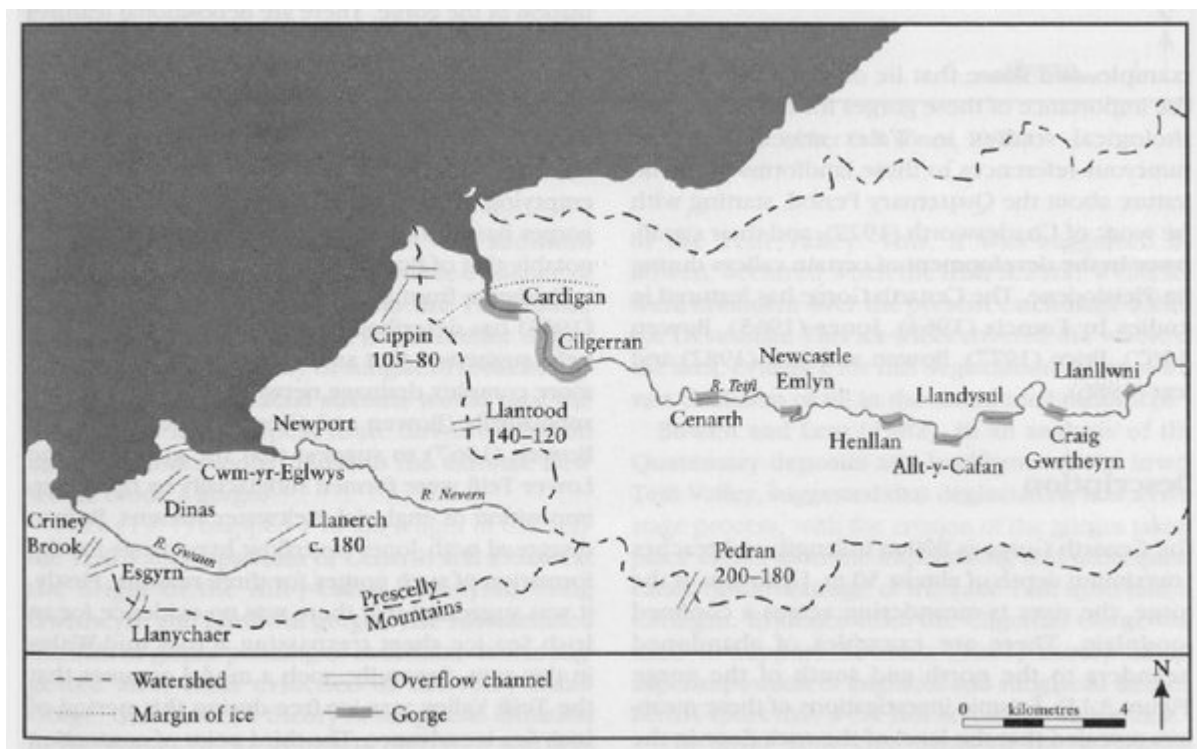
Bowen and Lear (1982), in an analysis of the Quaternary deposits and landforms of the lower Teifi Valley, suggested that deglaciation was a two-stage process, with the erosion of the gorges taking place earlier than the impounding and subsequent catastrophic drainage of the Lake Teifi upstream of Cardigan. Evidence from the Cilgerran Gorge was used to support Bowen's (1967) theory of the superimposition of englacial and subglacial streams across spurs that were laid across the valley axis.

The Afon Teifi, like many of the westward-flowing rivers of Wales, is characterized by gorge sections, important in the context of Pleistocene investigations in the area discussed in the vast literature on this subject. The Cenarth Gorge is a spectacular example of such a feature, which, together with the abandoned meanders to the north and south of the gorge, has been extensively studied. The hypothesis of a catastrophic meltwater emerging from a large proglacial lake has been discounted by Bowen (1967). Thus ... the subglacial meltwater hypothesis is the most likely cause of the Teifi gorges' (Lear, 1986). The complexity of the situation is illustrated by the fact that whereas Bowen (1967) suggested that deglaciation of the Irish Sea and local ice sheets prior to gorge erosion occurred when they were confluent, it was further added that it was unlikely that an Irish Sea ice sheet was involved (Lear, 1986). Evidence from the strati-graphic relationships of deposits in the Henllan area pointed to deglaciation of a single ice sheet as the eroding agent, thus discounting the idea of involvement of an Irish Sea ice sheet (Lear, 1986). There is thus no evidence that the Irish Sea ice sheet and Teifi Valley sheet were confluent (Garrard, 1977).

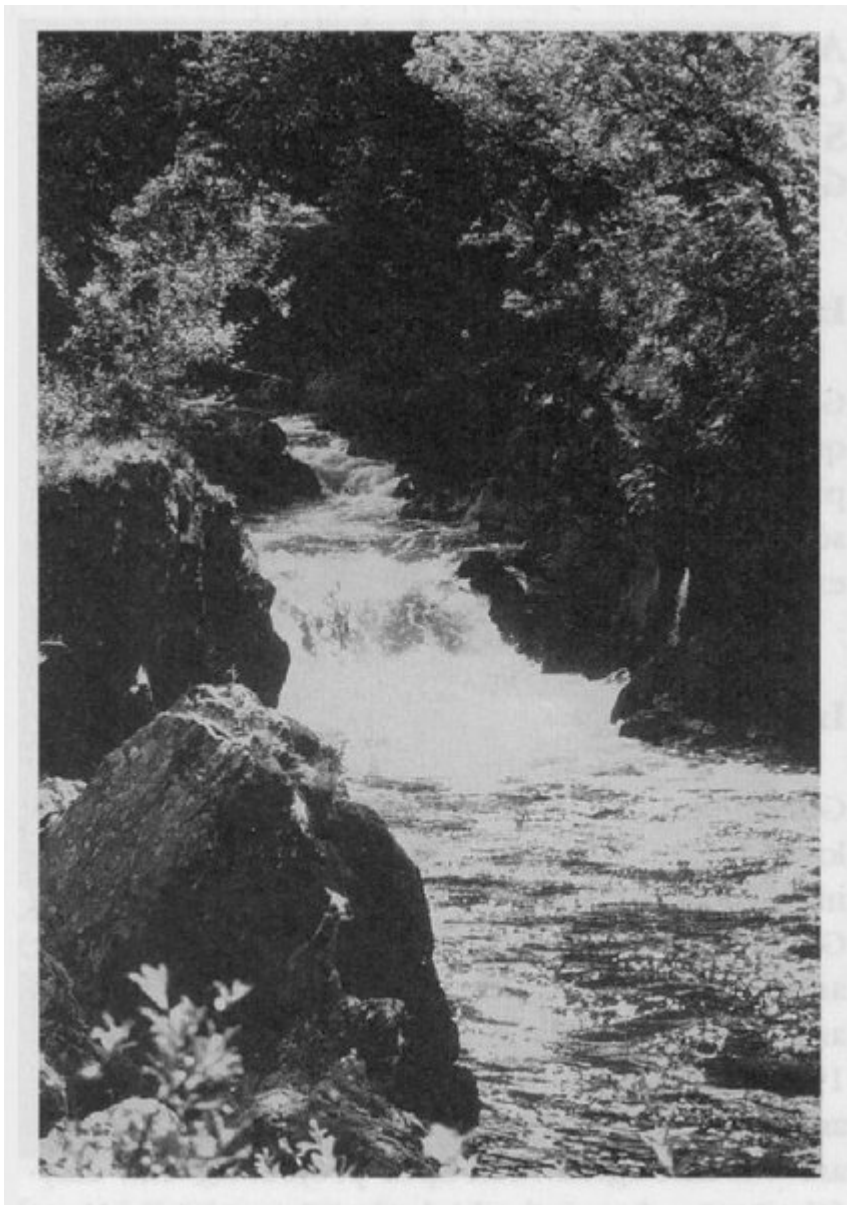
## **Conclusion**

Gorges occur on several streams in West Wales, of which the one on the Teifi at Cenarth is a spectacular example. Their formation is associated with meltwater flows during deglaciation of the area in the Pleistocene, but their precise origin has been the subject of much debate.

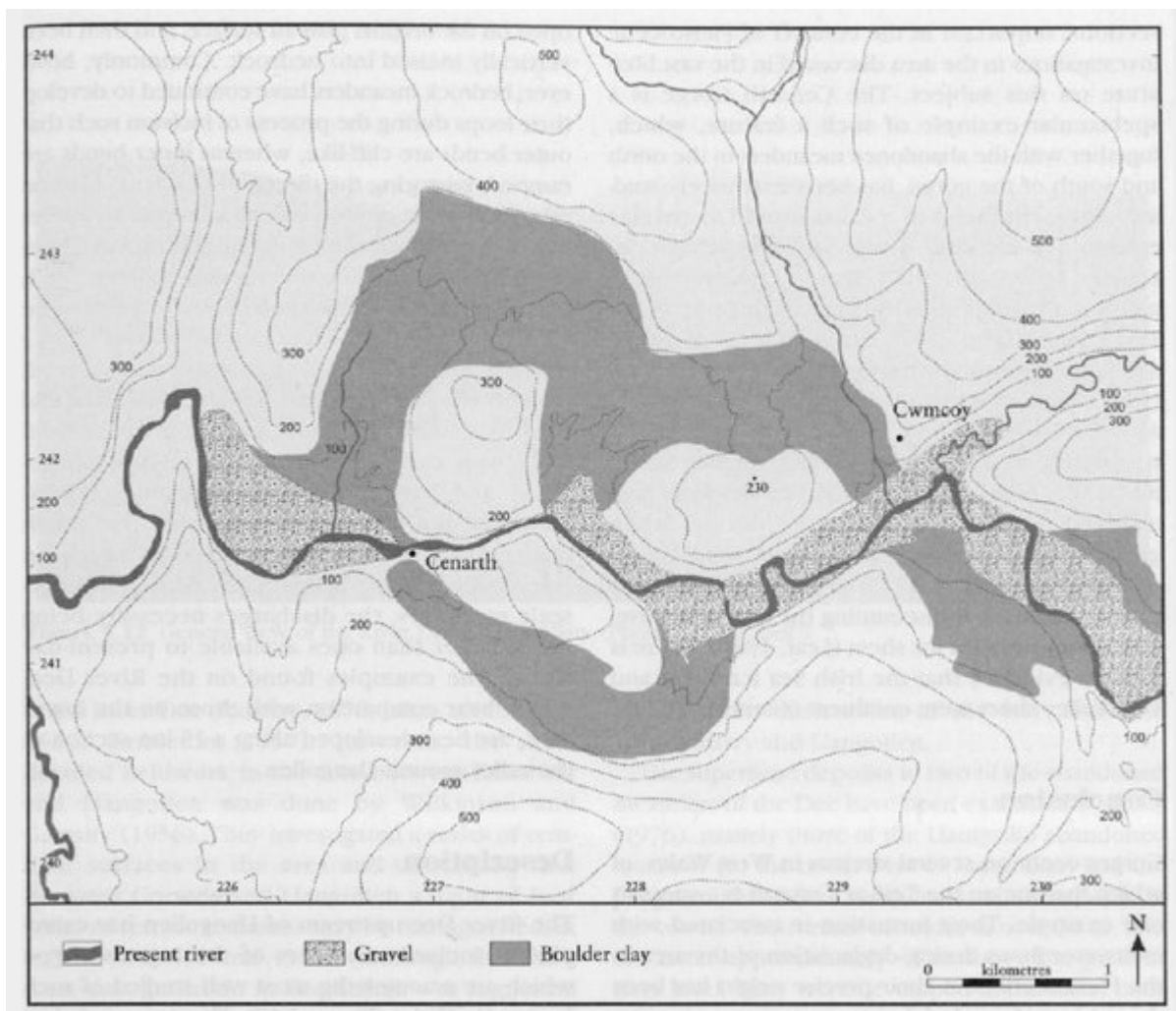
## **[References](#)**



(Figure 3.9) The lower Teifi Valley and the overflow channels of the Teifi lakes. (After O.T. Jones, 1965.) 1964).



*(Figure 3.10) A narrow incised section of the Afon Teifi. (Photo: S. Campbell.)*



(Figure 3.11) *The Afon Teifi: a geological map of the area around Cenarth. (After O.T. Jones, 1965.)*