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Stop 5: Main River – example for valley bottom development (W. SCHIRMER)

TK 25: 5832 Lichtenfels, R 44381, H 55582; 267 m a. s. l.

The Upper Main valley originates from the Middle Tertiary at least, when a primeval Main, the "Urmain" (KRUMBECK 1927) run from the water divide in the Thüringer Wald southward via Regnitz to the nowadays Donau basin. In the oldest Pleistocene it was captured by the Main at Bamberg to feed the Rhein. At about 1 m. y. ago fluvial erosion had already reached the base of the recent valley fill. It was followed by a late Lower to early Middle Pleistocene, at least 30 m thick accumulation that again has been cut by a mid-Middle Pleistocene terrace stair case down to the recent valley bottom. It was mainly tectonical activity that formed the rough valley structure up to that state. Since the late Middle Pleistocene, from the antepenultimate glacial period on, the Main river formed a gentle staircase, the slope toe terraces, which mediate between the valley slope and the valley bottom (see vol. 1, p. 486, Fig. 10). The terrace of the antepenultimate glaciation rises up to 15 m above the recent river level, that of the penultimate glaciation up to 5.5 m. The adjoining valley bottom reaches in the Maxiwürm Terrace (wu1) an elevation of 4 m above the river level. In contrast to the precedent terraces the slope toe terraces and valley bottom terraces are predominantly the result of climatic change.

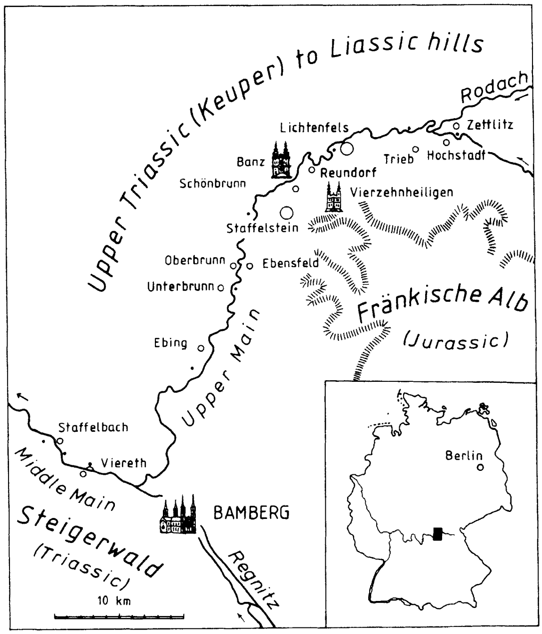

Fig. 12 Type localities of the Middle European late Quaternary terrace sequence

The area of the Upper Main and adjoining Middle Main River (Fig. 12) is the type area of a newly investigated system of valley bottom deposits (Fig. 13) placed since the Upper Würmian Period in central Europe. Here for the first time, the fluvial

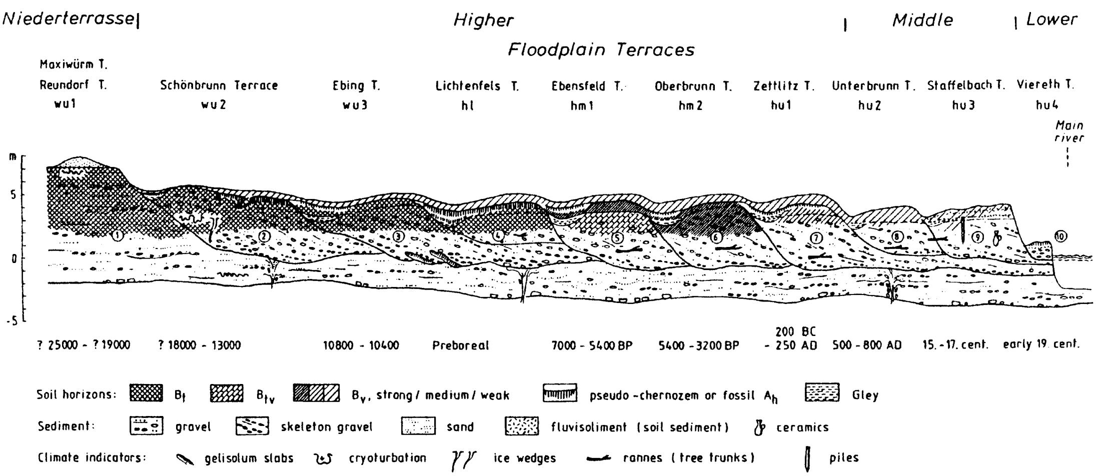

Fig. 13 Late Quaternary terrace sequence of the River Main

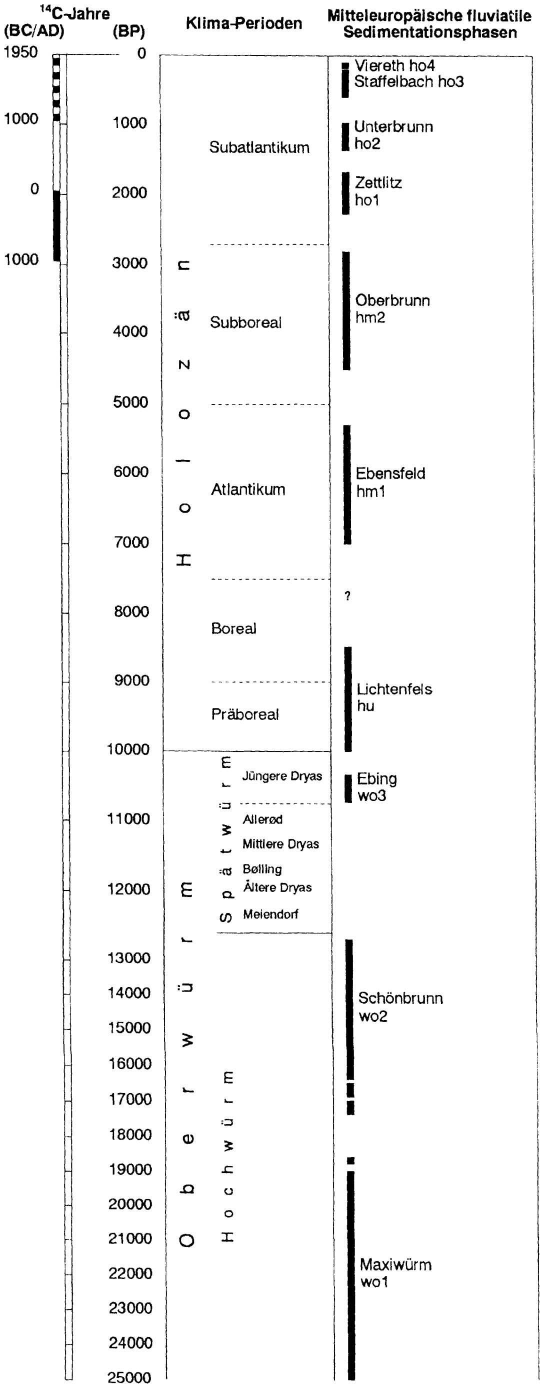

Fig. 14 Middle European fluviatile depositional phases

sediments of the valley bottom have been subdivided into three gravel bodies and terraces of Upper Würmian age and seven gravel bodies and terraces of Holocene age (SCHIRMER 1983a, 1988, 1991a). Meanwhile this ten-membered terrace sequence has been proved being regularly developed along many smaller and bigger rivers of central Europe (SCHIRMER 1983b, 1991c, 1994; see vol. 1, p. 514, Fig. 40).

On the river Main this terrace system is equipped with the richest amount of chronological, sedimentological and soil chemistry data among all investigated rivers. Due to occasional pumping out of the ground water the base line of all ten accumulations has been exhibited in gravel pits (Fig. 14). It gave proof of all terraces younger than the Maxiwürm Terrace (wu1) being filled in the wu1 terrace body. Consequently, the erosional base of the Central European Upland rivers remained higher than that of the early Upper Würmian. A next fill-in stage starts with the Unterbrunn phase (hu2) due to man's impact into the valley and its watershed: the river tends to braiding and flattening (SCHIRMER 1981: 206).

All ten terraces have been mapped extensively within the valley. Their age is determined by radiocarbon dates, dendrochronological dates (few thousands for the Ebensfeld up to the Unterbrunn Terrace), archaeological dates (some thousands within the Staffelbach and Viereth Terrace) and historical dates (for the Staffelbach and Viereth Terrace). Moreover, the assignment of a terrace to a certain phase is possible by its floodplain soil. The Main soil sequence ranges from calcaric regosol above rich fluvisoliment (flood sediment rich in reworked soil material) (hu4 Terrace) through a variety of increasing cambisol stages (hu3–hm2 Terrace) to a variety of luvisol stages (hm1–wu1 Terrace) with precedent fluvic phaezem (pseudochernozem) soils. The floodplain soils are the most essential indicators for the identification of a distinct terrace. Except for the younger terraces these floodplain soils mostly occur buried being covered by flood sediments of younger accumulation phases.

Climatic and human control of the accumulation phases

The coincidence of the ten accumulation phases on all Middle European rivers gives proof of their climatic control. They result from periodically increased flooding periods. Moreover they coincide with phases of Alpine glacier advance as far as the latter are known (SCHIRMER 1983a: 40, 1988: 33). However, man's influence is visible, too. In some valleys, as the Niederrhein, man's impact into the valley starts with the early Neolithic period by land clearence of loess areas, thus, evolving augmentation of flood deposits and smoothening of the valley relief since the Ebensfeld phase (SCHIRMER 1993). In the Upper Main valley man's influence becomes visible later, during the Zettlitz phase. Main features are: augmentation of flood sediment, rise of the erosional base since the Unterbrunn phase (on the Main, the Isar and Donau river this happens at the same time), and increase of the efficiency of gravel reworking (SCHIRMER 1988: 37, 1994).

River dynamics

In central Europe the Maxiwürm phase presents a V gravel with fresh load supply under periglacial conditions. The Schönbrunn and the Ebing phase present transitions between V and L gravels. The seven Holocene phases present L gravel caused by mere reworking of formerly deposited gravel (SCHIRMER 1983a, 1994). Thus, the change from braiding to meandering takes place during the Schönbrunn phase (SCHIRMER 1983a: 19) and revives locally during the Ebing phase (SCHIRMER 1994).

Incision happened between the Maxiwürm and the Schönbrunn phase as well as towards the end of the Schönbrunn aggradation. In the Alpine foreland due to higher water discharge and gradient the incision continued until the Zettlitz phase. By contrast in the central upland and lowland the erosional base was stable from the Schönbrunn or Ebing phase on. After the Zettlitz phase in all areas the erosional base rose due to man's clearence activity (destabilization of river banks, tendency to braiding) (SCHIRMER 1994).

Glacial-interglacial model

The Upper Würmian, representing the youngest part of a glaciation, devised three different terrace bodies. The Holocene, representing the earlier part of an interglacial, presents seven terrace bodies. However, the Holocene gravel volume is smaller than that of the Würmian. The Late Würmian dynamics resemble more that of the Holocene than the glacial one. Vertical aggradation (V gravel) takes place only under periglacial conditions. Beyond that, periodical reworking activity (L gravel) happens. Incision prevails in phases within the pleniglacial and towards its end, however it continues under proper conditions into the late glacial and even into the interglacial (Schirmer 1991b, 1991c, 1994).

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Middle and Upper Pleistocene hominid occupation in the Neuwied Basin (Rhineland)

(S. GAUDZINSKI, M. STREET & E. TURNER)

Stop 6: The Kärlich clay pit

Geographical situation

Kärlich is situated on the south-western edge of the Neuwied Basin. The Neuwied Basin is a region of tectonic subsidence and located in the centre of the Rhenish Massif. It is part of the large rift system which runs from the Rhône Valley through the Burgundy gates into the Upper Rhine Graben and the Lower Rhine Embayment. This rift system continues as part of the central graben of The Netherlands into the North Sea (Fig. 15).

The Upper Rhine Graben is bordered by the Vosges, the Palatinate forest and the Rheinhessen Plateau to the west and to the east by the Black Forest and the Odenwald forest. The Swabian and Franconian Alps form its southern boundary.

The Rhenish Massif occupies the central part of this area, and is drained by the Rhine and its tributaries, the Lahn and the Moselle. The Rhenish Massif is divided geographically into the Hunsrück and Taunus regions to the south and the Eifel and Westerwald regions to the north. Uplift of the Rhenish Massif since the Eocene has resulted in splitting of the peneplain into plates which vary in altitude. Plateau uplift and, at the same time, the sinking of the Lower Rhine Embayment led to heavy erosion of Tertiary and Quaternary deposits