Aspects of the Geology, Palaeontology and Archaeology of the Travertine sites of Weimar-Ehringsdorf (Thuringia, Central Europe)

D. Schäfer*, W.-D. Heinrich**, G. Böhme**, W. Steiner***

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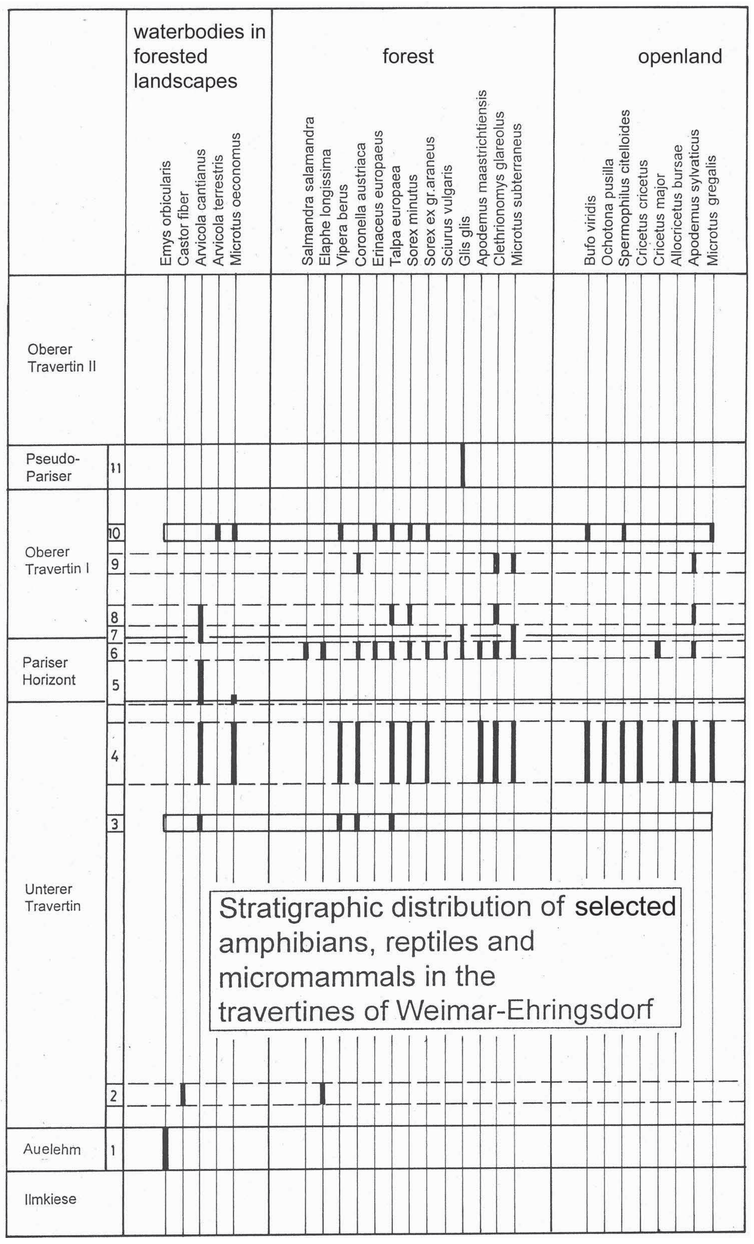


Palaeontology

Samples from the travertine deposits of Weimar-Ehringsdorf have produced a diverse assemblage of microvertebrates, including amphibia, reptiles and mammals. Much of the material was collected by washing and screening soft sediments. To obtain skeletal remains from the travertine, the samples were dissolved in acetic acid (approx. 5% by volume).
The lower part of the Lower Travertine yielded Emys orbicularis, Elaphe longissima and Castor fiber as well as interglacial mammals, including Elephas antiquus, Stephanorhinus kirchbergensis, Dama dama, Sus scrofa etc. (Kahlke ed. 1974, 1975) indicating a period, during which mixed decidous forests dominated the landscape. By contrast, a rich microvertebrate assemblage containing Vipera berus, Bufo viridis, Ochotona pusilla and Microtus gregalis collected from the upper part of the Lower Travertine points to cooler and more continental openland conditions. This conclusion is in accordance with the absence of Elephas antiquus and Stephanorhinus kirchbergensis and the occurrence of Stephanorhinus hemitoechus. Moreover, rodent (e.g., Arvicola cantianus) and reptile material (e.g., Vipera berus, Coronella austriaca) were recovered from from cavern infill sediments, but require further study. Arvicola cantianus (Heinrich 1987), Castor fiber (Kretzoi 1977, Heinrich 1991), and Stephanorhinus kirchbergensis (van der Made 2000), from the Lower Travertine, are distinctly more primitive than those from the travertine deposits of Taubach. This strongly indicates that the Lower Travertine from Weimar-Ehringsdorf is older than the Eemian travertine of Taubach. The occurrence of Equus chosaricus (Eisenmann 1991), Apodemus maastrichtiensis and the evolutionary level of Cyrnaonyx cf antiqua (Heinrich & Fejfar 1988) also suggests a pre-Eemian age for the Lower Travertine.

A microvertebrate assemblage with Elaphe longissima, Salamandra salamandra, Erinaceus europaeus, Sciurus vulgaris, Glis glis, etc., collected from deposits between the top of the Pariser Horizon and the base of the Upper Travertine, is of forest type, testifying to temperate (interglacial) conditions. The occurrence of Apodemus maastrichtiensis could indicate an interglacial older than the Eemian.

By contrast, micovertebrate assemblages from the lower part of the Upper Travertin 1 (sensu Soergel) are insufficiently known to permit precise reconstruction of environmental conditions. The rodent assemblage includes Apodemus sylvaticus, Cletherionomys glareolus and Microtus subterraneus, which could indicate temperate conditions, whereas Mammuthus primigenius and Coelodonta antiquitatis from the Upper Travertine 1 suggest that there may have been a deterioration of the climate. Unfortunately, the precise stratigraphic range of most large mammals within the Upper Travertine as well as the Lower Travertine is far from clear.
A land vertebrate assemblage (e.g., Bufo viridis, Spermophilus citelloides, Microtus gregalis) from colluvial chernozem deposits intercalated in the Upper Travertine is predominantly of open land type, testifying to open grassland and continental conditions. The composition of the assemblage and the evidence of an early Arvicola terrestris suggest that this land vertebrate fauna dates from the Early Weichselian.

Find levels for the Microvertebrates

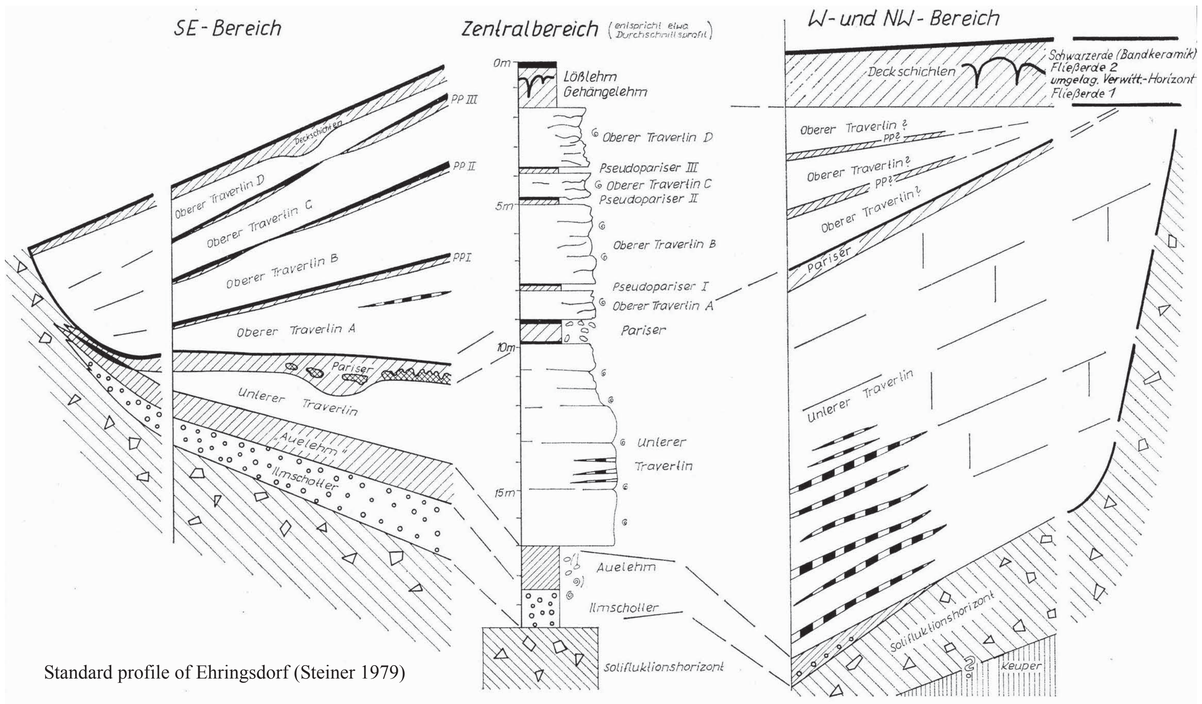
1 Flood loam,
2 Beaver Bed within the lower part of the Lower Travertin,
3 Cavern infillings intercalated in the upper part of the Lower Travertine (Alternative: sediment infilled in caverns of the upper part of the Lower Travertine,
4 Lower Travertin, approximately 1.0 - 3.5m below the basis of the Pariser Horizon,
5 Pariser Horizon, including humous silts and travertine sands at its base;
6 'Pariser Boden' between the top of the Pariser Horizon and the base of the Upper Travertine,
7 Boundary interval between the uppermost part of the Pariser Horizon and lowermost part of the Upper Travertine,
8 Travertine sand within the lowermost decimetres of the Upper Travertine,
9 Upper Travertine, about 1.0 m above the top of the Pariser Horizon,
10 Colluvial chernozem deposits intercalated in the Upper Travertine,
11 Pseudopariser Horizon.

Stratigraphy	Elephants	Rhinos	Horses	Cervids	Suids	Carnivores
Oberer Travertin 2		Stephano-rhinus hemi-toechus Stephano-rhinus hemi-toechus	(Equus sp., Upper Travertin, precise stratigraphic position within this unit unknown)	Cervus ela-phus, Mega-loceros gi-ganteus, Ca-preolus ca-preolus		(Ursus spelae-us, Ursus arctos ?, Canis lupus, Panthera spelaea, Mustela sp., Martes martes, Meles meles; Upper Travertin, precise stratigraphic position unknown)
Pseudopari-ser		Coelodonta antiquitatis ?				
Oberer Travertin 1	Mammuthus primigenius, Mammuthus trogontherii-primigenius	Coelodonta antiquitatis, Stephano-rhinus hemi-toechus		Cervus ela-phus, Megalo-ceros gigan-teus, Capreolus capreolus, Alces latifrons postremus, Rangifer ta-randus ?	Sus scrofa	
"Pariser Boden"			Capreolus capreolus		Sus scrofa	Martes martes, Ursus sp., Crocuta crocuta spelaea, Vulpes vulpes
Pariser Horizont	Mammuthus primigenius ?	Stephano-rhinus hemi-toechus	Megaloceros giganteus, Rangifer tarandus ?			Ursus sp.
Unterer Travertin	Elephas antiquus	Stephanorhi-nus hemitoe-chus Stephano-rhinus kirch-bergensis	Equus chosaricus Equus chosaricus	Alces lati-frons postre-mus, Mega-loceros giganteus, Cervus elaphus, Capreolus capreolus, Dama dama Megaloceros giganteus, Cervus ela-phus, Capreolus capreolus	Sus scrofa	Ursus spelae-us, Ursus arctos, Ursus thibetanus, Canis lupus, Vulpes vul-pes, Lynx lynx, Martes martes, Meles meles, Cyrnaonyx antiqua, Crocuta crocuta spe-laea
Auelehm		Coelodonta antiquitatis				
Ilmkiese	Mammuthus primigenius	Coelodonta antiquitatis				

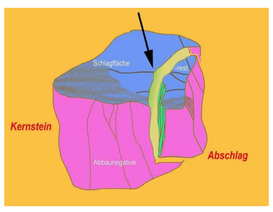
Geology

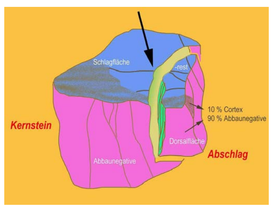
Weimar-Ehringsdorf, Opencast mining in the 1960s

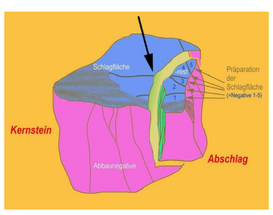
The classical geological profile of Weimar-Ehringsdorf (Lower Travertine, Pariser, Upper Travertine I and II divided by the Pseudopariser) is based primarily on the works of W. Soergel (e.g. 1940). The 'Standard profile' produced by this famous scientist was for a long time the fundamental basis for several campaigns of field work carried out also by other researchers. Indeed, the outcrops and quarries of earlier times in Ehringsdorf were rather restricted and did not allow a truly three-dimensional reconstruction of the travertine sedimentation processes, especially in spite of the inclusion of intervening strata (e.g. the number and character of Pseudopariser). Only during the very extended exposures (opencast mining) in the late 1960s/early 1970s was W. Steiner able to find more detailed stratigraphic structures: „*Contrary to SOERGEL's classification in the Upper Travertine (1926, 1940), at least in the south-east part of the Travertine field of Ehringsdorf the Upper Travertine must be divided into four horizons (Upper Travertine A to D) and the Pseudoparisians (PP 1 to 3) situated between them. A decisive factor are the bedding conditions. The individual travertine horizons of the Upper Travertine do not horizontally lie one upon the other, but are slantingly placed side by side like tiles at the glacial valley wall of the river Ilm. As a result, material was collected from the overlying horizons in individual exposures scattered over the entire travertine field in former times. As has now become known, the material was erroneously assigned to the two horizons Upper Travertine I and II according to SOERGEL, and finds from quite different horizons were mixed. Thus contradictions involved in the climatic and ecological interpretation of the material could now be eliminated*" (W. Steiner 1973, 528). Steiner's call for a three dimensional reconstruction of the entire travertine field of Ehringsdorf as a basis for the validity of the most important palaeontological finds has had no consequences until now. These are still restrictions in statements about some palaeontological elements (especially with ecologically conflicting requirements) within the Upper Travertine.



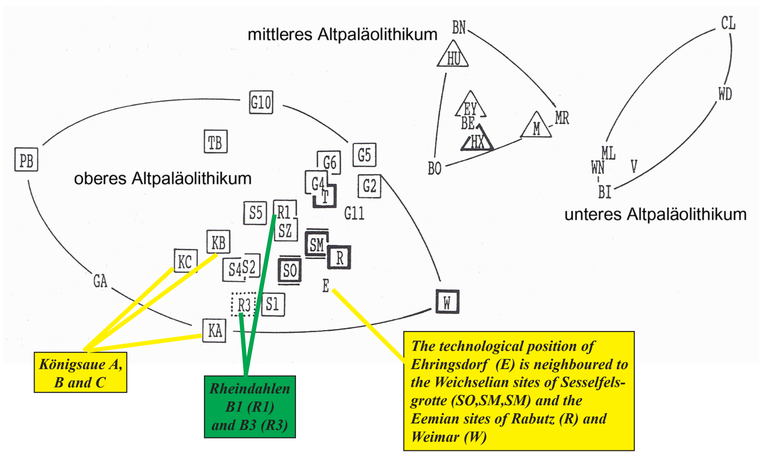
Standard profile of Ehringsdorf (Steiner 1979)







Flaking process and examples for technical attributes



Technological similarities of 39 Middle and Upper Pleistocene flake inventories: Multi-dimensional scaling MDS of 16 attributes of blank production (Schäfer 1993)

Archaeology

On the basis of an archaeological attribute system 900 stone artefacts (cores, flakes, tools) from Weimar-Ehringsdorf (Lower Travertine) were analysed in 1979/1980. The method considers technological attributes of blank production as well as attributes of the retouch process. Since that work more than 20.000 artefacts from more than 50 inventories of middle and young Pleistocene age in Europe could be added into the database. The task was to discover possible clusters of sites with similar attributes. Despite this type of approach the unretouched flakes showed the best discrimination independent of the typological character of the tool inventory. As a result three pre-Upper Palaeolithic technological units could be recognized on the basis of several methods (univariate and multivariate statistics; Schäfer 1993). They clearly show a chronological gradient. Here it makes sense to stress the statement that the chronological judgement for any inventory is based on facts independent of classical archaeological reasons, but rest upon geochronological, palaeontological and radiometric arguments. Only if the technological similarity/dissimilarity of well dated archaeological inventories is known can one also include those sites which are under discussion, in spite of their chronological status. On this basis we can recognize the very strong similarity of the artefacts of Weimar-Ehringsdorf with those of Eemian and early Weichselian age (e.g. Taubach, Rabutz, Königsaue etc.). As a consequence of the attribute analytical point of view we also argued for an Eemian age for the Lower Travertine of Ehringsdorf (Schäfer 1991). But if the chronological basis for integrated sites is changing one has to re-consider the results achieved from the former arguments. This is now the case for the artefacts from Mönchengladbach-Rheindahlen (Lower Rhine loess area), which are also very similar to the Ehringsdorf artefacts. The included strata (B3 and B1) were traditionally viewed in an Early Young Pleistocene context. Re-examination by the team of W. Schirmer (Schirmer 2002) has presented good arguments for a Middle Pleistocene age for this strata and therefore also for the included artefacts. The further confirmation of this result would be an additional argument to scrutinize chronological arguments within and between the attribute analytical based clusters of our sites. In this case it seems that time is not the only dimension within our site configuration.

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* Universität Innsbruck, Institut für Hochgebirgsforschung, Innrain 52, A-6020 Innsbruck ** Humboldt-Universität zu Berlin, Museum für Naturkunde, Institut für Paläontologie, D-10099 Berlin
*** Dichterweg 12, D-99425 Weimar