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**MESSEL-PIT – RESEARCH EXCAVATIONS
IN A WORLD HERITAGE MONUMENT**

Messel Pit is located about 9 km NE of the city of Darmstadt (Hessian State, S Germany). It is an ancient open-cast mining, in which oilshale was quarried until 1971. This oilshale originated from sludge deposits at the bottom of a freshwater lake. It was dated as lowermost Middle Eocene (Lower Geiseltalian; see Franzen & Haubold, 1986), with an accurate biostratigraphical classification as mammal unit MP 11 (Franzen & Haubold, 1985).

The locality is well-known as an Eldorado for palaeontologists, because of the rich mammal fauna which demonstrates the rather rapid radiation of this group since the beginning of the Tertiary (e.g., Franzen, 1990). There are opossum-like marsupials as well as the world-famous „Urpferdchen“ (Franzen, 1992; Koenigswald & Storch, 1992). Messel fossils are famous for their „soft tissue preservation“. Details of feathers and fur became outlined by petrified bacteria. Contents of the digestive tract also were preserved in a similar way (Wuttke, 1992).

Messel research started more than hundred years ago. However, there are still debates concerning the exact composition of the ancient environment and the fauna and flora still bears mysteries as well. But there are some certainties, at least (e.g., Schaal, 1992a; Schaarschmidt 1992): The oilshale is derived from deposits of a freshwater lake, which was embedded in a flat landscape. The climate was similar to the one of extant tropical or subtropical regions. The lake was stagnant most of the time. In the lowermost section of the water body there was a lack of oxygen; poisonous gas also accumulated here. The upper water layers turned green during seasonal algae blooms. Aquatic life was dominated by various fish, amphibians, crocodiles and turtles. Waterlilies covered the flat areas and aroids and reed-like plants grew in the silting up area. This was followed by a dense belt of bushes, a good shelter for small mammals. Further away, a paratropical timber forest began, which was home for the larger-sized mammals.

Messel excavations, Messel research and the presentation of Messel fossils are important duties of the Hessian State Museum. Since 1874, the oldest collection of Messel fossils, which is also one of the world's most important ones, was established here. Regular scientific excavations were undertaken since 1965. The present-day inventory comprises more than 16.000 fossils. Among them are many type specimens and also some rare materials from the close-by Prinz von Hessen fossil site, which is not accessible any longer.

On 12th December 1995, Messel Pit was declared a monument on the World Cultural and Natural Heritage List of the UNESCO, in which only two other fossil localities were

hitherto inscribed. This was the peak of a unique career (Schaal, 1992b): Messel Pit was originally endangered to become a central refuse deposition site, an idea which was conceived by the governing bodies of Hessian State since 1971. A respective planning decision was dropped in 1981 and in April 1987, green light was given to the completion of the pit as disposal. Tremendous efforts of private individuals, citizen's initiatives, scientists, scientific institutions, and a few politicians against these intentions succeeded in December 1987. A lawcourt's decision was dropped, which prohibited the inauguration of the refusal dump and cancelled the immediate execution of all respective plans. In June 1991, Messel Pit was purchased by Hessian State Government and in 1992, a contract was signed which settled the general framework for future palaeontological excavations. Hessian State Museum got a steady excavation permit as well as a seat and a vote in the Scientific Messel Committee, which was also established as a controlling organisation. Furthermore, it was decided that all future type specimens must be deposited at the Senckenberg Research Institute (Frankfurt) or at the Hessian State Museum.

Being „on the safe side“, there was the possibility and necessity to modify excavation methods and research plans. The era of emergency excavations was finished, the reconstruction of the ancient realm and ecosystem as well as of the genesis of the Lagerstätte became primary investigation accents, instead.

Since then, excavations in Messel Pit were obliged to obey certain rules and the results were steadily evaluated via a framework of control mechanisms and authorities. The fossil site must be preserved a historical monument, at first. It also must be preserved as a natural monument, as it became a highly characteristic biotope, inhabited by numerous rare animal and plant species, the meantime. Mining regulations must be kept to reduce the risk of surface damages, e.g., earth slides. Institutes carrying out Messel excavations were furthermore obliged to ascertain basic informations during fieldwork and to feed them into a standardised central data bank (Keller et al., 1991). In addition, they must carefully split and document a reference column for each excavation area.

Due to the new excavation prerequisites and research intentions, the excavation methods also must be modified. Large and thick oilshale blocks could not be excavated any longer. They mean a high rate of material turnover, which is not reconcilable with the aspects of preservation. The overall analysis of the fossil assemblage within such blocks furthermore bears high risks for misinterpretations because it results from an accumulation over hundreds or thousands of years. Instead, a detailed stratigraphical excavation method was applied, with a maximum care to determine the original positions of most discoveries. Thus, their relative age could be defined by means of their vertical distances from standard strata and their horizontal positions could be measured with reference to surface bench marks.

The modified excavation methods, of course, resulted in shifts concerning the fossil record: There was a decreased number of spectacular and large fossils and an increased number of small records, e.g., insects and plants. However, there also was a gain of various other informations/data, e.g., exactly documented air heave structures and micro bench marks in the sedimentary surface, which could be useful for the intended reconstructions.

Most important were the greatly improved options for statistic based analyses by merits of the central computer data bank. Peculiarities of certain excavation areas, e.g., area-



Fig. 1. Messel Pit as a natural monument: slopes with typical plant succession. (summer 1996).

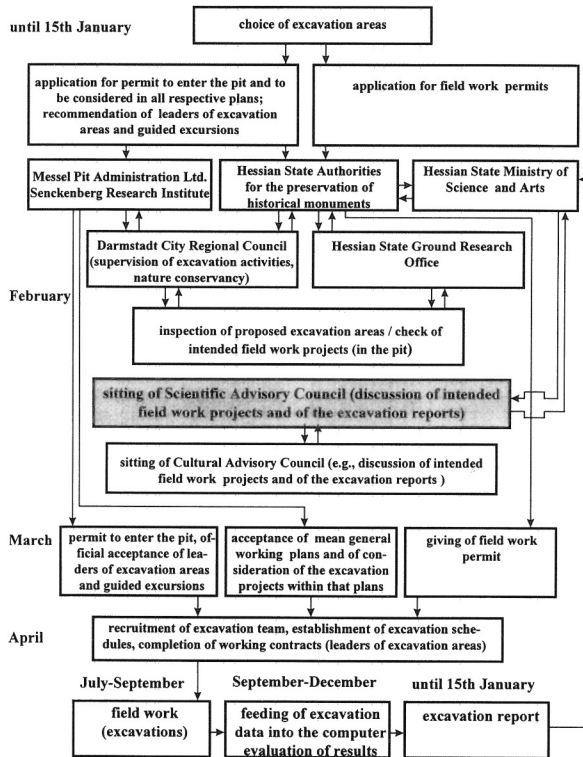


Fig. 2. Synopsis concerning the organisation, as well as the controlling and evaluation committees and mechanisms for present-day Messel excavations.

dependent differences concerning the vertical fossil distribution within the same strata, could be detected by selective filtering the data. Furthermore, these distributions could be analysed for selected taxa with respect to their presumed ecological peculiarities. Data transfer/exchange with other software products allowed a conversion of metrical measured horizontal distribution patterns into co-ordinates and orientation maxima could also be detected this way.

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