

LITERATURE REVIEWS

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A PICTURE WINDOW ON THE EOCENE

MESSEL: AN INSIGHT INTO THE HISTORY OF LIFE AND OF THE EARTH. Stephan Schaal and Willi Ziegler, editors. Monika Shaffer-Fehre, translator. 1992. Oxford: Clarendon Press. 322 p. Hardback, \$85.00

Reviewed by Harold G. Coffin, The Dalles, Oregon

The outstanding preservation of animals and plants in the Messel pit warrants a volume that can do justice in illustrating these organisms, and this volume meets that challenge. It is a landmark for magnificent illustrations, most of them in color. Although technical details are well-represented in this volume, its main audience is the educated layperson or scientists in general. The volume is a symposium with various scientists addressing their areas of expertise.

Messel (often described as a pit or lake) is the name for a Middle Eocene site near Darmstadt, Germany. Quarrying in the past for oil shales has left a shallow depression, spanning less than one kilometer. In recent years Messel has been used as a landfill, but fortunately, this is no longer allowed, and its paleontological value has become recognized. A great array of plants and animals — marine, freshwater, and terrestrial — was buried and exquisitely preserved. Messel is considered to have been a lake with at least occasional access to oceanic waters. Although in some areas the fossil fish show orientation, in general there is no evidence of strong currents. The prevailing view is that the lake bottom was anoxic (without oxygen) at least part of the time.

Well-preserved leaves of 65 species of plants have been identified. The leaves, fruits, pollen, etc., indicate a tropical to subtropical climate. Puzzling is the absence of larger plant structures such as trunks, roots, and limbs. A number of the species are now limited to tropical areas of

Africa, Asia, or South America. Examples are “Milfordia,” certain palms, fruits of Mistixiaceae, and certain pteridophytes. Caddis-fly larvae are abundant on certain fossil plant fragments such as lotus blossoms. Grape seeds were found in the stomach contents of a horse.

Insects are well-represented; in fact, the Messel pit is considered one of the best insect fossil sites of the world. Many of the beetles show their original colors. Giant ants with a wingspan of 126 mm, dung beetles, cockroaches (not common), crickets and stick insects, are represented. Many ants from several species have been found — all of them are, winged. Some insects are unusual, such as “Stylops,” a small parasitic wasp found protruding between segments of an ant — the oldest example of this type of parasite-host relationship.

These finds are evidence not only that in the Middle Eocene the same parasite-host relationship already existed as exists today, but simultaneously, that we must assign a far greater age than has been usual to the entire order Strepsiptera [maggot-like insect], because the Myrmecolacidae are evolutionarily the youngest family. In addition, both of these finds are good indicators of a tropical-subtropical climate during the epoch of the European Middle Eocene (p. 64).

The near absence of water insects, such as dragonflies and stoneflies, and the rarity of mosquitoes pose a challenge to the lake hypothesis.

All the fossil fish of Messel are “bony.” Bowfin-like types, gars, perch, and many other kinds are present, including the “oldest” record of a freshwater eel. Because eels migrate to the ocean and back, Lake Messel, if a reality, appears to have been connected to the sea. An anomaly is the absence of any fossil fish other than predators, indicating an incomplete food chain. I was struck by the many illustrations of fossil fish with mouths open.

Amphibians are rare, which is an odd situation if Messel was a freshwater lake, since many amphibians spend most of their lives in freshwater. Only one specimen of salamander and three species of frogs and toads are represented. One of the toads (spade-foot toad) shows spawn, but no fossil tadpoles have been found.

The “first” fossil turtles are from the Triassic, but are not that different from the Messel turtles and, for that matter, modern turtles:

In the terrestrial tortoises, for example, the digits are very much shortened; in freshwater or oceanic turtles they develop,

by elongation of the bony elements, into effective paddles. These characteristics have not changed essentially up to the present day and allow us to draw comparisons with extant chelonians [turtles, etc.] (p. 101).

Six genera of crocodiles, most specimens of small size, have been excavated. Different species of modern crocodiles seldom co-exist. The presence of several genera and species in one small area suggests these animals were transported from different biotopes to Lake Messel. Other reptiles also are important and abundant. Surprising aspects are the unusual armored lizards, limbless lizards, monitor-like lizards (considered modern and advanced), and the earliest documented fossil snake. Speaking of the limbless lizards the authors say:

The already very highly evolved adaptations of Messel limbless lizards (which represent a largely 'finished' construction no longer undergoing fundamental development) make the appearance and the evolutionary origin of the ancestors appear all the more mysterious (p. 123).

The Messel fossil birds are not much different from modern birds. Feathers are clearly seen on some of the fossils. Note this list of birds that have been collected through the years: falcons, ibises, seriemas, rails, flamingos, owls, swifts, and birds similar to ostrich, fowls, cranes, nightjars, rollers, woodpeckers, and others not well known. The birds suggest zoogeographical connections with North America, Africa, Asia, etc. The complete absence of true water birds at Messel is also incompatible with the lake model.

Many orders of mammals are represented. The only marsupials found are opossum-like. Concerning insectivores the following comment is made: "It appears remarkable to us that three mammalian species of such homogeneous and highly specialized type are able to share a habitat" (p. 164). Several hundred bats, including highly specialized forms, have been found. Even stomach contents, including one specimen that dined only on moths and butterflies, are identifiable. The suggestion is made that the sudden death of so many bats was the result of toxic gas over the water, but the absence of true water birds challenges that hypothesis. Four different primates, pangolins (scaly anteaters) and a South American anteater are oddities.

Speaking of carnivores at Messel, Springhorn says:

Among the mammals, there is a significant preponderance of finds that, according to their relaxed skeletal position and the degree of disintegration, must be regarded as having drowned (p. 231).

Odd- and even-toed ungulates (having hoofs) are well represented. In fact seventy specimens of horses (including foals and pregnant mares) make Messel a prime fossil site for “primitive” horses:

Initially it was believed that evolution progressed in a straight line that led from primitive forms, with five small hooves on each extremity, to the Recent single-hoofed representatives, but we know today that the development has not proceeded so simply. At all times there were ramifications when evolution, mosaic-like, sometimes progressed more slowly, while at other times or in other parts of the body it proceeded more quickly. Sometimes one complex of characters evolved, then another. Again and again lines became extinct...

...

If one could meet these small animals today [speaking of Eohippus=Hyracotherium], which ranged in size from that of a pekinese to that of a fox terrier, one would hardly recognize them as relatives of extant horses. On the front legs they still had four hooves, on the hind legs three each — in all 14 hooves! Legs and neck were still quite short and the back was still strongly curved, reminiscent of the extant duiker antelopes (p. 243).

Perhaps they should not be called horses! The even-toed ungulates from Messel are already much more differentiated than was originally assumed.

Do the Messel remains represent life, death and burial under normal conditions, or are they the result of catastrophic geologic activity such as would be expected by a global flood? Some of the features which suggest normal or near-normal conditions are:

1. The localized accumulations of fossilized remains in what looks like an ancient lake.
2. The presence of some insect larvae attached to plant remains. Could these have survived the Genesis Flood?

3. Some evidences suggesting that some organisms could not have been transported far.
4. Fossil fecal pellets.

On the other hand, note these factors that indicate unusual conditions or contradict the lake model for Messel.

1. Excellent preservation of most plant and animal remains indicates rapid sedimentation.
2. The absence of remains expected in a small lake environment, such as herbivorous fish, roots, stems, and branches of trees and shrubs, water plants (except for water lilies), water insects (some exceptions), amphibians (rare exceptions), and true water birds.
3. The presence of some species now with limited distribution in tropical Africa, South America, Asia, or other areas far removed from Messel.
4. The presence of sea animals that require oceanic access to Lake Messel. Periodic opening and closing of the lake to ocean access without the lake being destroyed seems unlikely.
5. The relaxed position of many of the birds and mammals strongly suggests death by drowning rather than death under normal conditions.
6. Tropical to subtropical climate indicated by the fauna and flora.

Little mention is made of the elevational or stratigraphic positions of the various categories of plant and animal fossils. One might suspect that both flood and early post-flood activity is involved in Messel — perhaps late-flood deposits in the lower part and early post-flood in the upper layers — but further information and research are needed to clarify this suggestion. At any rate, the statement below, made by one of the authors, is apropos:

One of the most difficult problems of the Messel research, as always, still proves to be the construction of a valid model of Lake Messel itself (p. 66).

I recommend this volume for anyone interested in paleontology.