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ELECTRON MICROSCOPY OF MESOZOIC MEGASPORES FROM DENMARK

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ABSTRACT

Kempf, E. K. (Dept. Geol. Univ. Cologne, W. Germany.) *Electron microscopy of Mesozoic megaspores from Denmark.*

Grana 11: 151–163, 1971.—Ultra-thin sections of the megaspores *Banksisporites pinguis* (Harris, 1935) Dettmann, 1961 from the Upper Keuper, *Nathorstisporites hopliticus* Jung, 1958 from the Lias, as well as *Margaritatisporites turbanaeformis* (Harris, 1961) n.comb., *Horstisporites kendalli* (Harris, 1961) n.comb. and *Istisporites murrayi* (Harris, 1961) n.comb. from the Dogger of Denmark were studied by transmission electron microscopy. In all of these megaspores two different sporoderm layers are preserved in the fossil state. The inner layer (exine) is very thin (0.3–2.0 μm) and reveals a lamellated structure formed by sporonine plates or bands. The outer layer (perine) is thicker by far (10–70 μm) and shows different kinds of fine structure formed by sporonine threads. In addition to the sculptural details of the spore surfaces the sporoderm fine structure represents valuable taxonomic characters. Microspores were ultra-thin sectioned together with the megaspores of *Margaritatisporites turbanaeformis* and *Nathorstisporites hopliticus*. There is some evidence that, in both cases, megaspore and microspore are derived from the same species. As a general trend the ratio of perine to exine thickness in the sporoderms of megaspores decreases with ascending level of plant evolution.

INTRODUCTION

During the last years several investigations have demonstrated that the study of fossil and modern megaspores by transmission electron microscopy reveals new and valuable data (Pettitt, 1966; Kempf, 1969 *a*, 1969 *b*, 1970, 1971 *a* and *b*; Jux & Kempf 1971). These studies are useful for comparing and defining different megaspore types and also for producing new ideas on taxonomic relationships.

For the most part the microstructures are very well preserved. In some cases in which, following standard micropalaeontological or palynological techniques, oxidation with H_2O_2 or Schulze's solution ($KClO_3 + HNO_3$) had been carried out, the sporoderms were damaged to a certain extent.

Fossil megaspores require the following treatment: (1) most careful separation of the fossils from the embedding sediments, if possible without making use of oxidizing chemicals, in order to prevent damage; (2) study of sculptural features by reflected light or by the scanning electron microscope. It is then of the utmost importance that the surfaces be as clean as possible; (3) study of structural details in ultra-thin sections by the transmission electron microscope.

The results so gained provide sufficient knowledge of the characteristics of a megaspore.

The study of unsectioned megaspores by transmitted light should be avoided, when an oxidation process is necessary. The different, and not quite reproducable, maceration states which are obtained cannot be compared with each other.

The same treatment should be used for microspores.

MATERIALS

The megaspores *Banksisporites pinguis* and *Nathorstisporites hopliticus* were found in Rhaetic and Liassic sediments from the boring Rødby 1 and sent to me by Dr F. Bertelsen, who described these megaspores (Bertelsen & Michelsen, 1970), for investigations by the transmission electron microscope. The megaspores *Margaritatisporites turbanaeformis, Horstisporites kendalli* and *Istisporites murrayi* were picked out, by me, from the residues of samples, which were collected in 1967 during a field excursion of the Department of Geology, The University of Cologne, by my