POLLEN GRAINS OF ANGIOSPERMS IN THE CENOMANIAN PERUC FORMATION IN BOHEMIA

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ABSTRACT

Pollen grains of angiosperms found in the Cenomanian Peruc Beds in Bohemia belong to several morphological groups and represent the terrestrial, paludal and aquatic plants. They involve both the monocotyledon (Monoporopollenites, Monocolpopollenites) and dicotyledon (Tricolpopollenites, Tricolporopollenites, Triporopollenites, Polyporopollenites, Normapolles) trees and herbs. The pollen spectrum, however, is characterized by smooth and sculptured tricolpate and tricolporate pollen grains whose percentage greatly prevails. In the lower layers of the Peruc Beds there are mainly small (10-18 μ) tricolpate and tricolporate forms, the larger forms appearing in the upper part of the complex. Changes in the composition of spectrum are observable already during the sedimentation of the 25 m thick formation. Therefore, it cannot yet be excluded whether the lower part of the Peruc Beds does not fall still in the Albian. Most recent investigation has shown that the development of the progressive angiosperm element, termed by Pflug "Normapolles", which prevails in and is characteristic of the pollen spectrum of the Upper Cretaceous, started in the Cenomanian. In the Peruc Beds primitive forms of this group appear sporadically but quite regularly, and from the top layers a representative showing a more advanced morphology has been recovered. The discrepancies in the results of macropalaeobotanical and palynological investigations led the authoress to the revision of some classic macropalaeobotanical studies (by HEER, VELENOVSKÝ, VINIKLÁŘ, BAYER). By the example of the fossil genus "Eucalyptus Heer", whose identity with the modern genus Eucalyptus has been disproved (B. PACLTOVÁ, 1962), she has shown that it is advisable to revise some earlier determinations by means of modern integrated methods, now available.

INTRODUCTION

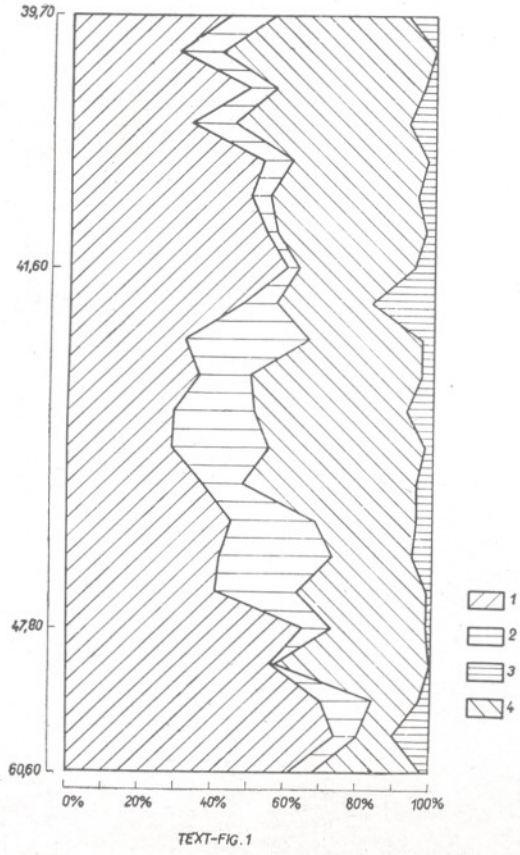
SOME layers of the Cenomanian Peruc Formation yield macroscopic plant remains, which towards the end of the last and at the beginning of this century were studied by eminent paleobotanists, viz. O. Heer, J. Velenovsky, L. Viniklář and E. Bayer. The discrepancies in the results of palynological and macropaleobotanical investigations led the present author (PACLTOVA', 1961) to the revision of leaf impressions assigned by the above-mentioned authors to the genus *Eucalyptus* Heer. The re-investigation did not bear out that the fossil "*Eucalyptus*" was identical with the modern genus *Eucalyptus*. Further research was directed at palynological study of samples from the classical localities in the Peruc Formation. The first report on general palynological investigation was published by Thiergart (1953). Recently, the samples from deep boring Ln-1 carried down through the whole thickness of the Peruc Formation (near Louny) have been worked out. This report deals with the results of this palynological research, with special respect to the pollen of angiosperms.

POLLEN GRAINS OF ANGIOSPERMS

In the average pollen spectrum of the entire Peruc Formation there are 35·74 per cent pollen grains of Angiosperms, 46·84 per cent spores of Bryophyta and Pteridophyta and 13·27 per cent pollen grains of Gymnosperms. The separately evaluated monocolpate pollen average 4·21 per cent of the total spectrum (TEXT-FIG. 2). As is seen in Text-fig. 1, the percentage of Angiosperm pollen increases in the upward sequence. The composition of the pollen spectrum depends on the lithological facies of sediments.

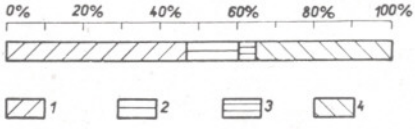
The pollen assemblage of the Peruc Formation is characterized by tricolpate and tricolporate pollen grains with smooth, sculptured and structured exine (PL. 1, FIGS. 9-17). Monocolpate grains are relatively frequent and occur in several morphologically different forms. They can belong to monocotyledons or dicotyledons (e.g. Magnoliaceae), but also to Cycadaceae, Bennettiteae and some of the Gymnosperms (Ginkgoaceae). In some samples there are small spherical pollen grains with a finely spinose structure with or without apertures. It is likely that they belonged to water plants (PL. 1, FIGS. 1-6).

In these years, the writer has established that in the Peruc Formation occur sporadically but regularly primitive representatives of the group *Normapolles*, whose presence



TEXT-FIG. 1 — Graphic representation of frequencies of 1. Bryophyta and Pteridophyta, 2. Gymnospermae, 3. Monocolpopollenites, 4. Angiospermae in the Cenomanian Peruc Formation from boring Ln-1, near Louny, NW Bohemia.

has so far been unknown in this complex. In Germany (KRUTZSCH, 1963) and southern France (THIERGART, 1954) they have not been found in the complexes of analogous age either. Most frequent are representatives of the genus *Latipollis* Krutzsch (PL. 2, FIGS. 2-33 and PL. 3, FIGS. 38-41) and several others belonging to the so far non-described



TEXT-FIG. 2 — Graphic representation of the average pollen spectrum from the Peruc Formation, boring Ln-1.

genera and species from the group *Normapolles* Pflug (PL. 2, FIGS. 21-23, 34-37 and PL. 3, FIG. 42). They are obviously the oldest and therefore morphologically relatively primitive members of this sporomorph group. It is apparent that the flora represented by this pollen was a very progressive element in the Upper Cretaceous, particularly in the Senonian, when it reached the maximum development.

DISCUSSION

Palynological investigation of the Upper Cretaceous is still in the initial stage, even though a number of works dealing with this problem have already been published. From the existing palynological studies carried out in several areas of the northern hemisphere it follows that the research should be aimed at the following tasks: 1. To describe and figure precisely the established sporomorphs, 2. determine the index types common to all localities on the one hand, and the types distinctive of a certain geobotanical province, on the other, 3. within the scope of international co-operation to correlate the Upper Cretaceous formations of the northern hemisphere. This would demand, of course, to study this question also from the paleoclimatic and paleogeographic points of view.

Only in this way it will be possible to remove the existing contradictions in the results of palynological investigation of Cenomanian formations in different European countries. Thus, for instance, pollen of the group *Normapolles* is commonly recorded from the Cenomanian in the U.S.S.R. (BOLKHOVITINA, 1953; Authors' collective, ed. I. M. POKROVSKA and N. K. STELMAK 1960 *et al.*). Groot & Groot (1963) report them from the Cenomanian of Portugal (thanks to W. Krutzsch I had their specimens at my disposal). From the drawn illustrations by Soviet authors, as well as from the Groots' data it follows that the *Normapolles* pollen referred to is not only morphologically more complicated, but also shows a greater variety in genera and species and a substantially higher frequency than that of the Bohemian Peruc Formation, where it is found but sporadically. Thus, it is a question, whether the fresh-water Cenomanian Peruc Formation is not relatively older than the Cenomanian complexes in Portugal or in the U.S.S.R. subjected to

palynological research. It may possibly be the case of the Cenomanian in southern France and in German "Niederschonaer Schichten". This question, which has already been mentioned by Krutzsch (1963), must also be studied, however, from the paleoclimatic and paleogeographic points of view.

CONCLUSION

Further palynological investigation of this interval of the Cretaceous, which is evidently very important for the evolution of Angiosperms, will, no doubt, give answers to some of the above-discussed questions and throw more light upon the intricate problems of the development of Angiosperms. There is, however, an urgent need to check by means of modern methods the results of earlier studies interpreted in rather too actualistic terms. Their authors endeavoured to arrange all impressions of Cretaceous plants into the present-day system, but palynological studies show that most Cretaceous Angiosperms became extinct in the course of geological eras.

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EXPLANATION OF PLATES

Plate 1

(*Magnification* × 1000)

1-3. Type A; Bore Ln-1 Louny — 284/4 /22, 4/90, 0/

4-6. Type B; Bore Ln-1 Louny — 297/4 /8, 2/82 9/.

7-8. *Polyporopollenites* Type C; Bore Ln-1 Louny — 283/5 /7, 3/74, 2/.

9-11. *Tricolpopollenites* Type D; Bore Ln-1 Louny — 281/4 /13, 0/83, 6/.

12-14. *Tricolporopollenites* Type E; Bore Ln-1 Louny — 289/4 /14, 0/72, 1/.

15-17. *Tricolporopollenites* Type F; Bore Ln-1 Louny — 284/4 /9, 2/86, 2/.

18-20. *Tricolporopollenites* Polar view Type G; Bore Ln-1 Louny — 295/4 /19, 8/14, 3/.

Plate 2

(*Magnification* × 1000)

21-23. Type H; Bore Ln-1 Louny — 297/1 /9, 3/75, 9/.

24-26. *Tenerina* Krutzsch Type I; Bore Ln-1 Louny — 303/3 /19, 3/74, 9/.

27-29. *Latipollis* Krutzsch Type K; Bore Ln-1 Louny — 280/1 /12, 3/84, 6/.

30-33. *Latipollis* Krutzsch Type L; Bore Ln-1 Louny — 280/1 /13, 6/85, 8/.

34-37. *Complexiopollis* Type M; Bore Ln-1 Louny — 286/5 /8, 5/73, 1/.

Plate 3

(*Magnification* × 3000)

38, 39. *Latipollis* Krutzsch Type L; Bore Ln-1 Louny — 280/1 /13, 6/85, 8/.

40, 41. *Tenerina* Krutzsch Type I; Bore Ln-1 Louny — 303/3 /19, 3/74, 9/.

42. *Complexiopollis* Type M; Bore Ln-1 Louny — 286/5 /8, 5/73, 1/.


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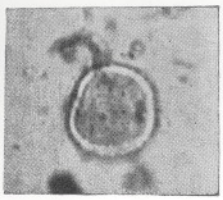
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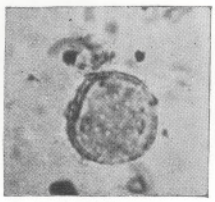
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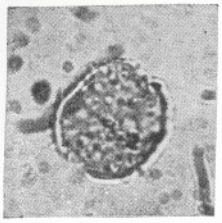
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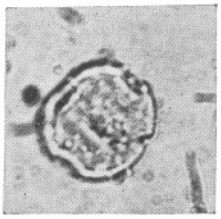
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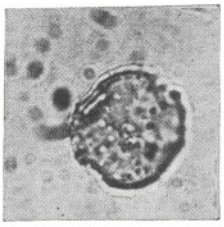
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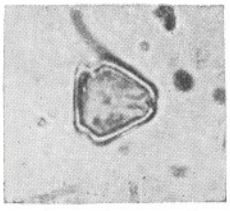
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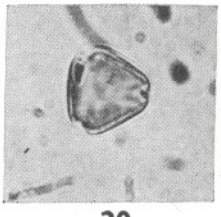
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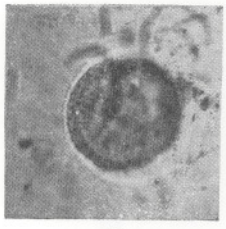
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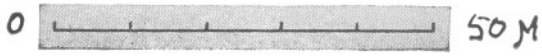

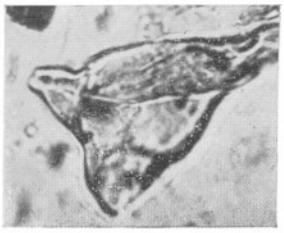

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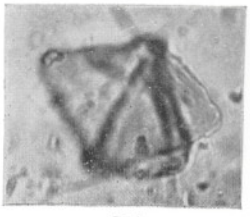

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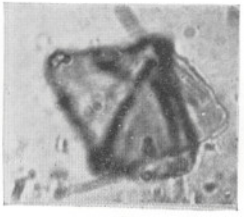

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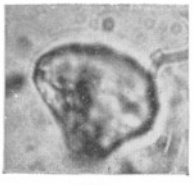

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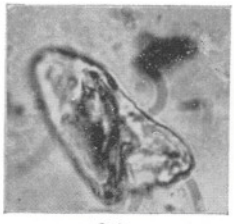

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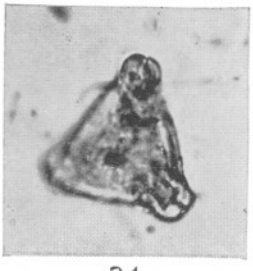

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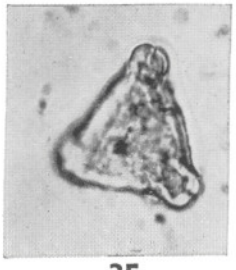

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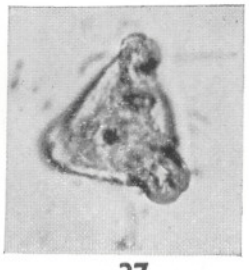

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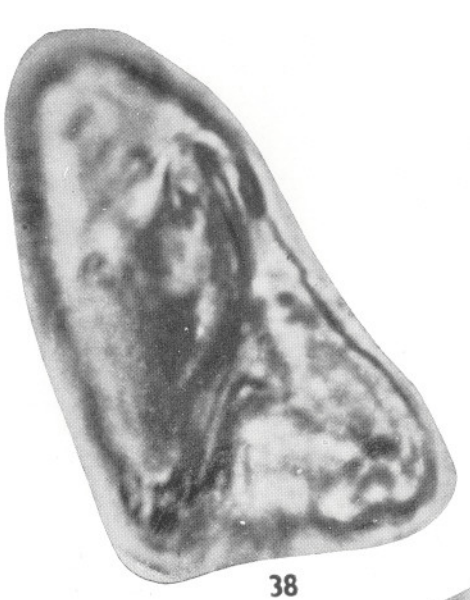

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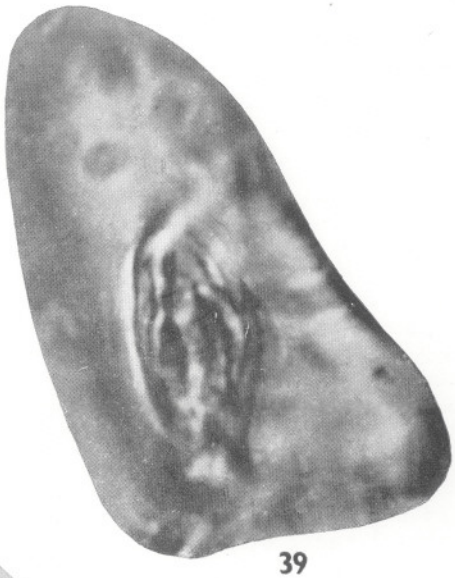

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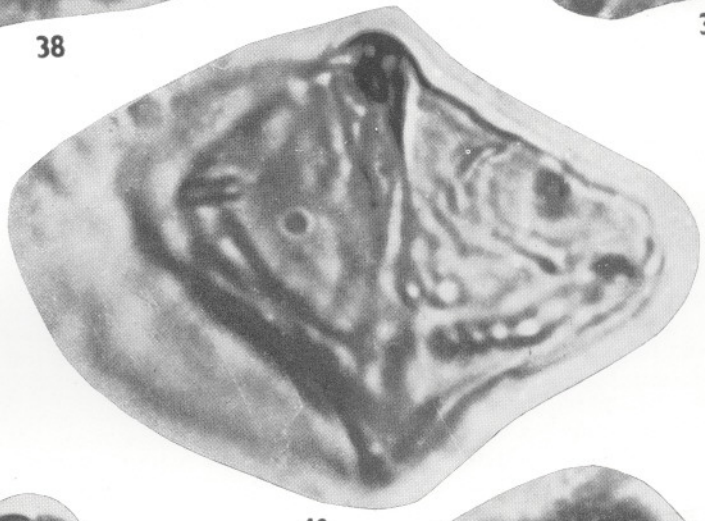

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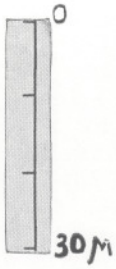

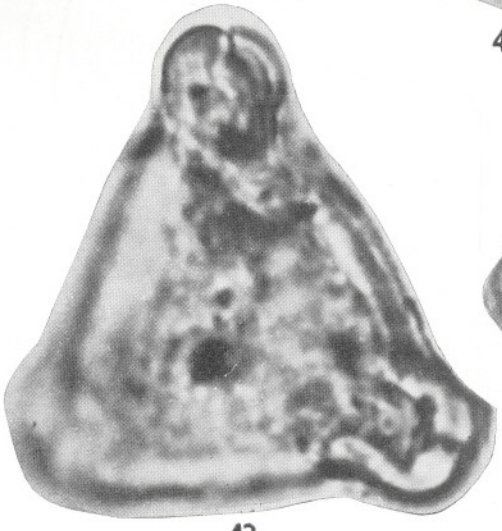

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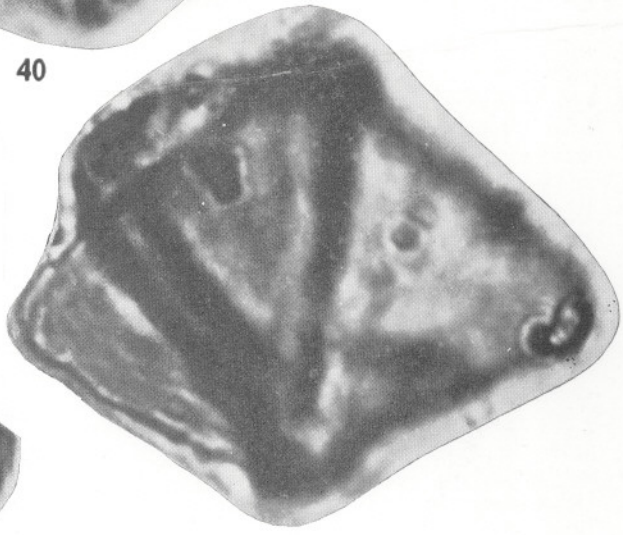

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