THE PALYNOLOGICAL INVESTIGATION OF CARBONIFEROUS COAL MEASURES IN THE AMASRA BASIN

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INTRODUCTION

In the field of modern coal geology and paleontology systematic studies of isolated fossil spores constitute a relatively new phase of paleobotanical research.

In this paper the content of the Megaspores in the paleophytogenetic material has been investigated. All the coal samples of this study were collected from the coal borings executed by the M. T. A. Institute in the Amasra district dining the year 1959-1960. For the maceration of the Amasra coal samples Schultze's and Zetzsche's methods were applied. Our new Megaspore species described here are based on morphological study. These species are referred to spore genera as defined by Potonie and Kremp (1954) and Bhardwaj (1955). As a result of this palynological study one new genus and 14 new species have been discovered, described and stratigraphically evaluated.

SYSTEMATIC DESCRIPTION OF GENERA AND SPECIES

Laevigatisporites triglandiferus n. sp.
Pl. I, Figs. 1, 2; holotype Fig. 1

Description. — Spores are radial, trilete, circular, oval or roundly triangular in transverse plane, and vertically compressed. Holotype measures 54 x 62 microns, triradiate ridges 1/2 the length of the spore radius, half - cylindrical in shape; at the apex each radius strongly swollen and «knop-like» in appearance. One ray is usually longer than the other two, the difference being as much as 60 microns in an extreme case. Arcuate ridges and contact areas are not clearly distinguishable. Extrema lineamenta and the surface of the spore coat levigate; every ornamentation is lacking. Exine smooth, black and 25-30 microns thick.

Comparison. — This new species most resembles *Laevigatisporites primus* (Wicher) Pot. and Kr., but evidently differs from it by structure of the trilete mark.

Locality. — Amasra, Boring No. 35, 750 m in depth.

Occurrence. — Westphalian very rare.

Colisporites coniferus n. sp.
Pl. I, Fig. 3

Description. — The similarity in the ornamentation and shape in *Colisporites* and *Tuberculatisporites* suggests phylogenetic nearness of the two genera. The shape of the spore is roundly triangular, compressed in lateral direction. Holotype measures 1118 x 1248 microns. Triradiate ridges very conspicuous, coarse, 546 microns long, 80-100 microns wide and 30-40 microns high. Whole spore coat, excluding the contact area, is densely covered with sharp-pointed coni; they are 100 microns in length and 60 microns in breadth; the smallest coni measuring 30 microns and arranged towards the interior. The contact faces are free of coni and contain trilete rays that reach to the equatorial portion; the thickness of the spore coat is approximately 50-60 microns.

Comparison. — In some respects *Colisporites coniferus* resembles *Colisporites bulbosus* (Horst, 1943) Pot. and Kr., and *Colisporites olgae* Pot. and Kr.; it differs from these two species by absence of coni at the contact faces and by straight triradiate ridges.

Locality. — Amasra, Boring No. 33, 800 m in depth.

Occurrence. — Westphalian B; of this species only one specimen has been found, but its conservation is excellent.

Triletisporites distinctus n. sp.
Pl. II, III; Figs. 4, 5; holotype Fig. 5

Description. — Spores are radial trilete, oval to roundly triangular in transverse plane, have a smooth to strongly wavy cingulum, with 30 to 50 microns overlap; they are compressed in dorso-ventral or oblique direction. Holotype measures 1820 X 1970 microns. The cingulum is from 156 to 175 microns wide and wavy. Ray ends extend into small auriculae which together with the flattened arcuate ridges build narrow cingulum, 1040 microns long, 20-25 microns wide and 200-210 microns high. Contact areas smooth and levigate, the structure of the distal area is corrugate and consists of randomly winding ridges, 20-30 microns wide, 30-40 microns high. Exine black, shiny and approximately 40-50 microns thick.

Comparison. — This species resembles *Triletisporites (Triletes) tuberculatus* (Zerndt) Pot. and Kr., but differs from it in having a corrugate structure.

Locality. — Amasra, Boring No. 34, 445 m in depth.

Occurrence. — Westphalian D; rarely encountered.

Valvisisporites corrugatus n. sp.
Pl. IV, Figs. 6-11, holotype Fig. 6

Description. — Spores are radial, tri-lobate, roundly triangular in transverse plane and have a wavy cingulum with a 150 microns overlap. Compressed in dorso-ventral or in lateral direction. Holotype measures 884 x 936 microns. Cingulum distinctly recognizable in obliquely as well as equatorially flattened spores. The auriculae, in polar view, are small and tortuous. Triradiate ridges conspicuous, slightly plicate and reach the base of the auriculae, 78 microns high,

10 microns wide. Exine is corrugate on the proximal as well as on the distal sides, which is evidently due to a negative reticulum. The spore coat is 25 microns thick, shiny, black-colored.

Comparison. — This species most resembles *Valvisisporites (Triletes) auritus* (Zerndt) Pot. and Kr., 1954, but differs in structure which is finely corrugate on both proximal and distal surfaces.

Locality. — Amasra, Boring No. 34, 445 m in depth.

Occurrence. — Westphalian D; only a few specimens were found.

Cystosporites perficioreticulatus n. sp.

Pl. V, Fig. 14

Description. The shape of the megaspore is elongate oval, with slightly truncated outline in transverse plane, and much flattened. Exirema lineamenta of the spore coat is finely reticulate with lacunae varying in size between 78 microns to 156 microns. The lacunae are separated by interlacunar ridges (muri) or crests, each murus 20 microns high and 3 microns broad and folded over sideways by compression. Trilete mark not observed. Exine light-brown, semi-translucent, except interlacunar ridges 10 microns thick.

Locality. — Amasra, Boring No. 35.

Occurrence. — Westphalian C; very rare.

Cystosporites defessus n. sp.

Pl. V, Figs. 12. 13; holotype Fig. 12

Description.—The shape of the megaspores is elongate oval with slightly truncated outline in transverse plane, compressed in vertical or oblique direction. Holotype measures 806x1144 microns. Arcuate ridges and suture lines not observed. Ornamentation of the spore coat is faintly reticulate with lacunae varying in size (70x100 microns). The muri are 2.6 microns thick. The spore coat is divisible into two definite zones: (1) the outer membranous transparent «wing-like outgrowth of the exospore», and (2) the inner thick, dark-orange, transparent to opaque membranous structure. Exine orange, smooth and thin, secondary folds few.

Comparison. — This species most resembles *Cystosporites indicus* Trivedi, but differs from it by the structure of reticulation.

Locality.—Amasra, Boring No. 33, 882 m in depth.

Occurrence. — Westphalian B; very rare.

Endosporites observatus n. sp.

Pl. V, Fig. 15

Description. — Spore is triangular, with slightly convex sides and broadly rounded angles in transverse plane. Diameter in the flattened spore, including the wing, 208x286 microns. Triradiate ridges 104 microns long, 10 microns high and folded over sideways by compression. In this species central body optically is

divisible in two definite zones: (1) the outer membranous, transparent, and (2) the inner thick, dark-orange, semi-translucent; the structure of the spore coat, except the central portion, is membranous and about 2 microns: thick.

Comparison. — This species resembles *Endosporites (?) radiatus* (İbrahim), type 49, Zerndt in size and in outline, but differs from it by the arcuate thickening of the central body.

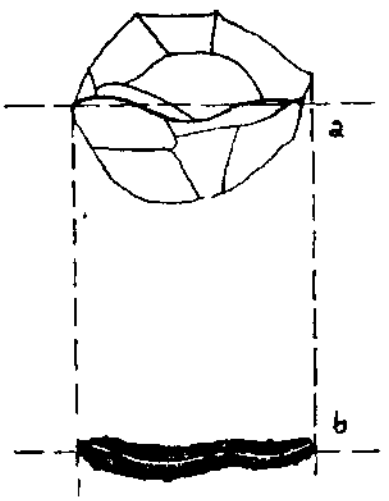
Locality. — Amasra, Boring No. 35, 849 m in depth.

Occurrence. — Westphalian B; only one specimen was found.

Division *PRAECOLPATES* POT. and KR.

İbrahimipollenites n. gen.

Generic description. — Microspores (pollen grains) are monolete, round to oval in transverse plane. In the genotype the monolete mark almost equal to the radius of the body. Labra not well developed and not bifurcated. Extrema lineamenta of the body is reticulate with lacunae varying in size. The presently-known size range is from 234 to 312 microns in (he longest diameter.



Diagrammatic drawing of *İbrahimipollenites* n. gen; *a*, equatorial (transverse) plane; *b*, axial (longitudinal) plane. × 100.

İbrahimipollenites lacunosus n. sp.

Pl. V, Figs. 16-18; holotype Fig. 18

Description.— Microspores (pollen grains) are monolete, round to oval in transverse plane. The holotype measures 260 x 312 microns. Extrema lineamenta of the body is reticulate with lacunae varying in size between 52 - 104 microns on the holotype. Interlacunar ridges (muri) are from 3 to 5 microns thick. Monolete mark with slight deviation, distinct and reaching to the periphery of the body. Labra thin and not bifurcated. Suture is narrow but distinct. Microspore coat—exclusive the muri—is 15 microns thick and black-colored.

Locality. — Amasra, Boring No. 35, 603 m in depth.

Occurrence. — Upper Westphalian C; only a few specimens were found.

Schopfipollenites baykali [1] n. sp.

Description. -— Microspores (pollen grains) are bilateral, monolete, roundly oval in transverse plane, have a smooth encircling ridge with 15-20 microns overlap. The holotype measures 260 x 312 microns. Monolete mark 182 microns in length. Lips (labra) are clearly developed, ends bifurcated. Suture line distinct and closed. Encircling ridges clearly distinct. The body has two types of ornamentation: (1) the proximal area of body rough due to thickly set verrucae, which are low,

[1] This new species has been named in honor of my teacher Prof. Dr. F. Baykal.

2-3 microns in diameter; (2) the distal area of body is obervermiculate. Exine bright, black, opaque, 20 microns thick.

Locality.—-Amasra, Boring No. 34, 463 m in depth.

Occurrence. — Lower Westphalian D; only two specimens were found.

Schopfipollenites subtilirugosus n. sp.
Pl. **VI,** Figs. 20, 21; holotype Fig. 20

Description. — Microspores (pollen grains) are bilateral, monolete, oval in transverse plane. The holotype measures 208 X 312 microns. The monolete mark more than two thirds the length of the body. The suture line is closed with lips. Labra weakly developed and not bifurcated. Extrema lincamenta is rugate, rugae less than 2 microns in diameter. Exine reddish-brown, semi-translucent, about 13 microns thick.

Locality. — Amasra, Boring No. 34, 463 m in depth.

Occurrence.—Lower Westphalian D.

Schopfipollenites abruptus n. sp.
Pl. VI, Fig. 22

Description. — Microspore (pollen grain) monolete, suboval in outline with one margin convex and the other slightly truncated. The holotype measures 338 X 468 microns. The monolete mark 350 microns in length. The suture line is closed with lips. Labra weakly developed, ends bifurcated. Proximal area slightly folded, but the structure of the basal area densely covered with dome-shaped bubbles. Exine levigate, reddish-brown, translucent and 15 microns thick.

Locality.—Amasra, Boring No. 34, 463 m in depth.

Occurrence-—Lower Westphalian D; only a few specimens were found.

Schopfipollenites unberbis n. sp.
Pl. VI, Figs. 23, 24; holotype Fig. 24

Description. — Microspores (pollen grains) are bilateral, monolete, roundly oval in transverse plane. The holotype measures 416 x 520 microns. Monolete mark nearly reaching to the equator. The suture line is opened with lips. Labra thin and not bifurcated. On the opposite side a ridge (umbo) lies along the equatorial axis. Exine levigate, reddish-brown, translucent and 15 microns thick.

Comparison. — This species resembles *Schopfipollenites abruptus* n. sp. from which, however, it can be easily distinguished by the absence of bifurcate of monolete mark.

Locality. —Amasra, Boring No. 34, 463 m in depth.

Occurrence. — Lower Westphalian D; only a few specimens were noticed.

Zonalosporites membranacingulatus n. sp.
Pl. **VI,.** Fig. 25

Description. — Microspore (pollen grain) is bilateral, monolete, roundly oval in transverse plane, has a smooth cingulum. The holotype measures 260 X 442

microns. The cingulum is generally regular in outline, 78 microns wide, 3 microns thick, and transparent. The central area is ellipsoidal in shape, and measures 130 x 312 microns; semi-translucent, and 13 microns thick. Monolete mark straight and does not exceed the radius of the central area. Labra poorly developed, ends not bifurcated. Suture line distinct and closed, extrema lineamenta and surface are levigate.

Locality. — Amasra, Boring No. 34, 603 m in depth.

Occurrence- — Upper Westphalian C; only one specimen was found.

Zonalosporites aurorus n. sp.

Pl. VII, Figs. 26-28; holotype Fig. 26

Description. - Microspores (pollen grains) are monolete, round in transverse plane, have a smooth cingulum. The holotype measures 286 x 390 microns. The cingulum is slightly irregular in outline, 80 microns wide, 15 microns thick and transparent. The central area is oval in shape and measures 182 x 260 microns, opaque and 25 microns thick. Monolete mark straight and does not exceed the radius of the central area. Labra slightly developed, ends bifurcated. Encircling

EXPLANATION OF PLATES

PLATE I

Figs. 1,2 —- *Laevigatisporites triglandiferus* n. sp. X 50
Fig. 3 — *Colisporites coniferus* n. sp. X 50

PLATE II

Fig. 4 — *Triletisporites distinctus* n. sp. X 45

PLATE III

Fig. 5 — *Triletisporites distinctus* n. sp. X 45

PLATE IV

Figs. 6-11 —- *Valvisisporites corrugatus* n. sp. X 50

PLATE V

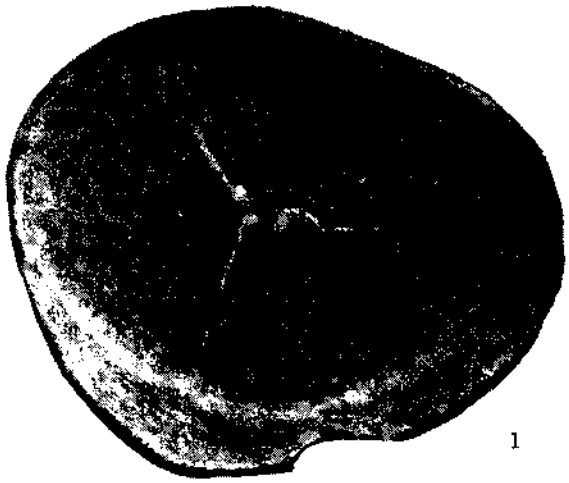
Figs. 12,13 —- *Cystosporites defessus* n. sp. X 60
Fig. 14 — *Cystosporites perficioreticulatus* n. sp. X 50
Fig. 15 — *Endosporites observatus* n. sp. X 100
Figs. 16-18 — *İbrahimipollenites lacunosus* n. gen. n. sp. X 100
Fig. 19 — *Schopfipollenites baykali* n. sp. X 100

PLATE VI

Figs. 20, 21 — *Schopfipollenites subtilirugosus* n. sp. X 100
Fig. 22 — *Schopfipollenites abruptus* n. sp. X 100
Figs. 23,24 — *Schopfipollenites imberbis* n. sp. X 100
Fig. 25 — *Zonalosporites membranacingulatus* n. sp. X 100

PLATE VII

Figs. 26-23 — *Zonalosporites aurorus* n. sp. X 100



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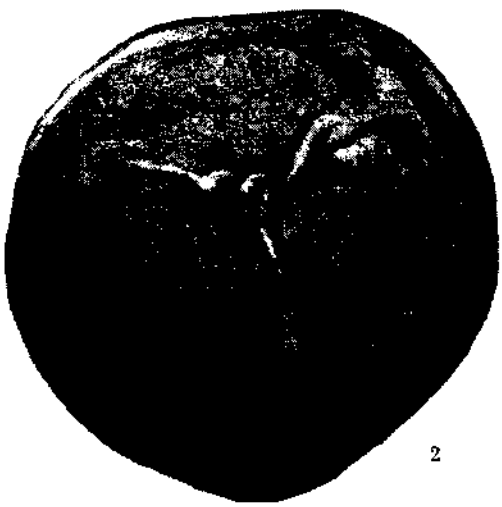

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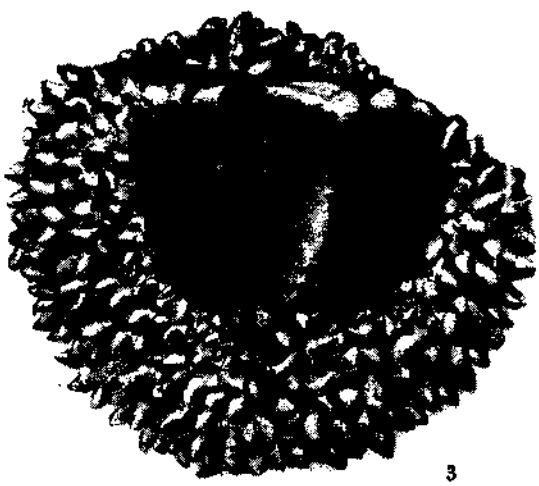

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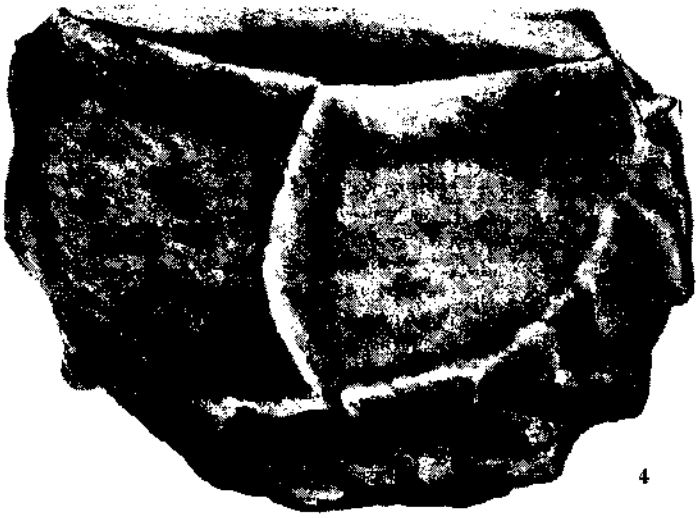

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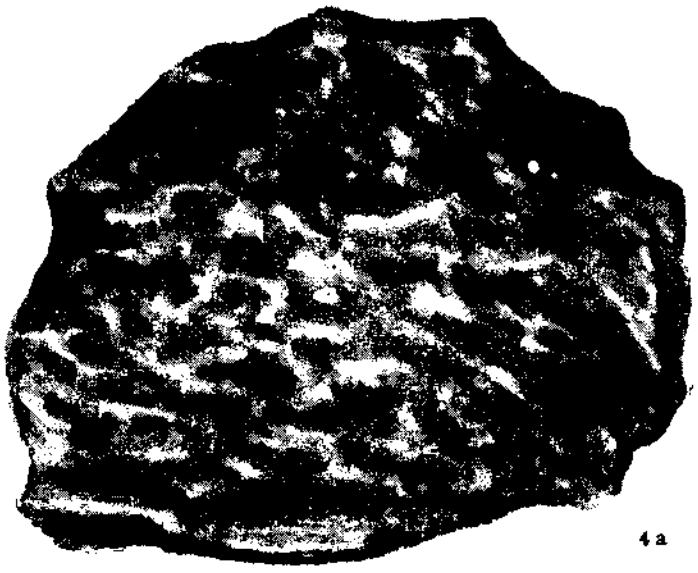

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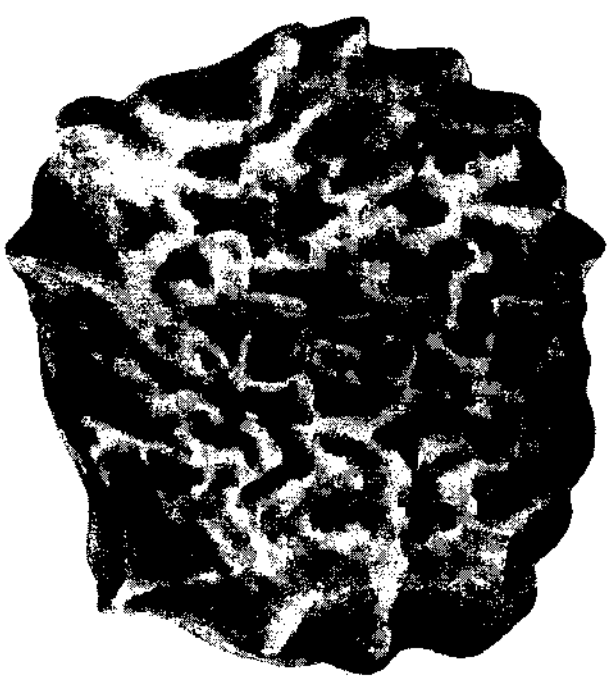

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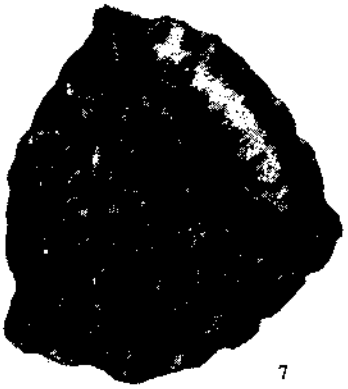

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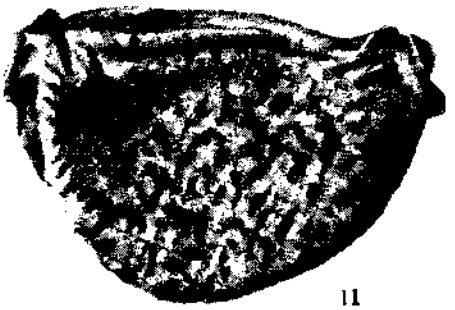

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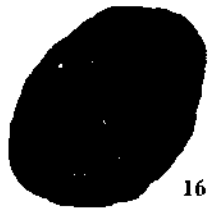

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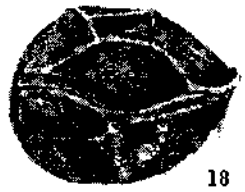

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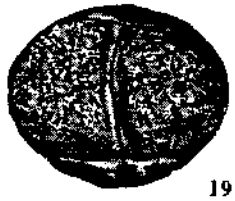

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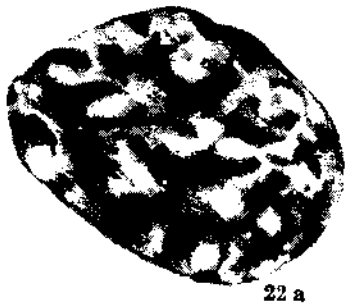

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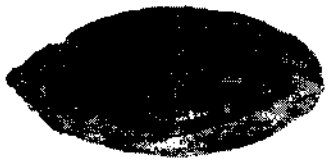

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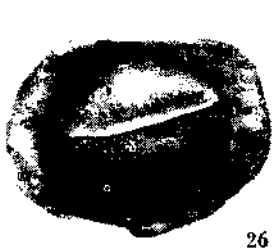

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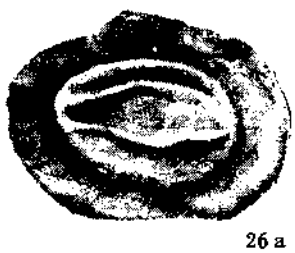

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ridges well developed. Extrema lineamenta and surface are levigate. The thickness of the exine is approximately 25-28 microns.

Locality. — Amasra, Boring No. 34, 463 m in depth.

Occurrence. — Lower Westphalian D; only few specimens were found.

NOMENCLATURAL NOTE

Laevigatisporites subglabratus Ergönül, 1959 (M. T. A. Bull. No. 53, 1959, p. 110, pl. I, fig. 4) has no relation with *Laevigatisporites,* but is included in the genus of *Nemejcisporites,* so the writer changed this name to *Nemejcisporites (Laevigatisporites) subglabratus* (Ergönül, 1959) n. comb.

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