PALYNOLOGICAL INVESTIGATIONS ON THE LOWER EOCENE LAYERS IN THE SURROUNDING COUNTRY OF ISZKASZENTGYÖRGY

III.

by
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Introduction

Quantitative data about palynological composition of the tertiary sediments of Iszkaszentgyörgy are published by the author in a previous paper (6). In the same paper the relation of these layers to the other pollen complexes of the Lower Terciere known till now in Hungary was also discussed. Qualitative results are presented in this work. It must be emphasized that with these results the palynological relations of the Lower Eocene layers of this area are not yet definitively cleared up. Further investigations being in progress (KEDVES and ENDRÉDI) will enrich with numerous new data the knowledge of the palynology of the Lower Eocene of Hungary.

Results

Fungi

No characteristic fungous residues were found in the samples.

Pteridophyta

Filicinae

In the samples investigated — similarly to the results of the investigation of the bauxit-baring of Halimba (4) — fern spores occur in small amount and a relatively small number of species are represented. From the family *Schizaeaceae Leiotriletes dorogensis* (KEDVES 1960 a) KEDVES 1961 a asp. *triplanoid* KEDVES 1961 a cf. *Lygodium* and *Cicatricosisporites dorogensis* (R. POT. & GELL. 1933) KEDVES 1961 a subfsp. *minor* KEDVES 1961 a *Mohria*, *Anemia* were found. The family *Polypodiaceae* is represented also by two species: *Laevigatosporites haardti* (R. POT. & VEN. 1934) TH. & PF. 1953 and *Reticuloidosporites (Polypodiisporites) favus* (R. POT. 1931 c) KRUTZSCH 1959 b.

Further fern spores with unknown systematic position: *Camarozonosporites heskemensis* (PFLANZL 1955) KRUTZSCH 1959 b (it may belong to *Lycopodiales*), *Polypodiaceoisporites potoniei* (R. POT. & GELL. 1933) KEDVES 1961 a subfsp. *major* KEDVES 1961 a fvar. *convex* KEDVES 1961 a. Also a new fern spore was found:

Verrucingulatisporites transdanubicus n. fsp.

Diagnosis

In polar view the spore has a rounded-off triangle form. Zone 3—10 μ broad, verrucose, verrucae cca 2—5 μ high and usually with considerably rounded-off apices. The proximal pole of the central body is verrucate or corrugate, measure of the verrucae 2—3 μ. Laesures of the tetragonal sign usually reach the inner border of the zone, sometimes they split in two. Distant pole is corrugate, decorated with well-developed sculptural elements. Measure of the sculptural elements 3—6 μ. Greatest dimension of the spores is 40—65 μ.

Occurrence: so far only in the Lower Eocene (Sparnacian) layers of Iszkaszentgyörgy.

Statigraphy: so far only in the Sparnacian stage.

Holotype: Table I. 9, 10; praep. I—IV./3—1, 10/102.

Locus typicus: Lower Eocen layers of Iszkaszentgyörgy.

Stratum typicum: Sparnacian stage of the Lower Eocene, clay layers.

Derivatio: nominis: from the place of occurrence (Transdanubia is a territory between the rivers Danube and Drava).

Note: From the other known species of the formgenus it may be distinguished through the sculpture of the zone and through the central body (3, 11).

Gymnospermae

Coniferae

Abietaceae pollens occur only sporadically: *Pityosporites microalatus* (R. POT.) TH. & PF. 1953 f. *minor* (R. POT.) TH. & PF. 1953, *Pinus haploxylon* group RUDOLPH, *Pityosporites labdacus* (R. POT.) TH. & PF. 1953, *Pinus diploxylon*-group *(Silvestris* type). From this family in greater quantity only *Inaperturopollenites magnus* (R. POT.) TH. & PF. 1953 occurs in some places. The families *Taxodiaceae-Cupressaceae* are represented by *Inaperturopollenites dubius* (R. POT. & VEN.) TH. & PF. 1953 and by *Inaperturopollenites hiatus* (R. POT.) TH. & PF. 1953, *Taxodium* v. *Glyptostrobus*.

Angiospermae

Dicotyledones

These pollens were found in the greatest quantity and in very different forms. Cf. *Nymphaeaceae — Pollenites pseudohirsutus* DOKT. — Hrebnicka ex Bacltová 1960, *Leguminosae* or perhaps *Rosaceae* or closely related with them a new pollen fsp. was found:

Tricolporopollenites solé de portai n. fsp.

Diagnosis

Ellipsoidal sometimes nearly globose, tricolporate pollen. Ration of length and width variable. Greatest measures 20—35 μ. The ectexine is subtly striated, 1—1,5 μ thick. Ectexine and endexine are of the same measure. The colpes are parallel with the contour. Width of the colpes is variable, usually 1—3 μ. The pores towards the equator are usually stretched elliptical, seldom circular, their greatest dimension is about 3 μ, their width 1 μ, seldom greater (at most 2 μ).

Occurrence: It is known till now from the Lower Eocene layers of Iszkaszentgyörgy and from the coal basin of Dudar (this latter unpublished). According to SOLÉ DE PORTA (14) it occurs probably in the Lower Terciere layers in Columbia too.

Stratigraphy: In Hungary it is known till now only in the Lower Eocene (Sparnacian) layers in the Halimba-type pollen associations. According to SOLÉ DE PORTA (14) similar pollens are also known from the Lower and Middle Oligocene layers of Columbia.

Holotype: Table 4, 9, praep. I–IV/4–2, 9, 5/68.

Locus typicus: Lower Eocene layers of Iszkaszentgyörgy.

Stratum typicum: Lower Eocene, Sparnatian stage, in layers with coal.

Derivatio nominis: N. SOLÉ DE PORTA, the outstanding palynologist of the Lower Terciare layers of Columbia.

Botanical relations: According to SOLÉ DE PORTA (14) *Leguminosae Isoberlinia*? But *Rosaceae* or its relatives are not out of question too.

Note: The measure of the pollens observed in Hungary does not attain the greatest values published by SOLÉ DE PORTA (14). It is possible that the greater dimensions of the Columbian exemplares are given from the taxonomical differences following from the geographical distance. One part of the Columbian pollens may be doubtlessly identified morphologically with the Hungarian exemplares. It is interesting that till now this pollen was found in Hungary only from Lower Eocene layers, and in the Lower Eocene layers of Dorog, Tatabánya and Oroszlány it was not demonstrated so far. The new form-species may not be identified with the morphologically related form-species described by KRUTZSCH (11).

Anacardiaceae- Tricolporopollenites pseudocingulum (R. POT.) TH. & PF. 1953 *Rhus, Rhus carbogena* TRAVERSE 1955; the exemplare observed is entirely identical with the pollens known from the work of TRVERSE. In this case author omits the use of the artificial system, because in the present confused situation in the nomenclature it would be superfluous to create a new combination. *Aquifoliaceae — Tricolporopollenites iliacus* (R. POT.) TH. & PF. 1953 f. *medius* PF. & TH. 1953 *Ilex, Cyrillaceae-Clethraceae — Tricolporopollenites megaexactus* (R. POT.) TH. & PF. 1953 subfsp. *brühlensis* (THOMS.) TH. & PF. 1953, *Cyrillaceae-Clethraceae ?Theaceae — Tricolporopollenites megaexactus* (R. POT.) TH. & PF. 1953 subfsp. *exactus* (R. POT.) TH. & PF. 1953, *Vitaceae — Tricolporopollenites macrodurensis* PF. & TH. 1953 *Parthenocissus, Cissus, Araliaceae — Tricolporopollenites wallensenensis* PF. 1953 *Hedera, Caprifoliaceae — Tricolporopollenites microreticulatus* PF. & TH. 1953 f. *globosa* PF. & TH. 1953, *Sterculiaceae — Tricolporopollenites semiglobosus* KEDVES 1963, *Tricolporopollenites semiglobosus* KEDVES 1963 asp. *pseudolaesus* KEDVES 1963, possibly also *Nyssaceae-Mastixiaceae — Tricolporopollenites* cf. *globosus* E. KRIVÁN–HUTTER 1961, *Flacourtiaceae — Tricolporopollenites ráskyi* KEDVES 1963, *Ericaceae — Tetradopollenites callidus* (R. POT.) TH. & PF. 1953, *Sapotaceae — Tricolporopollenites* aff. *globosus* H. DEÁK 1960, *Tetracolporopollenites manifestus* (R. POT.) TH. & PF. 1953 subfsp. *contractus* PF. 1953, *Tetracolporopollenites halimbaense* KEDVES 1961 c. Two new form-species belonging to this family were found:

Tetracolporopollenites ellipsus n. fsp.

Diagnosis

Ellipsoidal, tetracolporate pollen. Greatest measures are 25—34 μ. The exine is 1,5—2 μ thick, ectexine and endexine are of the same measure. The exine is smooth or finely chagrenate. The colpes are generally 2 μ great, they do not reach in all cases the points of the pollen and never join at the poles. The exopores are situated in the direction of the equator and have an ellipsoidal or quadrangular form elongated in the direction of the equator, width 1—1,5 μ, length 3—4 μ.

Occurrence: in Hungary it is known till now only from Iszkaszentgyörgy, Dudar and Lábatlan (the two latter data unpublished).

Stratigraphy: According to the present data it occurs only in the Lower Eocene (Sparancian) layers.

Holotype: Table IV. 23, 24; praep. I—IV/2—2, 14,5/93.

Locus typicus: Lower Eocene layers of Iszkaszentgyörgy.

Stratum typicum: Lower Eocene, Sparnacien stage, coalbearing layers.

Derivatio nominis: the ellipsoidal form of the contour.

Botanical connections: It belongs surely to the family *Sapotaceae*.

Note: On the base of thickness of exine, measure and structure of pores it can easily separate from *Tetracolporopollenites microellipsus* Pf. 1953.

Tetracolporopollenites hungaricus n. fsp.

Diagnosis

Ellipsoidal sometimes nearly globose tetracolporate pollen, length 35—43 μ, width 25—30 μ. Thickness of the exine 1—2 μ, ectexine and endexenie are generally of the same measure, sometimes ectexine is a little thicker than endexine. The exine is scabrate or finely intragranulate. Colpes do not reach the poles; their width is 2—3,5 μ. Exopores are situated in the direction of the longitudinal axis, they have a quadrangular form with rounded-off apices, 1,5$\times$ $\times$2,5 μ great.

Occurrence: so far it is known from the Lower Eocene layers of Iszkaszentgyörgy.

Stratigraphy: According to our present results it occurs only in the Lower Eocene (Sparnacian) layers.

Holotype: Table VII. 1, 2, praep. I—IV/3—2,6/79.

Locus typicus: Lower Eocene layers of Iszkaszentgyörgy.

Stratum typicum: Lower Eocene, Sparnacian stage, coal-bearing layers.

Derivatio nominis: Hungary, the place of occurrence.

Botanical connections: It belongs surely to the family *Sapotaceae*.

Note: It can be separated in first line with the aid of form and measures of pores from similar tetracolporate pollens.

Betulaceae — Triporopollenites aff. *megagranifer* (R. Pot.) Th. & Pf. 1953, *Fagaceae — Tricolpopollenites microhenrici* (R. Pot.) Th. & Pf. 1953 subfsp. *intragranulatus* Pf. 1953 *Quercus, Tricolpopollenites microhenrici* (R. Pot.) Th. & Pf. 1953 subfsp. *intrabaculatus* Pf. 1953 *Quercus, Tricolporopollenites cingulum* (R. Pot.) Th. & Pf. 1953 subfsp. *fusus* (R. Pot.) Th. & Pf. 1953, *Tricolporopollenites cingulum* (R. Pot.) Th. & Pf. 1953 subfsp. Pot.) Th. & Pf. 1953 subfsp. *oviformis* (R. Pot.) Th. & Pf. 1953 *Castanea, Tricolpopollenites liblarensis* (Thoms.) (= *quisqualis* R. Pot.) Th. & Pf. 1953

subfsp. *liblarensis* (THOMS.) TH. & PF. 1953, *Tricolpopollenites liblarensis* (THOMS.) (= *quisqualis* R. POT.) TH. & PF. 1953 subfsp. *fallax* (R. POT.) TH. & PF. 1953, *Myricaceae* – it were found in realatively great diversity of forms pollens belonging probably to this family; *Triatriopollenites excelsus* (R. POT.) TH. & PF. 1953 subfsp. *minor* PF. 1953, *Triatriopollenites excelsus* (R. Pot.) TH. & PF. 1953 subfsp. *turgidus* PF. 1953, *Triatriopollenites excelsus* (R. POT.) TH. & PF. 1953 subfsp. *semiturgidus* PF. 1953, *Triatriopollenites excelsus* (R. POT.) TH. & PF. 1953 subfsp. *microturgidus* PF. 1953, *Triatriopollenites pseudorurensis* PF. 1953, *Triatriopollenites rurensis* PF. & TH. 1953, *Triatriopollenites bituitus* (R. POT.) TH. & PF. 1953, *Triatriopollenites myricoides* (KREMS) TH. & PF. 1953, *Triatriopollenites coryphaeus* (R. POT.) TH. & PF. 1953 subfsp *punctatus* (R. POT.) TH. & PF. 1953.

Dicotyledones incertae sedis – *Subtriporopollenites scissus* PF. 1953, *Intratriporopollenites indubitabilis* (R. POT.) TH. & PF. 1953, *Tricolpopollenites* cf. *densus* PF. 1953, *Tricolporopollenites satzveyensis* PF. 1953, *Pentapollenites regulatius Krutzsch* 1962 c subfsp. *regulatius* KRUTZSCH 1962 c, *Pentapollenites laevigatus* KRUTZSCH 1962 c subfsp. *laevigatoides* KRUTZSCH 1962 c, *Pentapollenites triangulus* KRUTZSCH 1963 c. In the followings some Dicotyledonous pollens will be described which are only once (at most twice) observed and therefore the knowledge of their morphology is unsatisfactory. – *Tricolporopollenites* indet. Typ. „A". – A relatively corroded exemplare was observed. It is 20 μ long, the exine 1–1,5 μ thick, ectexine and endexine have a similar thickness, its sculpture is scabrate. Colpes reach the apices of the pollen, the exopore is circular, its diameter is less than 1 μ. *Tricolporopollenites* Typ. „B". – An ellipsoidal tricolporate pollen. Length 32 μ, width 17 μ. The exine is smooth, here and there finely scabrate, 1–1,5 μ thick. Ectexine and endexine are of similar measure. The colpes are relatively broad, the pores are oblongal, elongated, in equatorial direction, their length generally 4 μ, their width 1,5–2 μ. From morphological point of view it is related to *Tricolporopollenites cingulum* (R. POT.) TH. & PF. 1953, especially to the subfsp. *fusus* (R. POT.) TH. & PF. 1953, but it is not identical with it. It may be considered as a *Fagaceae* or *Flacourtiaceae* pollen. *Tricolporopollenites* indet. Typ. „C". A 30 μ long and 20 μ broad tricolporate pollen. The exine is very thin, generally less than 1 μ, it is smooth, no structure can be observed on it. This latter may be the consequence of corrosion. Its characteristic, very broad colpes are 4 μ broad. The pores from above are elliptical and elongated in the direction of the equator, they are 4 μ long and 1 μ broad and become a little narrower in the middle. *Tricolporopollenites* indet. Typ „D". – An ellipsoidal, on the ends pointed tricolporate pollen. The exine is thin, the exact thickness was undeterminable because of the bed conservation. The surface is ornated with regularly hemispherical granules. The structure seems sometimes reticulated. The exopores are circular, their diameter is less than 1 μ.

Monocotyledones

Palmae – *Monocolpopollenites tranquillus* (R. POT.) TH. & PF. 1953, *Monocolpopollenites minor* KEDVES 1961 a. A new form-species of Palm-pollens was also found:

Monocolpopollenites eocaenicus n. fsp.

Diagnosis

Spindle-formed, 20—38 μ long, monocolpate pollen. The exine is 1,5—2 μ thick, echinated, the thorns are 1—2 μ long. The colpe has a symmetrical position, its width is 0,8—1 μ.

Occurrence: Till now it is known only from the Lower Eocene layers of Iszkaszentgyörgy.

Stratigraphy: Till now it is known only from the Lower Eocene (Sparnacian) layers.

Holotype: Table II. 7, 8, proep. I — 1 — IV/4 — 1, 18/73.

Locus typicus: Lower Eocene layers of Iszkaszentgyörgy.

Stratum typicum: Clay layers of the Sparnacian stage of Lower Eocene.

Derivatio nominis: From the geological age.

Botanical connections: Its belonging to the *Palmae* may be taken for certain. According to ERDTMAN (1) and to author's own observations on recent palm-pollens the smaller exemplares may be considered as *Didymosperma* while the larger exemplares as *Lepidocaryum* or *Arenga*.

Also the following form-species belongs to the Monocotyledons:

Monocolpopollenites oviformis n. fsp.

Diagnosis

Ellipsoidal, 15—25 μ large, monocolpate pollen. The exine is intragranulated, it is generally about 1 μ thick. The colpes are 1—1,3 μ broad and generally do not reach the points of the pollen.

Occurrence: Till now it was found in Iszkaszentgyörgy and Emőd (the latter unpublished).

Stratigraphy: It occurs in the Lower Eocene and in the Upper Pannonian layers and therefore its exact stratigraphical significance waits clearing.

Holotype: Table II. 7, 8, praep. 1 — 1 — IV/4 — 1, 18/73.

Locus typicus: Lower Eocene layers of Iszkaszentgyörgy.

Stratum typicum: Lower Eocene, Sparnacian stage in coalcontaining layers.

Derivatio nominis: From the characteristic contour.

Botanical connections: Not known nearer. Probably it is the pollen of a Monocotyledonous plant.

Angiospermae incertae sedis

Diporites iszkaszentgyörgyi n. fsp.

Diagnosis

It is an ellipsoidal, generally assymmetrical form. The exine is 1,5—2,5 μ thick, ectexine and endexine are of the same measure, sometimes the endexine is a little thicker. The surface is chagrenated or finely intragranulated. On each poles of the pollen is one pore. The are often situated below the outline — probably in consequence of compression — and so their has an ellipsoidal or lens-forms. The diameter of the pores is 7—17 μ. The greatest measure of the pollen is 35—55 μ.

Occurrence: Till now it is known only from the Lower Eocene layers of Iszkaszentgyörgy.

Stratigraphy: Till now it is known only from the Lower Eocene (Sparnacian) layers.

Holotype: Table VII., 15, 16, praep. I — 1/IV — 3 — 1, 11/70.

Botanical connections: Unknown, possibly the pollen belongs to a Monocotyledonous plant.

Note: From stratigraphical point of view it is a significant form, because — according to verbal communication of F. GÓCZÁN — in the Cretaceous layers of Hungary similar forms were found.

Incertae sedis

Ovoidites ligneolus R. POT.

Hystrichosphaeridae

In small quantity and in very corroded condition were found some representatives of this taxon. The corroded condition of these fossilia excludes a closer determination. Their presence is important, because they indicate salt-water.

Foraminiferae

In the argillaceous samples sometimes *Foraminifera* with chitin skeleton were observed in relatively greater quantity. Their significance is similar to that of the former taxon i. e. ecological one.

Discussion

The pollen-association demonstrated, similarly to the quantitative results, may be roughly identified with the Halimba-type (nearer with the Dudar-type) associations. The relatively great number of forms-species shows that we do not know yet sufficiently the Sporomorphes of the Hungarian Eocene.

Summary

The fossil pollens demonstrated till now from the Lower Eocene of Iszkaszentgyörgy indicate the abundance of forms of the Dicotyledonous plants. The *Pteridophyta*, *Gymnospermae* and Monocotyledons occur only in a less number. During the investigations a new spore and several new pollen form-species were found. The complete knowledge of the coal-bearing layers of Iszkaszentgyörgy wants further investigations, which are already in progress (KEDVES & ENDRÉDI).

Plate I.

Fig. 1, 2. — *Reticuloidosporites (Polypodiisporites) favus* (R. POT.. 1931 c) KRUTZSCH 1959 b) *Polypodiaceae.*

Fig. 3, 4. — *Camerozonosporites heskemensis* (Pflanzl 1955) KRUTZSCH 1959. b.

Fig. 5. — *Leiotriletes dorogensis* (KEDVES 1960 a) KEDVES 1961 a asp. *triplanoid* KEDVES 1961 a *Schizaeaceae* cf. *Lygodium.*

Fig. 6, 7. — *Laevigatosporites haardti* (R. POT. & VEN. 1934) TH. & PF. 1953 *Polypodiaceae.*

Fig. 8. — *Cicatricosisporites dorogensis* (R. Pot. & GELL. 1933) KEDVES 1961 a subfsp. *minor* KEDVES 1961 a *Schizaeaceae Mohria, Anemia.*

Fig. 9, 10. — *Verrucingulatisporites transdanubicus* n. fsp.

Fig. 11. — *Polypodiaceoisporites potoniei* (R. POT. & GELL, 1933) KEDVES 1961 a subfsp. *major* KEDVES 1961 a fvar. *concav.* KEDVES 1961 a.

N: 1000.

Plate II.

Fig. 1, 2. — *Monocolpopollenites tranquillus* (R. Pot.) Th. & Pf. 1953 *Palmae.*
Fig. 3—6. — *Monocolpopollenites minor* Kedves 1961 a *Palmae.*
Fig. 7, 8. — *Monocolpopollenites eocaenicus* n. fsp. *Palmae.*
Fig. 9, 10. — *Monocolpopollenites oviformis* n. fsp. *Monocotyledones.*
Fig. 11. — *Ovoidites ligneolus* R. Pot.
Fig. 12, 13. — *Inaperturopollenites hiatus* (R. Pot.) Th. & Pf. 1953 *Taxodiaceae, Taxodium, Glyptostrobus.*
Fig. 14. — *Inaperturopollenites magnus* (R. Pot.) Th. & Pf. 1953 *Abietaceae.*
Fig. 15, 16. — *Inaperturopollenites dubius* (R. Pot. & Ven.) Th. & Pf. 1953 *Taxodiaceae-Cupressaceae.*
Fig. 17. — *Pityosporites microalatus* (R. Pot.) Th. & Pf. f. *minor* (R. Pot.) Th. & Pf. *Pinus haploxylon-* group Rudolph.
Fig. 18, 19. — *Pollenites pseudobirsutus* Dokt-Hrebnicka cf. *Nymphaeaceae.*
Fig. 20, 21. — *Pityosporites labdacus* (R. Pot.) Th. & Pf. 1953 *Pinus diploxylon*-group (*Silvestris*-Typus).
N: 1000.

Plate III.

Fig. 1, 2. — *Triatriopollenites excelsus* (R. Pot.) Th. & Pf. 1953 subfsp. *minor* Pf. 1953 *Myricaceae.*
Fig. 3—6. — *Triatriopollenites excelsus* (R. Pot.) Th. & Pf. subfsp. *turgidus* Pf. 1953 *Myricaceae.*
Fig. 7—12. — *Triatriopollenites excelsus* (R. Pot.) Th. & Pf. subfsp. *semiturgidus* Pf. 1953 *Myricaceae.*
Fig. 13, 14. — *Triatriopollenites excelsus* (R. Pot.) Th. & Pf. subfsp. *microturgidus* Pf. 1953 *Myricaceae.*
Fig. 15, 16. — *Triatriopollenites pseudorurensis* Pf. 1953 *Myricaceae.*
Fig. 17—20. — *Triatriopollenites rurensis* Pf. & Th. 1953 *Myricaceae.*
Fig. 21, 22. — *Triatriopollenites bituitus* (R. Pot.) Th. & Pf. 1953 *Myricaceae.*
Fig. 23, 24. — *Triatriopollenites myricoides* (Kremp) Th. & Pf. 1953 *Myricaceae.*
Fig. 25, 26. — *Triatriopollenites coryphaeus* (R. Pot. Th. & Pf. 1953 subfsp. *punctatus* (R. Pot.) Th. & Pf. 1953 *Myricaceae.*
Fig. 27, 28. — *Triporopollenites* aff. *megagranifer* (R. Pot.) Th. & Pf. *Betulaceae.*
Fig. 29, 30. — *Subtriporopollenites scissus* Pf. 1953.
N: 1000.

Plate IV.

Fig. 1, 2. — *Intratriporopollenites indubitabilis* (R. Pot.) Th. & Pf. 1953.
Fig. 3, 4. — *Tricolpopollenites microhenrici* (R. Pot.) Th. & Pf. 1953 subfsp. *intragranulatus* Pf. 1953 *Fagaceae Quercus.*
Fig. 5, 6. — *Tricolpopollenites microhenrici* (R. Pot.) Th. & Pf. 1953 subfsp. *intrabaculatus* Pf. 1953 *Fagaceae Quercus.*
Fig. 7, 8. — *Tricolpopollenites liblarensis* (Thoms.) (= *quisqualis* R. Pot.) Th. & Pf. 1953 subfsp. *liblarensis* (Thoms.) Th. & Pf. 1953 *Fagaceae.*
Fig. 9, 10. — *Tricolpopollenites liblarensis* (Thoms.) (= *quisqualis)* (R. Pot.) Th. & Pf. 1953 *Fagaceae.*
Fig. 11—14. — *Tricolporopollenites pseudocingulum* (R. Pot.) Th. & Pf. 1953 *Anacardiaceae* Rhus.
Fig. 15, 16. — *Tricolpopollenites* cf. *densus* Pf. 1953.
Fig. 17, 18. — *Tricolporopollenites* indet. Typ. „A".
Fig. 19, 20. — *Tricolporopollenites cingulum* (R. Pot.) Th. & Pf. 1953 subfsp. *fusus* (R. Pot.) Th. & Pf. 1953 *Fagaceae.*
Fig. 23—30. — *Tricolporopollenites cingulum* (R. Pot.) Th. & Pf. 1953 subfsp. *pusillus* (R. Pot.) Th. & Pf. 1953 *Fagaceae Castanea.*

Fig. 31—33. — *Tricolporopollenites cingulum* (R. Pot.) Th. & Pf. 1953 subfsp. *oviformis* (R. Pot.) Th. & Pf. 1953 *Fagaceae Castanea.*
Fig. 34—42. — *Tricolporopollenites ráskyi* Kedves *Flacourtiaceae.*
Fig. 43, 44. — *Tricolporopollenites microreticulatus* Pf. & Th. 1953 *f. globosa* Pf. & Th. 1953 *Caprifoliaceae.*
Fig. 45—48. — *Tricolporopollenites megaexactus* (R. Pot.) Th. & Pf. 1953 subfsp. *brühlensis* (Thoms.) Th. & Pf. 1953 *Cyrillaceae Clethraceae.*
Fig. 49, 50. — *Tricolporopollenites megaexactus* (R. Pot.) Th. & Pf. 1953 subfsp. *exactus* (R. Pot.) Th. & Pf. 1953 *Cyrillaceae Clethraceae ?Theaceae.*
N: 1000.

Plate V.

Fig. 1, 2. — *Tricolporopollenites* aff. *wallensenensis* Pf. 1953 *Araliaceae Hedera.*
Fig. 3, 4. — *Tricolporopollenites satzveyensis* Pf. 1953.
Fig. 5, 6. — *Tricolporopollenites macrodurensis* Pf. & Th. 1953 *Vitaceae Parthenocissus Cissus.*
Fig. 7, 8. — *Tricolporopollenites* indet. Typ. „B".
Fig. 9, 10. — *Tricolporopollenites* indet. Typ „C".
Fig. 11, 12. — *Tricolporopollenites* indet. Typ. „D".
Fig. 13, 14. — *Tricolporopollenites iliacus* (R. Pot.) Th. & Pf. 1953 *f. medius* Pf. & Th. 1953 *Aquifoliaceae Ilex.*
Fig. 15, 16. — *Tricolporopollenites* cf. *globosus* E. Kriván—Hutter 1961.
Fig. 17—19. — *Tricolporopollenites semiglobosus* Kedves *Sterculiaceae.*
N: 1000.

Plate VI.

Fig. 1. — *Tricolporopollenites semiglobosus* Kedves *Sterculiaceae.*
Fig. 2, 3. — *Tricolporopollenites semiglobosus* Kedves asp. *pseudolaesus* Kedves *Sterculiaceae.*
Fig. 4, 5. — *Tricolporoppollenites* solé de portai n. fsp. *Leguminosae.*
Fig. 6, 7. — *Rhus carbogena* Traverse 1955 *Anacardiaceae.*
Fig. 8, 9. — *Tetracolporopollenites halimbaense* Kedves 1961 c *Sapotaceae.*
Fig. 10—17. — *Tricolporopollenites* aff. *globus* H. Deák 1960 *Sapotaceae.*
Fig. 18—20. — *Tetracolporopollenites manifestus* (R. Pot.) Th. & Pf. 1953 subfsp. *contractus* Pf. 1953 *Sapotaceae.*
Fig. 21—24. — *Tetracolporopollenites ellipsus* n. fsp. *Sapotaceae.*
Fig. 25, 26. — *Tetracolporopollenites hungaricus* n. fsp. *Sapotaceae.*
N: 1000.

Plate VII.

Fig. 1—4. — *Tetracolporopollenites hungaricus* n. fsp. *Sapotaceae,* N: 1000.
Fig. 5—8. — *Tetradopollenites callidus* (R. Pot.) Th. & Pf. 1953 *Ericaceae,* N: 1000.
Fig. 9, 10. — *Pentapollenites regulatius* Krutzsch 1962 c subfsp. *regulatius* Krutzsch 1962 c, N: 1000.
Fig. 11, 12. — *Pentapollenites laevigatus* Krutzsch 1962 c subfsp. *laevigatoides* Krutzsch 1962 c, N: 1000.
Fig. 13, 14. — *Pentapollenites triangulus* Krutzsch 1962 c, N: 1000.
Fig. 15, 16. — *Diporites iszkaszentgyörgyi* n. fsp.. N: 1000.

Plate VIII.

Fig. 1—4. — *Hystrichosphaeridae* gen. et spec. indet.
Fig. 5—12. — *Foraminiferae.*
N: 500.

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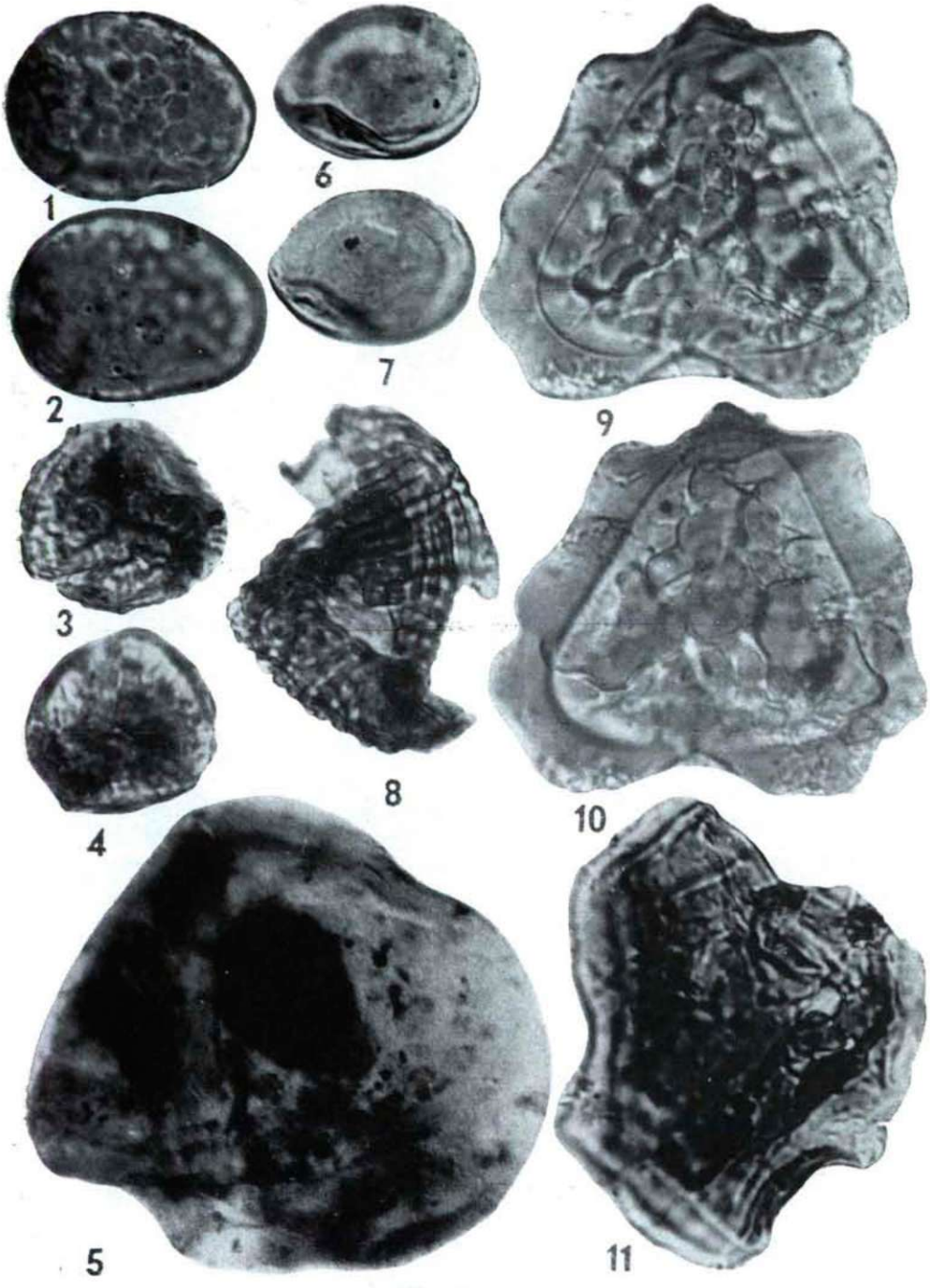
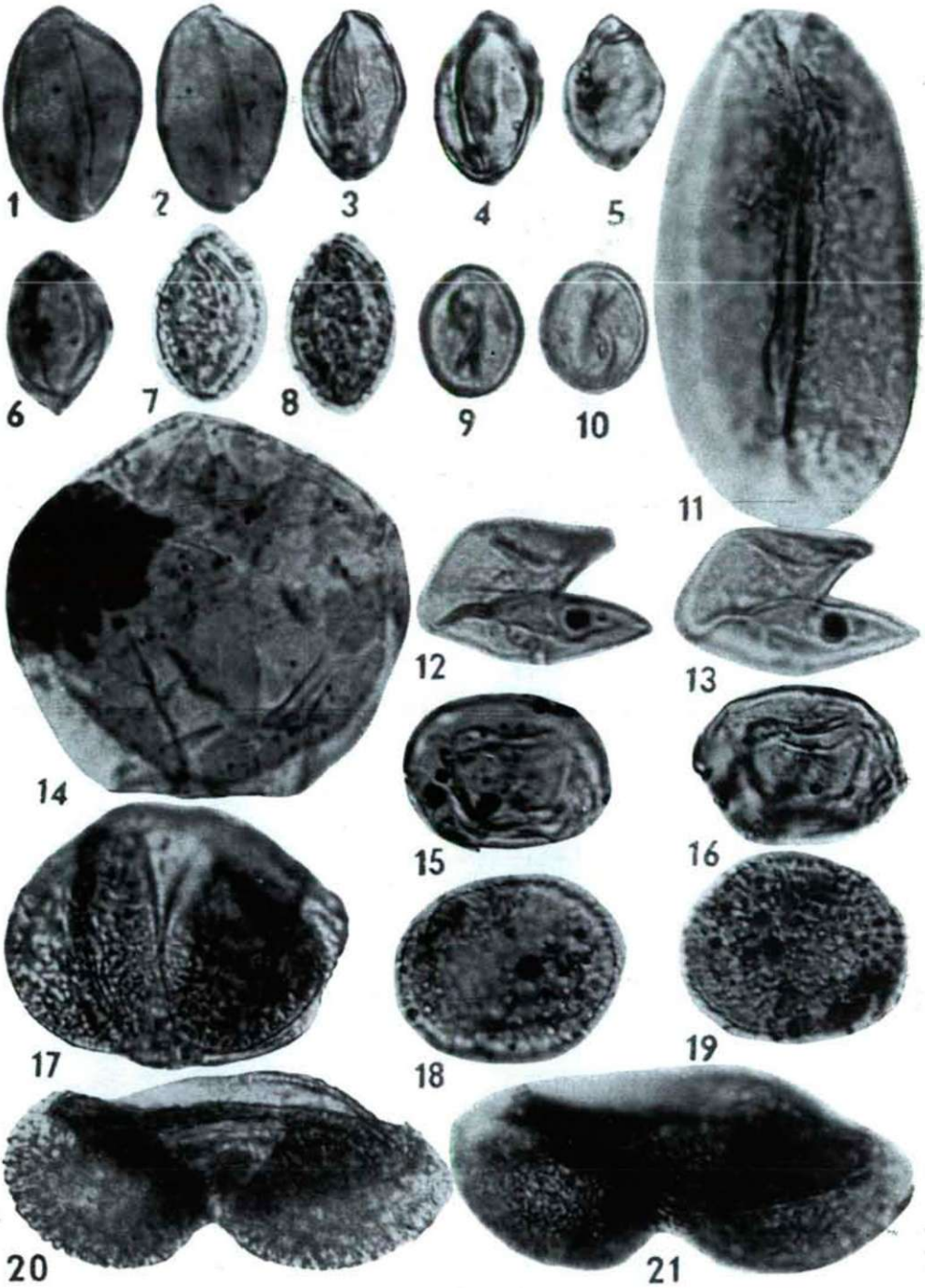


Plate I.



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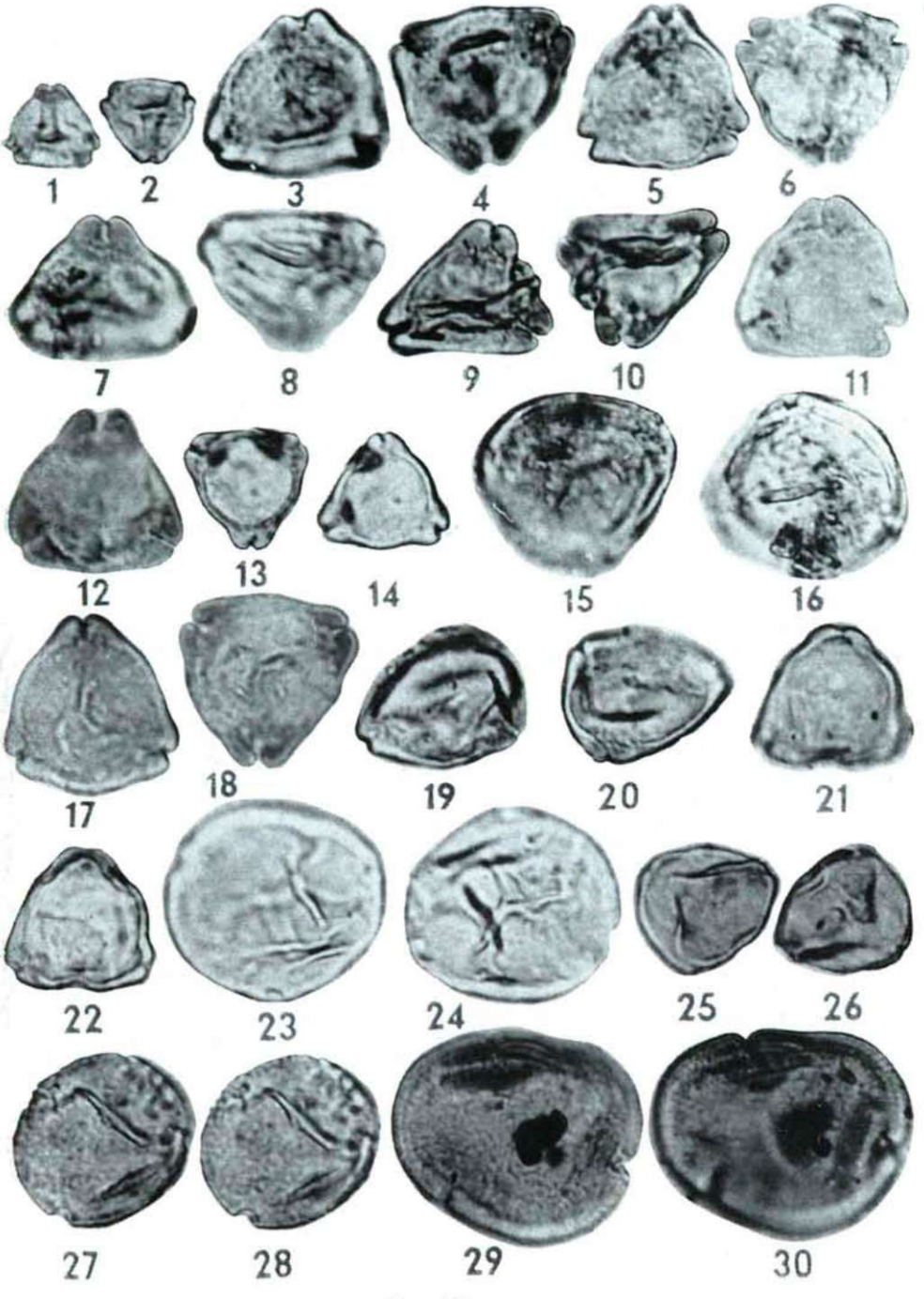
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Plate III.

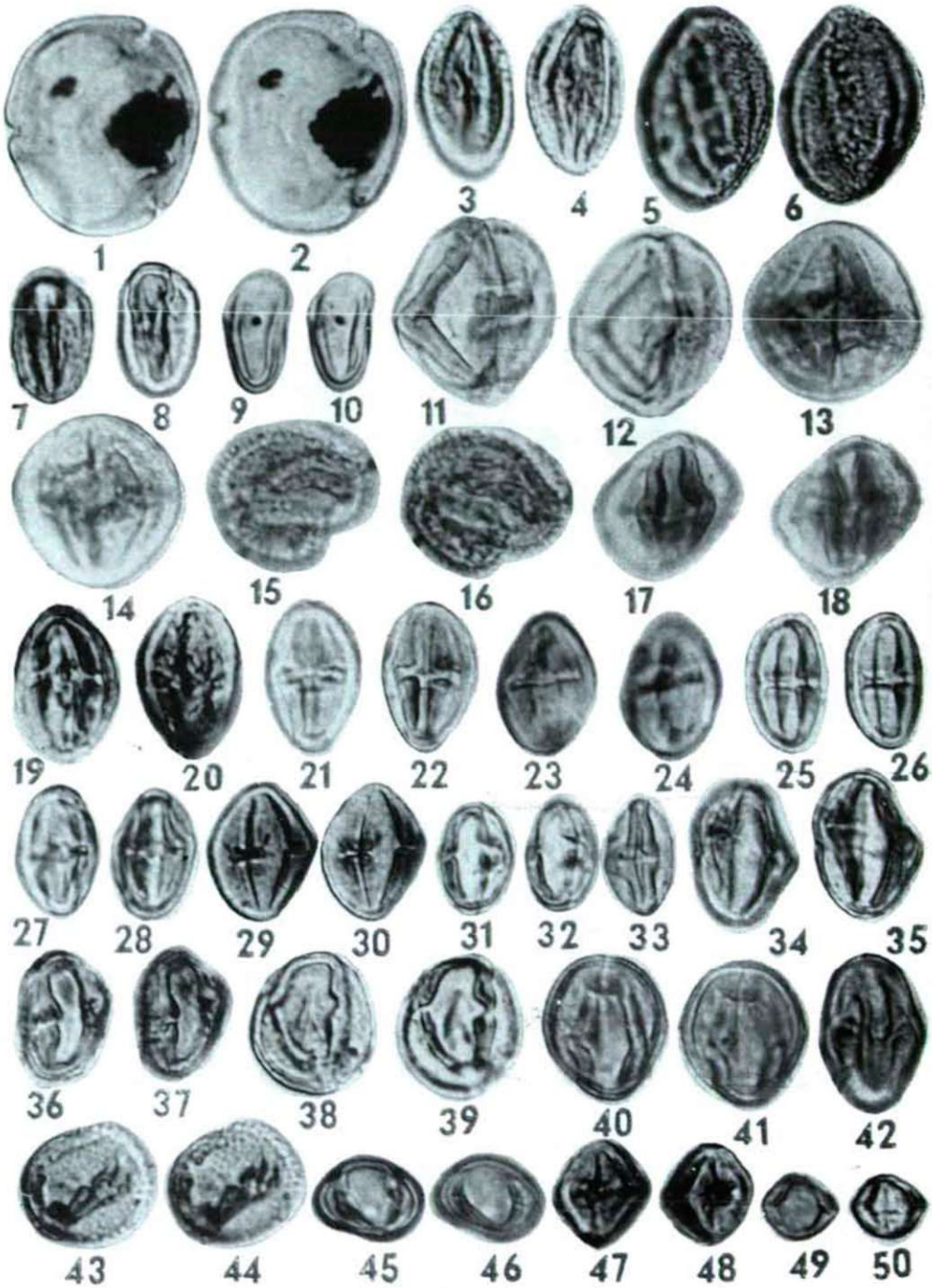
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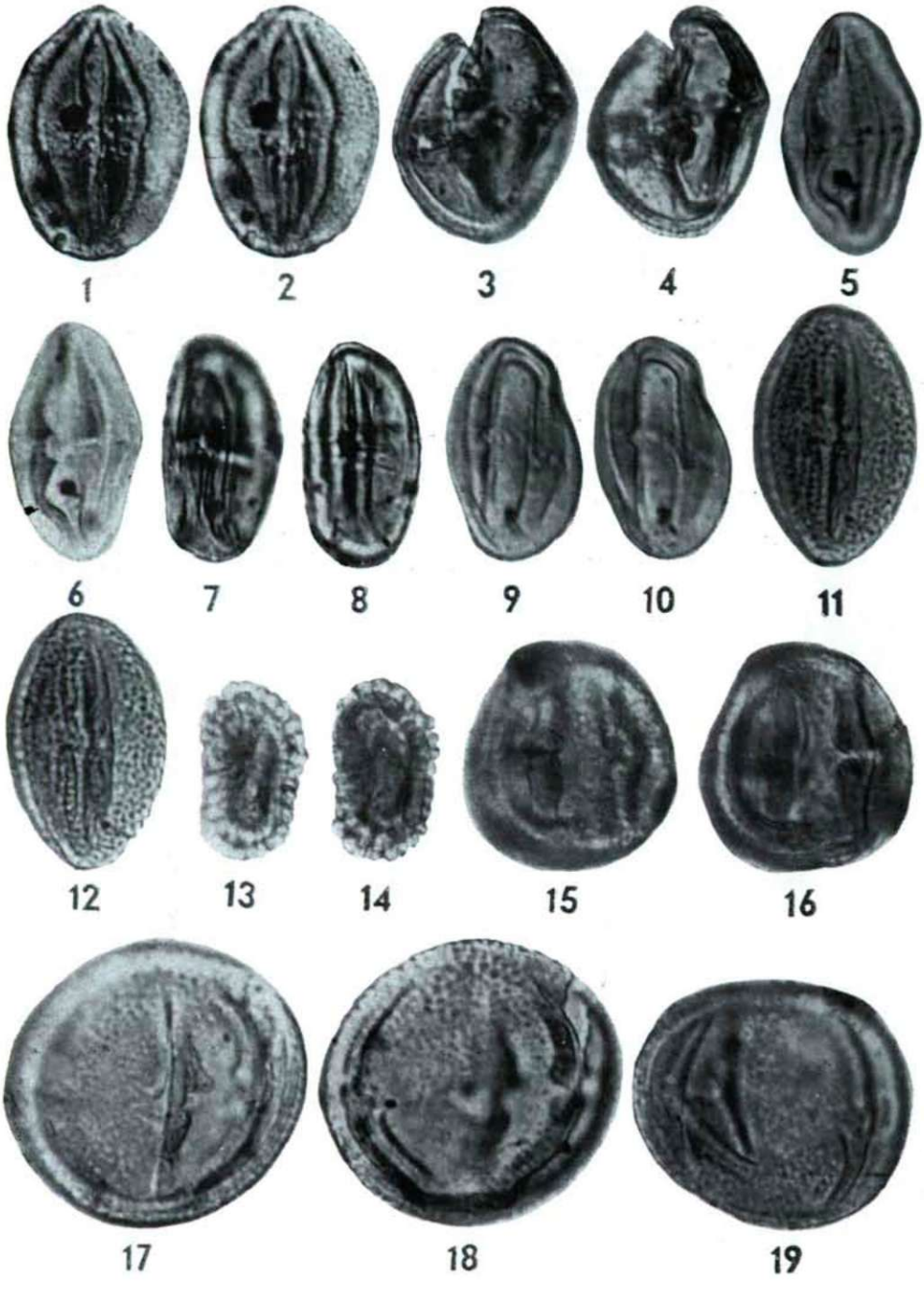
Plate IV.



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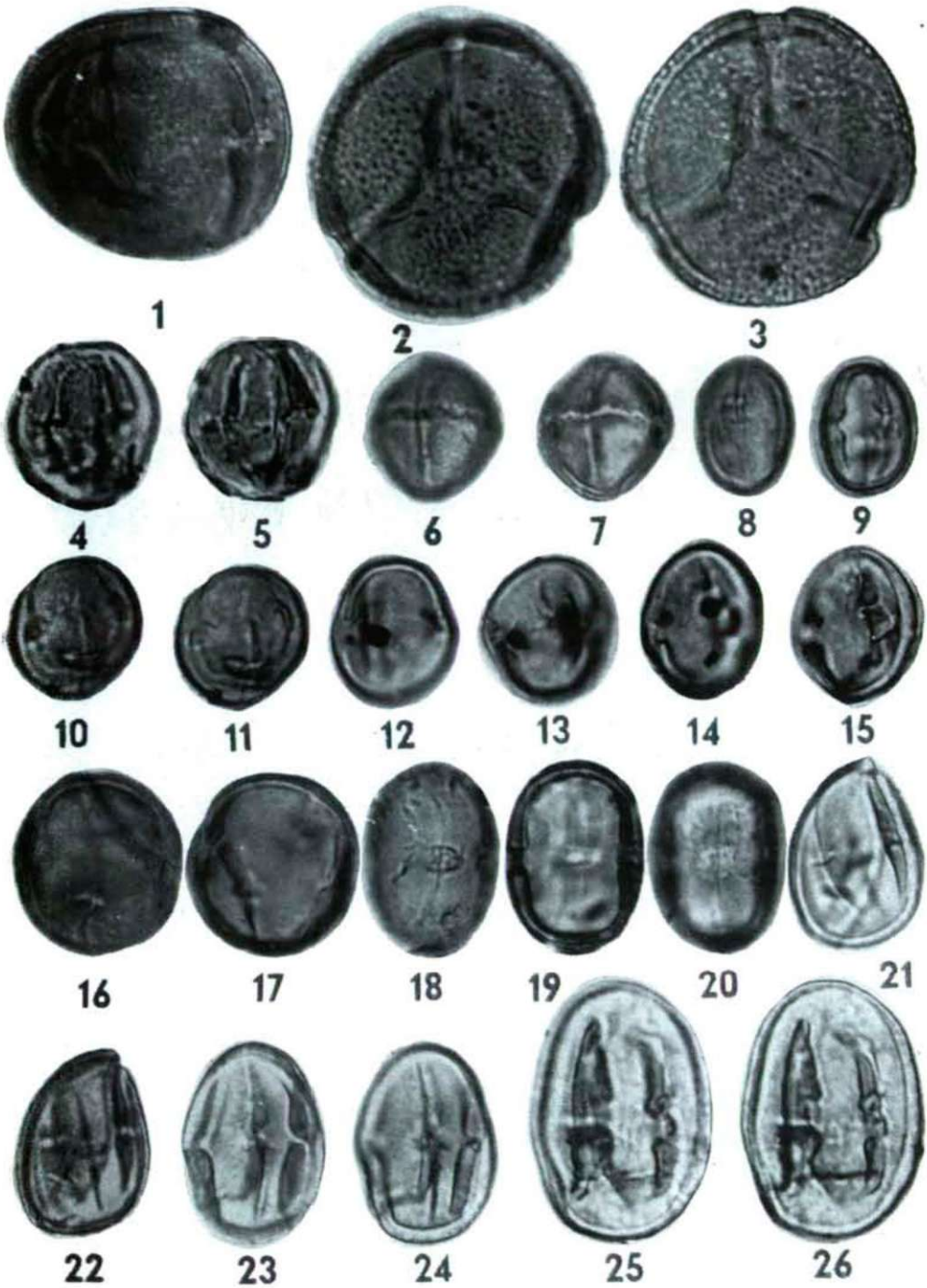

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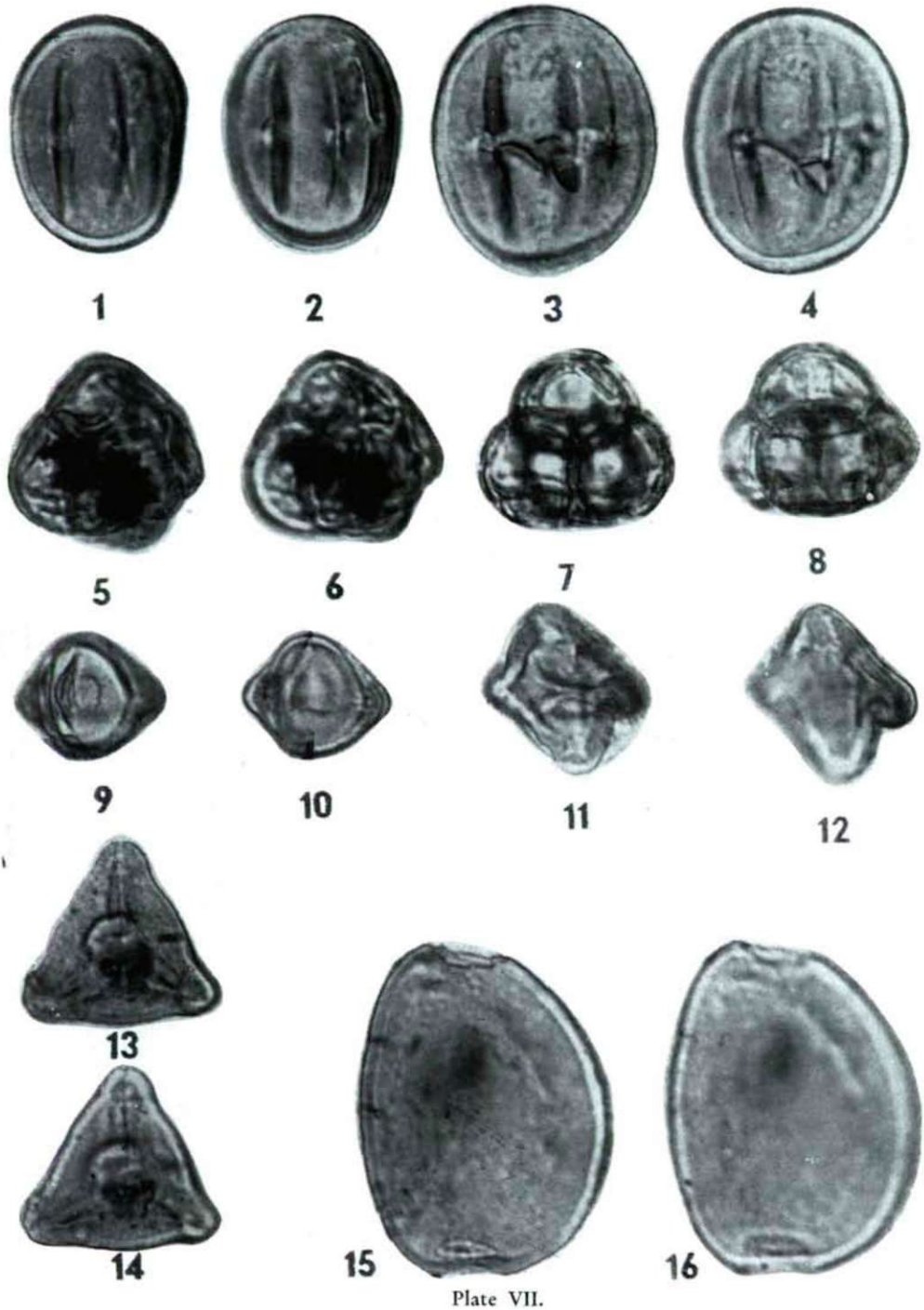

Plate VII.

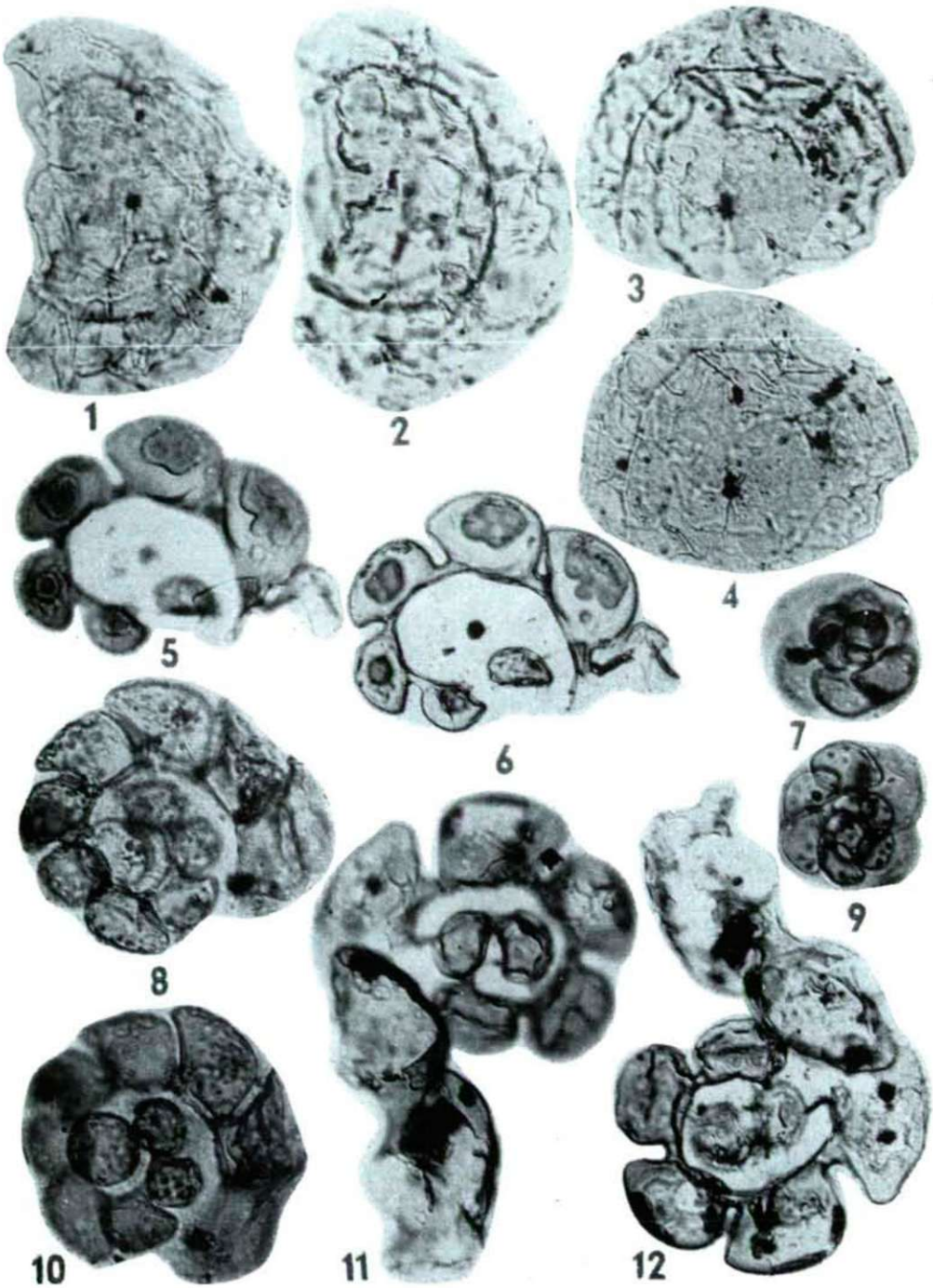

Plate VIII.