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Eocene Angiospermous Palynomorphs of Taiwan

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ABSTRACT: Ninety-seven taxa of Eocene fossil angiospermous palynomorphs were reported as an on-going effort to increase our knowledgs of the Eocene microflora of Taiwan. They belong to two classes, forty-nine families and sixty-seven form genera; namely sixty-five form genera and ninety-four taxa for the class Dicotyledoneae; and two form genera and three taxa for the class Monocotyledoneae. Ten new genera, sixty-six new species (*Striatopollis verus* Shaw *sp. nov.; Retitricolpites verus* Shaw *sp. nov.; Tricolpites pengchiahsuensis* Shaw *sp. nov.; Tricolpopollenites pengchiahsuensis* Shaw *sp. nov.; Alangiopollis taiwanensis* Shaw sp. nov.; *Rhoipites taiwanensis* Shaw sp. nov.; *Anodendronpolleniites taiwanensis* Shaw *sp. nov.; Retitricolpites schefflerus* Shaw *sp. nov.; R. acanthopanasus* Shaw *sp. nov.; Alnipollenites firmaensis* Shaw *sp. nov.; Ostryoipollenites taiwanensis* Shaw *sp. nov.; Carpinipites pengchiahsuensis* Shaw *sp. nov.; Retitricolpites campanulatus* Shaw *sp. nov.; Bombacacidites taiwanensis* Shaw *sp. nov.; Retitricolporoidites religiosus* Shaw *sp. nov.; R. racemosus* Shaw *sp. nov.; Ageratumpollenites formosensis* Shaw *sp. nov.; Compositoipollenites taiwanensis* Shaw *sp. nov.; C. pengchiahsuensis* Shaw *sp. nov.; Retitricolpites cruciferus* Shaw *sp. nov.; Thladiantkapollenites taiwanensis* Shaw *sp. nov.; Droserapollis taiwanensis* Shaw *sp. nov.; Mallotuspollenites taiwanensis* Shaw *sp. nov.; Acalyphapollenites taiwanensis* Shaw *sp. nov.; Tricolporopollenites gilvatus* Shaw *sp. nov.; T. pengchiahsuensis* Shaw *sp. nov.; Caryapollenites pengchiahsuensis* Shaw *sp. nov.; C. verus* Shaw *sp. nov.; C. quadriporus* Shaw *sp. nov.; Engelhartioipollenites pengchiahsuensis* Shaw *sp. nov.; Juglanspollenites pengchiahsuensis* Shaw *sp. nov.; Momipites pengchiahsuensis* Shaw *sp. nov.; Retihexacolpites pengchiahsuensis* Shaw *sp. nov.; Tricolpites stachysus* Shaw *sp. nov.; Cranwellia taiwaniana* Shaw *sp. nov.; C. pengchiahsuana* Shaw *sp. nov.; Myrtaceidites pengchiahsuensis* Shaw *sp. nov.; M. formosensis* Shaw *sp. nov.; Nymphaeacidites pengchiahsuensis* Shaw *sp. nov.; Corsinipollenites granulatus* Shaw *sp. nov.; C. pengchiahsuensis* Shaw *sp. nov.; Retitricolpites jasminus* Shaw *sp. nov.; Retitricolporoidites verus* Shaw *sp. nov.; Polygalacidites pengchiahsuensis* Shaw *sp. nov.; P. formosensis* Shaw *sp. nov.; Sanguisorbapollenites taiwanensis* Shaw *sp. nov.; Retitricolporoidites nitidus* Shaw *sp. nov.; R, formosensis* Shaw *sp. nov.; R. pengchiahsuensis* Shaw *sp. nov.; Yenjisapollis formosensis* Shaw *sp. nov.; Retitricolpites vandellius* Shaw *sp. nov.; Solanaceaepollenites taiwanensis* Shaw *sp. nov.; Pterospermumpollenites taiwanensis* Shaw *sp. nov.; P. pengchiahsuensis* Shaw *sp. nov.; Symplocoipollenites taiwanensis* Shaw *sp. nov.; S. pengchiahsuensis* Shaw *sp. nov.; Retitricolporoidites triumfettus* Shaw *sp. nov.* ; *Celtispollenites taiwanensis* Shaw *sp. nov.; Umbelliferaepites taiwanensis* Shaw *sp. nov.; Patriniapollenites pengchiahsuensis* Shaw *sp. nov.; Verbenaceaepollenites taiwanensis* Shaw *sp. nov.; V. vitexensis* Shaw *sp. nov.; Leeapollenites taiwanensis* Shaw *sp. nov.; Taiwanipollis verus* Shaw *sp. nov.; Potamogetonacidites taiwanensis* Shaw *sp. nov.; P. pengchiahsuensis* Shaw *sp. nov.*), four new varieties (*Triporopollenites coryloides* (Potonie) Th. & Pfl. minor var. nov. ; *Tricolporopollenites perprolatus* Huang *psilatus* Shaw *var. nov.*; *Periporopollenites formosana* Huang *medius var. nov.; Tiliaepollenites formosensis* Shaw *quadriporus* Shaw *var. nov.*) are described from well samples in offshore Keelung of northern Taiwan.

KEY WORDS: Eocene, Angiospermous palynomorphs, Taxonomy, Taiwan.

INTRODUCTION

This paper is the sixth installment reporting the palynological observation from wells drilled in offshore Keelung in northern Taiwan. The previous installments include reporting

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Tiliaeoous palynomorphs (Shaw, 1997), Ephedraceous (Shaw, 1998), Wetzeliellaceous dinoflagellate (Shaw, 1999a), fossil dinocysts (Shaw, 1999b), and pteridophytic spores (Shaw, 1999c). More reports which deal with the taxonomy and complete checklist will come in the immediate future.

In this paper, artificial form genera names for nomenclature the taxonomic treatment were adapted.

MATERIALS AND METHODS

Core samples from the OK-1, OK-2, OK-3, (Shaw, 1999a) YKL-6, YKL-3 and YKL-1 (Shaw, 1996) wells from offshore Keelung in northern Taiwan were made available. A total of fifty-five cores and one cutting sample were prepared by the Chinese Petroleum Corporation Micropaleontological Laboratory for this palynological study.

The palynomorph extraction method followed Shaw (1990), including the treatment of 10% KOH for the dissolution of humic material, heavy liquid solution of $ZnCl_2$ for flotation (S. G. 1.8-2.2), 30% of HCl for calcite, and 52% of HF for maceration of the laterite pebble samples.

Photomicrographs were taken with a Zeiss Universal microscope using Kodak Panatomic X (16 DIN) film. For fossil identification, the standard references as Huang (1972, 1978, 1980, 1981), Shaw (1995a, 1995b), Jansonius and Hills (1976), Kremp, Spackman, Ames and Kovar (1957-1972). The fossil slides are catalogued and stored at the Micropaleontology Laboratory, Chinese Petroleum Corporation.

RESULTS

An accurate taxonomic treatment is important for biostratigraphy. As an on-going effort in building up our knownledges of the Eocene microflora of Taiwan, ninety-seven angiospermous taxa are reported. They belong to two classes, forty-nine families and sixty-seven form genera; namely sixty-five form genera and ninety-four taxa for the class Dicotyledoneae; and two form genera and three taxa for the class Monocotyledoneae. Among these taxa ten new genera, sixty-six new species, and four are new varieties. They are described as below:

CLASS 1. DICOTYLEDONEAE

Family 1. ACERACEAE

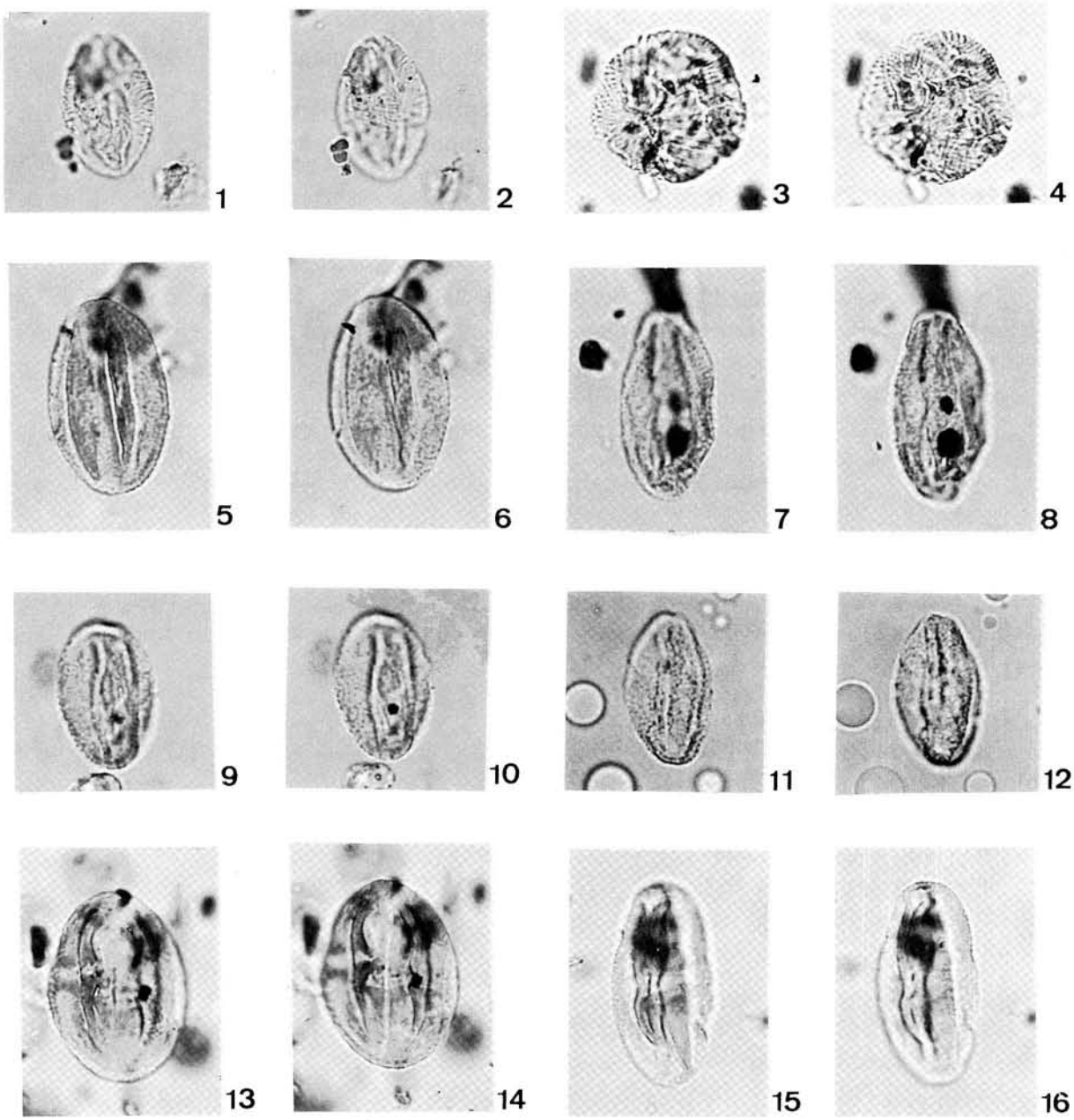
Genus 1. Striatopollis Krutzsch 1959

Type species: *Striatopollis sarstedtensis* Krutzsch 1959

Diagnosis: Pollen grains tricolpate, subprolate to prolate in equatorial view, circular in polar view; tectum subpsilate to finely verrucate; sexine striate (This description is taken from Jansonius and Hill, 1976).

1. Striatopollis verus Shaw sp. nov. Figs. 1-4

Holotype: Slide OK-1 1768-bl-(1); Figs. 1-2; film P3-31-32, P3-32-33; CPC Micropaleontology Lab.



Figs. 1-4. *Striatopollis verus* Shaw *sp. nov.* P3-31-32, P3-32-33; OK-1, 1768BL-1; 14 x 24 μm; W38-11, 12; OK-2, 1875-2; 23 x 24 μm. Figs. 5-8. *Retitricolpites verus* Shaw *sp. nov.* S4-29, 30; OK-1; 1768-3, 27 x 16 μm; P7-30-32, P7-31-33; OK-1 1669BL-2; 12 x 27 μm. Figs. 9-12. *Tricolpopollenites pengchiahsuensis* Shaw *sp. nov.* P7-3-5, P7-4-6; OK-1, 1669BL-2; 19.5 x12 μm; P6-3-5, P6-4-6; OK-1, 1669BL-1; 11.5 x 20 μm. Figs. 13-16. *Rhoipites taiwanensis* Shaw sp. nov S8-27, 28; OK-1, 1588-4; 30 x 22 μm; P10-2-1, P10-4-3; OK-1, 1588-3; 32 x15 μm. (ACERACEAE, AIZOACEA, ANACARDIACEAE).

Description: Grains tricolpate, subprolate to perprolate; 13-16 x 22-26 μm; colpi 13-15 μm long; surface view striate; lateral view scabrate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1768m).

Taxonomic affinity: This form species resembles to the species of *Acer*.

Family 2. AIZOACEAE

Genus 1. Retitricolpites van der Hammen 1956 emend. Pierce 1961

Type species: *Retitricolpipites ornatus* (van der Hammen) Pierce

Diagnosis: Reticulate tricolpate sporomorphs, subprolate to perprolate; colpi straight.

1. Retitricolpites verus Shaw sp. nov. Figs. 5-8

Holotype: Slide OK-1 1669-bl-(2); Figs. 7-8; film P 7-30-32, P7-31-33; CPC Micropaleontology Lab.

Description: Grains tricolpate, prolate to perprolate; 26-28 x 12-16 μm; colpi 22-23 μm long; surface view finely reticulate (pitted); lateral view verrucate to scabrate; exine 1 μm or less thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This species is similar to the extant species of Aizoaceae.

Genus 2. Tricolpites Cookson ex Couper 1953

New Zealand Geol. Surv., Paleontol. Bull. 22, p. 61.

Type species: Tricolpites reticulata Cookson 1947 ex Couper, ibid.; B. A. N. Z. A. R. E., Repts., ser. A, v. 2, pt. 8, p. 134, pl. 15, fig. 45.

Diagnosis: Free, isopolar, tricolpate. Exine variable in thickness and sculpture. Size variable.

1. Tricolpites pengchiahsuensis Shaw sp. nov. Figs. 137, 138

Holotype: Slide OK-3 1750-(5); Figs. 137, 138; film PF28-34, 35; CPC Micropaleontology Lab.

Description: Grains tricolpate, amb circular; 26-29 μm; colpi long, 2/3 of the radius; surface view finely granulate; lateral view scabrate; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1750 m).

Taxonomic affinity: This species is similar to the extant species of Aizoaceae.

Genus 3. Tricolpopollenites Pflug & Thomson in thomson & Pflug 1953

Palaeontographica Bd. 94, Abt. B, p. 95

Type species: *Tricolpopollenites parmularius* (Potonie) Thomson & Pflug.

Diagnosis: Pollen with the polar axis as long as or longer than the equatorial axis; three colpi in symmetrical distribution; colpi meridional.

1. Tricolpopollenites pengchiahsuensis Shaw sp. nov. Figs. 9-12

Holotype: Slide OK-1, 1669bl-(1); Figs. 11-12; film P6-3-5, P6-4-6; CPC Micropaleontology Lab.

Description: Grains tricolpate, subprolate to perprolate; 11-12 x 18-20 μm; colpi 13-15 μm long; surface view finely granulate; lateral view scabrate; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This species is similar to the extant species of Aizoaceae.

Family 3. ALANGIACEAE

Genus 1. Alangiopollis Krutzsch 1962a

Geologie, Jahrg. 11, H. 3, p. 279.

Type species: *Alangiopollis barghoornianum* (Trav.) Krtz., ibid. *Alangium barghoornianum* Traverse 1955 U.S. Bur. Mines, Rept. Invest. 5151, p. 64, fig. 12(102).

Diagnosis: Large tricolporate pollen with relatively short polar axis; figura spherical or oval-lenticular; amb Approx circular; exocolpi usually widely gaping, not very long, narrowing towards the poles to a V-shape, hardly depressed in the equatorial region; endopores large (up to over 10 μm diameter) round to some-what oval, cavernae variously thickened; structure and sculpture variable, in part very strongly reticulate-striate; structured part of the wall (especially along the sides) thicker than the smooth inner wall layer(s)."

1. Alangiopollis taiwanensis Shaw sp. nov. Figs. 17-20

Holotype: Slide OK-3 1750-(2); Figs. 17-18; film PF13-26, PF13-27; CPC Micropaleontology Lab.

Description: Grains tricolporate; polar view circular to semi-angular, 40-66 μm wide; colpi crassimarginate 2/3 to 3/4 length of the radius, ora circular, 10 μm wide; surface view rugulato-reticulate, lateral view verrucate; exine 1.5-4 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

Taxonomic affinity: This species is similar to the extant species of Alangiaceae.

Family 4. ANACARDIACEAE
Genus 1. Rhoipites Wodehouse 1933

Bull. Torrey Bot. Club, v. 60, p. 513.

Type species: *Rhoipites bradleyi* Wodehouse.

Diagnosis: Ellipsoidal, tricolporate pollen, with furrows long and pointed; furrow and pore thickenings conspicuous, projecting deeply inwards; exine rather finely reticulate-pited.

1. Rhoipites taiwanensis Shaw sp. nov. Figs. 13-16; 240, 241

Holotype: Slide OK-1 1588-(4); Figs. 13-14; film S8-27, S8-28; CPC Micropaleontology Lab.

Description: Grains tricolporate; subprolate to perprolate, 15-22 x 30-32 μm; colpi 24-26 μm long, ora lalongate, 7-8 μm wide; surface view finely reticulate, lateral view scabrate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1588 m).

Taxonomic affinity: This species is similar to the extant species of *Rhus* of Anacardiaceae.

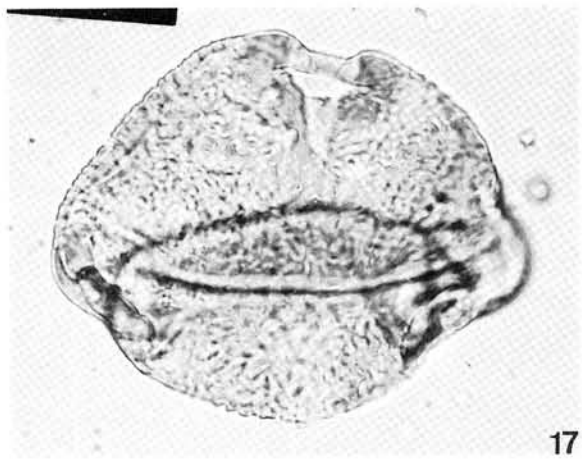
Family 5. APOCYNACEAE
Genus 1. Anodendronpolleniites gen. nov.

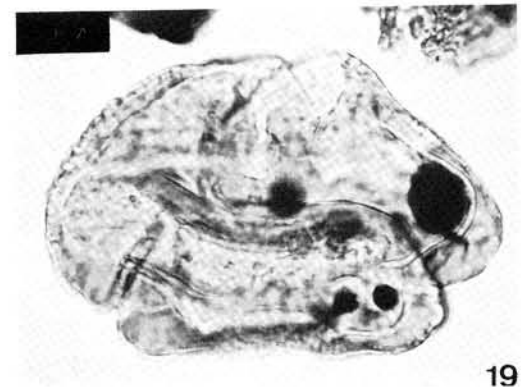
Type species: *Anodendronpolleniites taiwanensis sp. nov.*

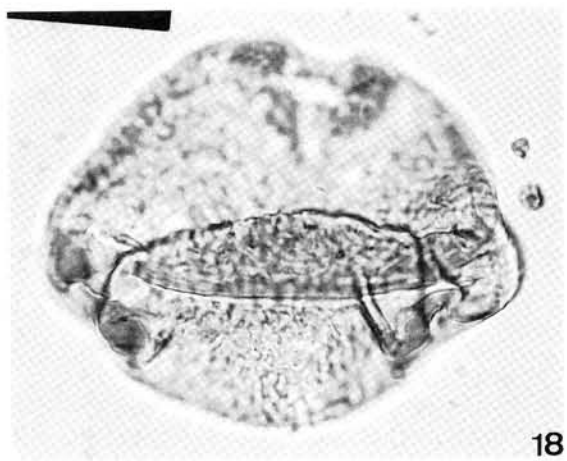
Diagnosis: Grains 2-porate; subspheroidal; pore somewhat crassimarginate; tectum rough pattern; exine thin.

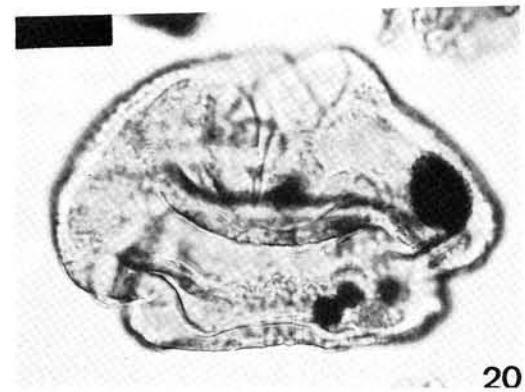
1. Anodendronpolleniites taiwanensis Shaw sp. nov. Figs. 39-40

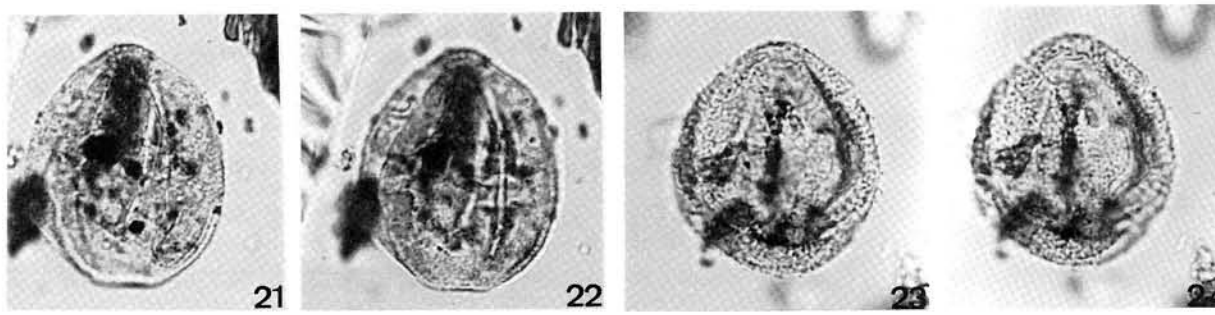
Holotype: Slide OK-1, 1588-(3); Figs. 39-40; film P9-12-14, P9-13-15; CPC Micropaleontology Lab.











Figs. 17-20. *Alangiopollis taiwanensis* Shaw sp. nov. PF13-26, 27; OK-3, 1750-2; 66 x 53 μm; WA78-9,11; OK-3, 1790-1; 62 x 40 μm. Figs. 21-24. *Retitricolpites schefflerus* Shaw *sp. nov.* PF54-26, 27; OK-3, 1800-4; 33 x 27.5 μm; S4-16, 17; OK-1, 1788-5; 33 x 29 μm. (ALANGIACEAE, ARALIACEAE).

Description: Grains 2-porate; shape subspheroidal to elliptical; 19 x 31 μm wide; pore crassimarginate, 2 μm thick; surface view rough pattern; lateral view subpsilate; exine less than 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1588 m).

Taxonomic affinity: This species is similar to the extant species of *Anodendron* of Apocynaceae.

Family 6. AQUIFOLIACEAE

Genus 1. Ilexpollenites Thiergart 1937 ex Potonie 1960.

Type species: *Ilexpollenites iliacus* Potonie 1960.

Diagnosis: Shape ovoid to sphaerical equator trilobate to circular, pores more or less distinguishable, with equatorial rugae (tricolporate). The exine shows closely but free-standing pilate or clavae, not all of exactly the same height that isshaped as wedges, pistils, pears, but even warts or rods (This description is taken from Jansonius and Hill, 1976).

1. Ilexpollenites ssuhuensis Shaw. Figs. 25-36

Slide: OK-3, 1760m-3, film WA65-36, 37, 38; OK-3; 1780 m-4, film PF55-25, 26; OK-3; 1750 m-4, film PF25-10, 11, 12; OK-3, 1720 m-1, film TL16-13, 14; OK-3, 1720 m-2, PF57-3, 4; CPC Micropaleontology Lab.

Description: Grain 3-colporate; prolate-spheroidal to prolate; 13-19x19-26 μm; colpi 8-16 μm long; ora obscure; lateral view clavate 0.7-1.5 μm long, 0.4-1.3 μm wide; surface view granulate; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1720 m, 1750 m, 1760 m, 1780 m).

Taxonomic affinity: This form resembles the species of *Ilex* of Aquifoliaceae (Huang, 1972).

2. Ilexpollenites minor Huang & Huang Figs. 37-38

Slide: OK-1,1669m-3, film S5-16, 17; CPC Micropaleontology Lab.

Description: Grain 3-colporate; prolate-spheroidal; 12 x 14 μm; colpi 8-10 μm long; ora obscure; lateral view clavate 0.7-0.9 μm long, 0.4-0.9 μm wide; surface view granulate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669 m).

Taxonomic affinity: This form ressembles the species of *Ilex* of Aquifoliaceae (Huang & Huang, 1984).

Family 7. ARALIACEAE

Genus 1. Retitricolpites van der Hammen 1956 emend. Pierce 1961.

Type species: *Retitricolpipites ornatus* (van der Hammen) Pierce.

Diagnosis: Reticulate tricolpate sporomorphs, subprolate to perprolate; colpi straight.

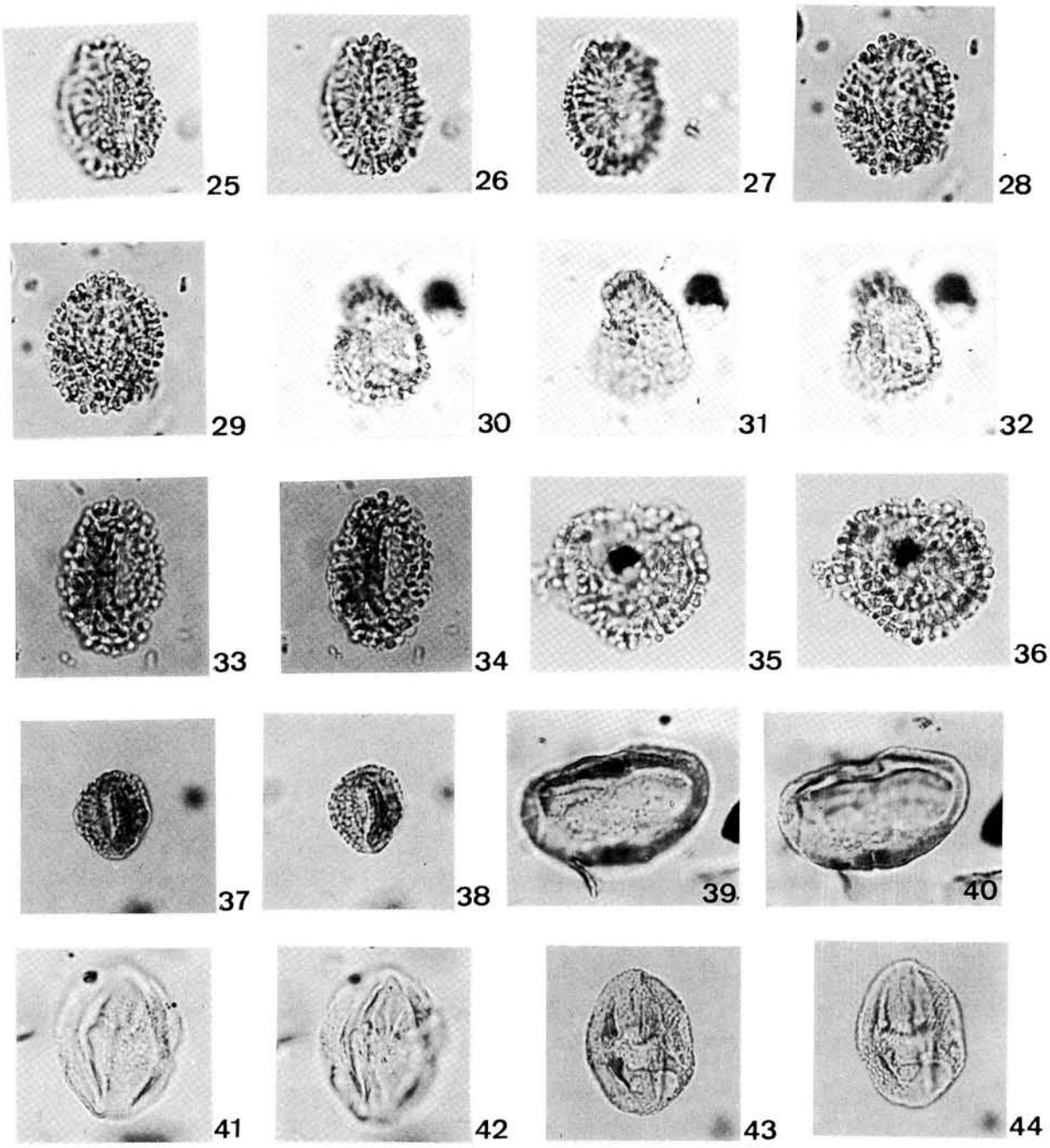
1. Retitricolpites schefflerus Shaw sp. nov. Figs. 21-24

Holotype: Slide OK-3 1800-(4); Figs. 21-22; film PF54-26, PF54-27; CPC Micropaleontology Lab.

Description: Grains tricolate, subprolate; 27-30 x 32-34 μm; colpi 23-28 μm long; ora lalongate, 7-8 μm wide; surface view reticulate; lateral view verruate to gemmate; exine 1 μm or less thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1800m).

Taxonomic affinity: This species is similar to the extant species of *Sinopanax* or *Schefflera* of Araliaceae.



Figs. 25-36. *Ilexpollenites ssuhuensis* Shaw. WA65-36, 37, 38; OK-3; 1760m-3, 23 x 17 μm; PF55-25, 26; OK-3, 1780m-4; 19 x 23 μm; PF25-10,11,12; OK-3, 1750m-4;19 x13 μm; TL16-13, 14; OK-3, 1720m-1; 25 x 16 μm; PF57-3, 4; OK-3, 1720m-2; 26 x 24.5 μm. Figs. 37-38. *Ilexpollenites minor* Huang & Huang. S5-16, 17; OK-1; 1669-3; 14 x 12 μm. Figs. 39-40. *Anodendronpolleniites taiwanensis* Shaw *sp. nov.* P9-12-14, P9-13-15; OK-1, 1588m-3, 19 x 31 μm. Figs. 41-44. *Retitricolpites acanthopanasus* Shaw *sp. nov.* S5-10, 11; OK-1, 1768m-4, 25 x 21 μm; S4-38, 39; OK-1, 1768-3; 24 x 18 μm. (AQUIFOLIACEAE, APOCYNACEAE, ARALIACEAE).

2. Retitricolpites acanthopanasus Shaw sp. nov. Figs. 41-44

Holotype: Slide OK-1 1768-(3); Figs. 43-44; film S4-38, S4-39; CPC Micropaleontology Lab.

Description: Grains tricolate, subprolate to perprolate; 18-21 x 24-25 μm; colpi 16-20 μm long; ora circular to lolongate, 3 μm long; surface view finely reticulate; lateral view finely verrucate to finely gemmate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1768 m).

Taxonomic affinity: This species is similar to the extant species of *Acanhtopanax* of Araliaceae.

Family 8. BETULACEAE

Genus 1. Alnipollenites Potonie 1931

Jahrrb. Preussischen Geol. Landesanstalt, Bd. 52, p. 4.

Type species: *Alnipollenites verus* (Pot.) ex Pot., ibid.

Diagnosis: Outlline polygonal, lenticullar in sideview, surface smooth, 4-5 protruding germinals, size 17-21 μm.

1. Alnipollenites firmaensis Shaw sp. nov. Figs. 45-46

Holotype: Slide YKL-6 1128-(2); Figs. 45-46; film WA75-28, 29; CPC Micropaleontology Lab.

Description: Grains 7-porate; 27-31 μm wide; aperture connected by thick sexinal bands; surface view obscure pattern, lateral view psilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (YKL-6 well, 1128m).

Taxonomic affinity: This species is similar to the extant species of *Alnus firma* of Betulaceae.

2. Alnipollenites formosensis (Huang) Huang Figs. 47-54

Slide: OK-1 1768-(4); Figs. 53-54; film S5-8, S5-9; CPC Micropaleontology Lab.

Description: Grains 4-5-porate; 17-25 μm wide; aperture connected by thick sexinal bands; surface view obscure pattern, lateral view psilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1768 m).

Taxonomic affinity: This species is similar to the extant species of *Alnus* of Betulaceae.

Genus 2. Ostryoipollenites Potonie 1951 ex Potonie 1960

Palaeontographica, Abt. B, Bd. 91; Pl. 20, Fig.46.

Type species: *Ostryoipollenites rhenanus* (Th.) Pot, 1951 ex Pot. 1960.

Diagnosis: Oblate pollen; stiffer than these in *Betulaceoipollenites,* equator circular to round triangular; triporate; no annulus; distinct labrum, exine chagrinate.

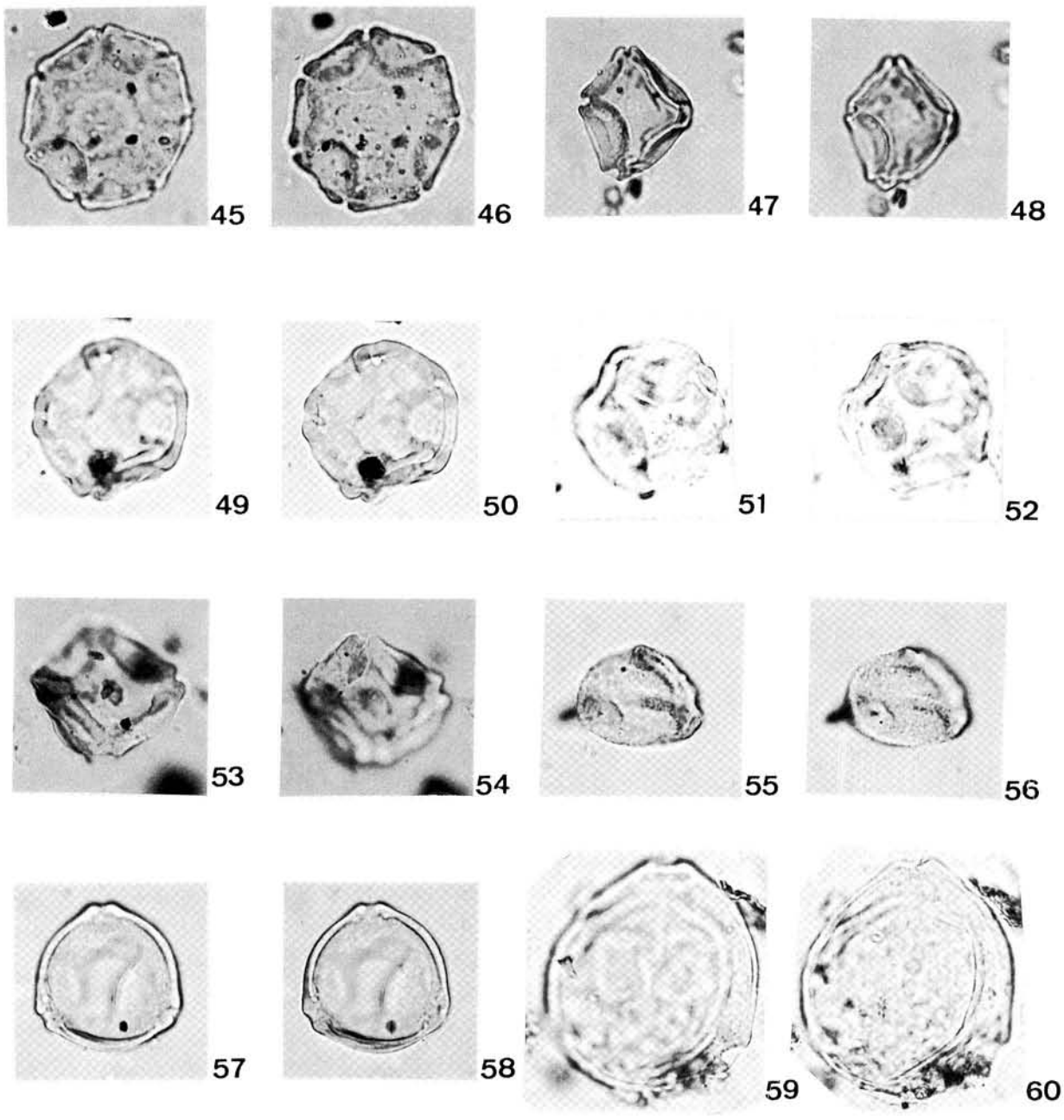
1. Ostryoipollenites taiwanensis Shaw sp. nov. Figs. 55-56

Holotype: slide OK-1 1719-(1); Figs. 55-56; film P 14-22-23, P14-23-24; CPC Micropaleontology Lab.

Description: Grains 3-porate; polar shape round triangular; 16-20 μm wide; surface view finely granulate; lateral view scabrate; exine thin, 1 μm thick; pore crassimarginate, 5-6 μm wide.

Stratigraphic occurrence: Eocene (OK-1 well, 1719 m).

Taxonomic affinity: This species is similar to the extant species of *Ostrya* of Betulaceae.



Figs. 45-46. *Alnipollenites firmaensis* Shaw *sp. nov.* YKL-6, 1128m-2, WA75-28, 29, 27 x 29 μm. Figs. 47-54. *Alnipollenites formosensis* (Huang) Huang, OK-3,1760m-4, PF45-3,4, 19 x 21 μm; OK-2; 1650m-3, W36-5, 6, 24 x 25 μm; YKL-1, 1190~1225m-3; W48-33, 34; 18 x 24 μm; OK-1; 1768m-4, S5-9, 8, 21 x 25 μm. Figs. 55-56. *Ostryoipollenites taiwanensis* Shaw *sp. nov.* OK-1, 1719m-1, P14-22-23, P14-23-24, 16 x 20 μm. Figs. 57-58. *Trivestibulopollenites taiwanensis* Huang OK-1, 1375m-1, P14-15-16, P14-16-17, 23 x 24 μm. Figs. 59-60. *Carpinipites ancipites* (Wodeh.) Sriv. YKL-6, 1190.5m-1, WA79-22, 23, 35 x 38 μm. (BETULACEAE).

Genus 3. Trivestibulopollenites Pflug in Thomson & Pflug 1953

1953 Palaeotographica, Bd. 94, Abt. B, p. 84.

Type species: *Trivestibulopollenites betuloides* Pfl. in Th. & Pfl.

Diagnosis: Triporate pollen; amb convexly, rounded triangular, never circular; pores equatorial, at the corners, always with a vestibulum, never with an atrium; isopolar; pore canal less than 0.3, cylindrical, never beak-sharped; no internoculum, solutionwedge, oculus or praevestibulum; anulus or labrum occasionally present.

1. Trivestibulopollenites taiwanensis Huang Figs. 57-58

Selected slide: OK-1 1375-(1); Figs. 57-58; film P14-13-14, P14-14-15; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb rounded triangular, 17-24 μm wide; pores equatorial, with a vestibulum at the corners, 6-7 μm wide; surface view obscure pattern, lateral view psilate to subpsilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1375 m).

Taxonomic affinity: This species is similar to the extant species of *Betula* of Betulaceae.

Genus 4. Carpinipites Srivastava 1953

Pollen et Spores, v. 8, no., 3, p. 530.

Type species: *Carpinipites ancipites* (Wodeh.) Sriv. ibid.

Diagnosis: Grains 3 or 4-porate; pores very slightly or not at all protruding, exine surrounding pores scarcely or not at all thickened, pore pattern as that of *Carpinus*; amb angular; exine smooth.

1. Carpinipites ancipites (Wodeh.) Sriv. Figs. 59-60

Selected slide: OK-2, 1901 m-2; Figs. 59-60; W38-28, 29; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular to round triangular; 34-39 μm; aperture slightly protruding common type, pores 6-7 μm wide; surface view smooth pattern; lateral view psilate; exine thin 1 μm or less thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1750 m, 1827 m, 1901 m).

Taxonomic affinity: This form species ressembles to the species of *Carpinus*.

2. Carpinipites taiwanensis Huang 1980 Figs. 61-68

Selected slide: OK-2, 1827m-1, W37-5, 6; OK-2, 1750m-5, W36-22, 23; OK-2, 1901m-3, W39-5, 6; OK-2, 1901m-2, W38-26, 27; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular; 23-29 μm; aperture slightly protruding common type, pores 4-5 μm wide; surface view smooth pattern; lateral view psilate; thin 1 μm or less thick.

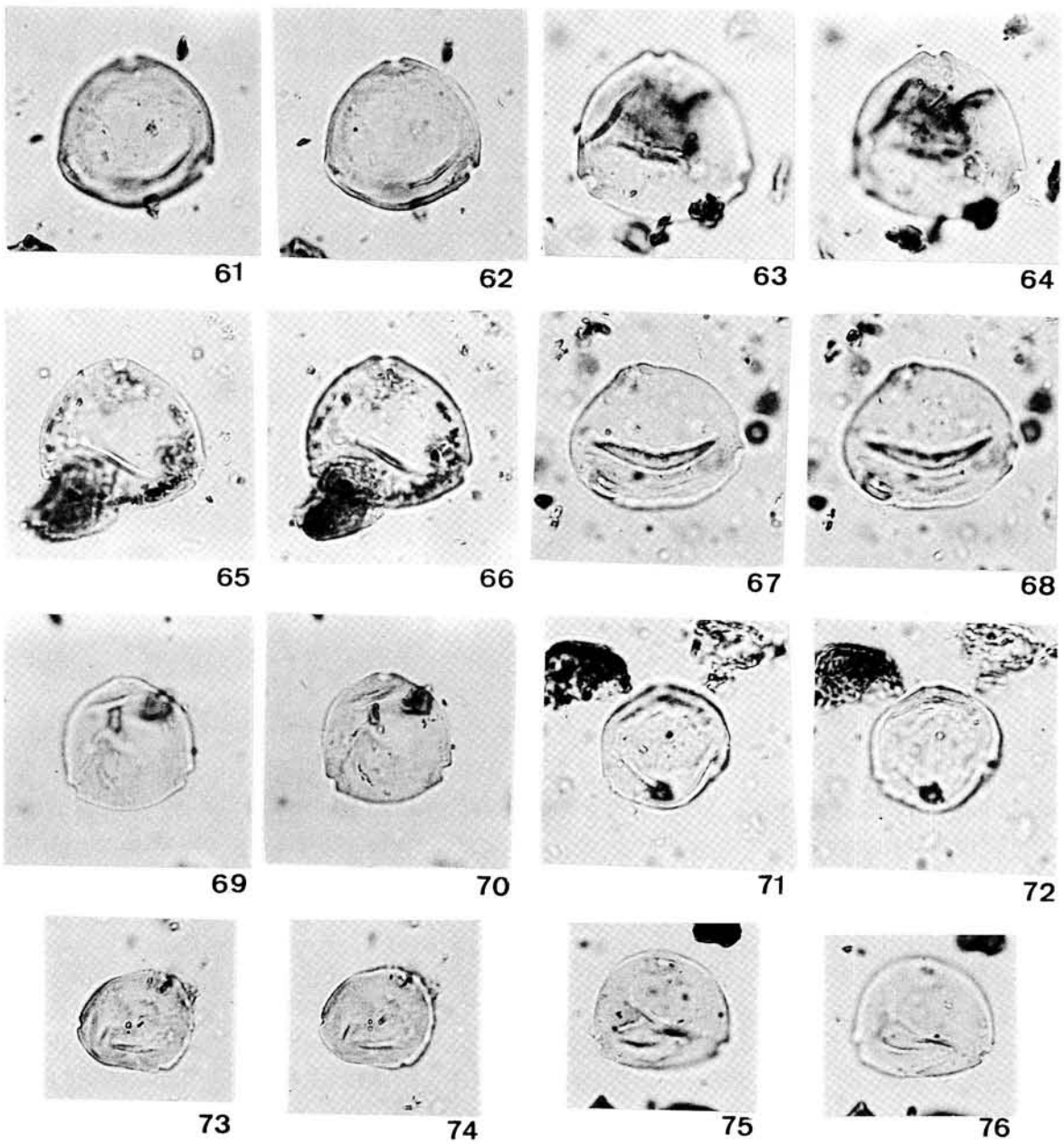
Stratigraphic occurrence: Eocene (OK-2 well, 1750 m, 1827 m, 1901 m).

Taxonomic affinity: This form species ressembles to the species of *Carpinus*.

3. Carpinipites pengchiahsuensis Shaw sp. nov. Figs. 69-76

Holotype: slide OK-2, 1801m-1; Figs. 69-70; film W36-34, 35; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular; 17-22 μm; aperture slightly protruding common type, pores 3-4 μm wide; surface view smooth pattern; lateral view psilate; exine thin 0.5 μm thick.



Figs. 61-68. *Carpinipites taiwanensis* Huang OK-2, 1827m-1, W37-5, 6, 25 x 25 μm; OK-2, 1750m-5, W36-22, 23, 28 x 26 μm; OK-2, 1901m-3, W39-5, 6, 27 x 26 μm; OK-2, 1901m-2, W38-26, 27. 24 x 29 μm. Figs. 69-76. *Carpinipites pengchiahsuensis* Shaw *sp. nov.* OK-2, 1810m-1, W36-34, 35, 21 x 21 μm; OK-2, 1901m-4, W39-25, 26, 21 x 21 μm; OK-3, 1750m-1; PF9-21, 22, 17.8 x 19; OK-2, 1700m-2, W36-7, 8, 20 x 22 μm. (BETULACEAE).

Stratigraphic occurrence: Eocene (OK-2 well, 1700 m, 1801 m, 1901 m; OK-3 well, 1750m).

Taxonomic affinity: This form species ressembles to the species of *Carpinus*.

Genus 5. Triporopollenites Pflug & Thomson in Thomson & Pflug 1953

Palaeontographica Bd. 94, Abt. B, 82, Pl. 9. Fig. 2a.

Type species: *Triporopollenites coryloides* (Potonie) Th. & Pfl.

Diagnosis: Grains 3-porate; amb angular to round triangular, never circular; pore equatorial, at the corner, never with atrium, vestibulum or post- vestibulum; endexine and ektexine always tightly appressed; enporus less than three times the exoporus; no interloculum, solution-wedge, oculus, praevestibulum, endanulus; occasionlly with anulus or labrum.

1. Triporopollenites coryloides (Potonie) Th. & Pfl. Figs. 77-84

Selected slide: OK-2, 1827m-1, W37-5, 6; OK-2, 1750m-5, W36-22, 23; OK-2, 1901m-3, W39-5, 6; OK-2, 1901m-2, W38-26; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular; 23-29 μm; aperture tumescence type, pores 6-7 μm wide; surface view obscure pattern; lateral view psilate to subpsilate; exine thin 1-1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1750m, 1827m, 1901m).

Taxonomic affinity: This form species ressembles to the species of *Corylus.*

2. Triporopollenites coryloides (Potonie) Th. & Pfl. minor var. nov. Figs. 85-86, 228, 229

Holotype: slide YKL-6, 1190.5m-2; Figs. 85-86; W79-22, 23; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular; 17-21 μm; aperture tumescence type, pores 4-5 μm wide; surface view obscure pattern; lateral view psilate; exine thin 1 μm thick.

Stratigraphic occurrence: Eocene (YKL-6 well, 1190.5m).

Taxonomic affinity: This form species ressembles to the species of *Corylus.*

Family 9. BIGNONIACEAE

Genus 1. Retitricolpites van der Hammen 1956 emend. Pierce 1961

Type species: *Retitricolpites ornatus* (van der Hammen) Pierce

Diagnosis: Reticulate tricolpate sporomorphs, subprolate to perprolate; colpi straight.

1. Retitricolpites campanulatus Shaw sp. nov. Figs. 87-92

Holotype: Slide OK-1 1768bl-(1); Figs. 89-90; film P4-18-21, P4-19-22; CPC Micropaleontology Lab.

Description: Grains tricolpate, subprolate to perprolate; 19-26 x 38-45 μm; colpi 31-41 μm long; surface view reticulate; lateral view gemmate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1719m, 1768m, 1825m).

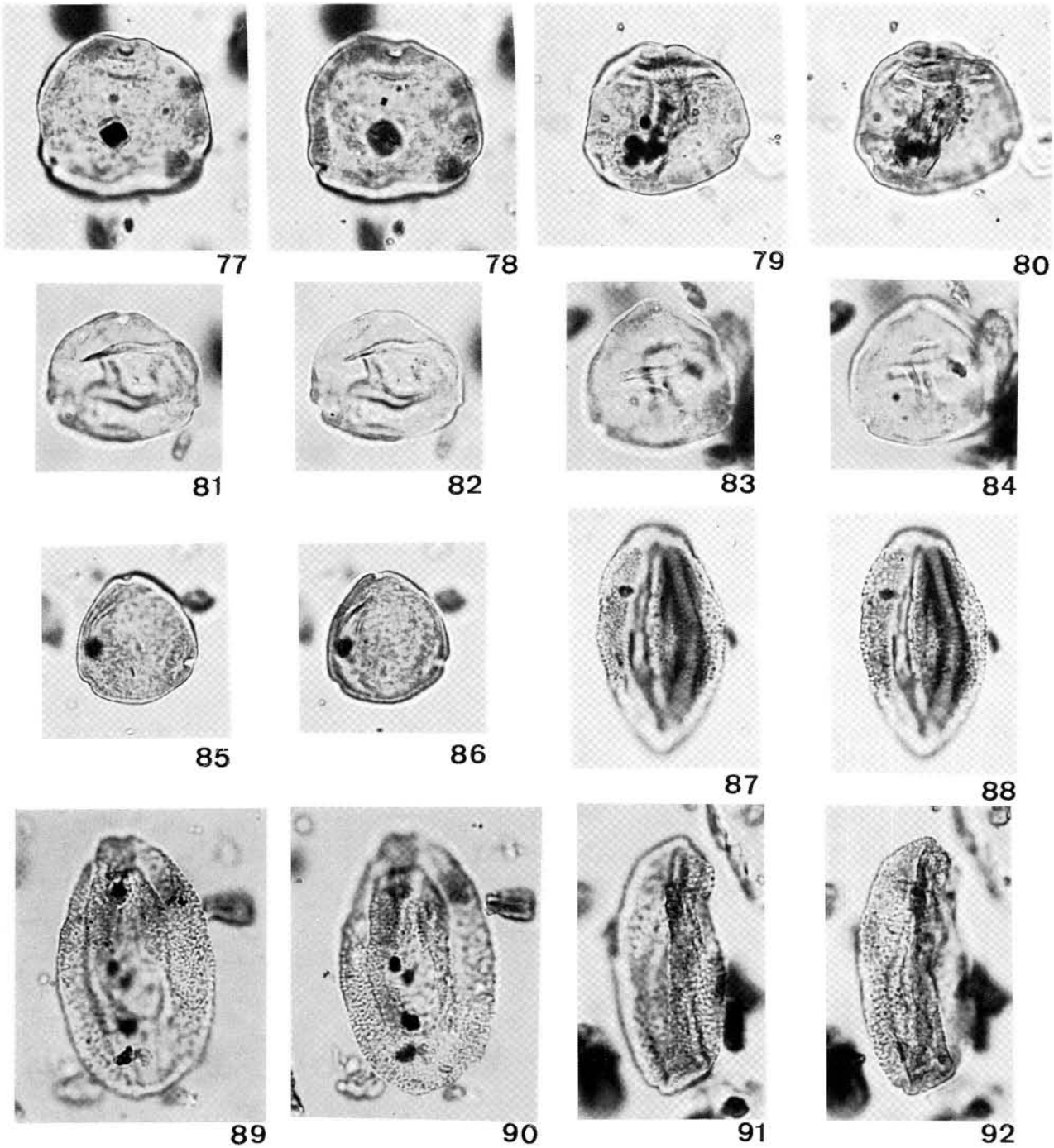
Taxonomic affinity: This form species ressembles to the pollen of *Spathodea campanulata.*

Family 10. BOMBACEAE

Genus 1. Bombacacidites Couper 1960

New Zealand Geol. Surv., Paleont. Bull. 32, p. 53.

Type species: *Bombacacidites bombaxoides* Coup.



Figs. 77-84. *Triporopollenites coryloides* (Potonie) Th. & Pfl. OK-1; 1955m-1, WA60-25, 26. 26 x 23 μm; OK-1; 1955m-1, WA60-23, 24, 28x24 μm; OK-1; 1719m-2, P15-32-34, P15-33-35, 25 x 22 μm; OK-1; 1588BL-3, P9-31-33, P9-32-34, 25 x 26 μm. Figs. 85-86. *Triporopollenites coryloides* (Potonie) Th. & Pfl. *minor var. nov.* YKL-6; 1190.5m-2, W79-22, 23, 19 x 21 μm. Figs. 87-92. *Retitricolpites campanulatus* Shaw *sp. nov.* OK-1; 1719m-1, P14-19-20, P14-20-21, 21 x 38 μm; OK-1; 1768BL-1, P4-18-21, P4-19-22, 26 x 44 μm; OK-1; 1825m-1, S3-21, 22, 44 x 19 μm. (BETULACEAE, BIGNONIACEAE).

Diagnosis: Isopolar, tricolporate, colpi short, plan-aperturate (apertures midway in sides of grain in polar view); peroblate, triangular amb, clearly sculptured.

1. Bombacacidites taiwanensis Shaw sp. nov. Figs. 93-94

Holotype: Slide OK-1 1435-(3); Figs. 93-94; film S9-15, S9-16; CPC Micropaleontology Lab.

Description: Grains tricolporate, polar view inter-angular; 24-28 μm wide; colpi 4-5 μm deep; surface view finely reticulate; lateral view finely clavate; exine 1 μm thick or less.

Stratigraphic occurrence: Eocene (OK-1 well, 1435m).

Taxonomic affinity: This form ressembles to the species of *Bombax*.

Family 11. CAPPARIDACEAE

Genus 1. Retitricolporoidites Mathur 1966

Quart. J. Geol. Min. Metall. Soc. India, v. 38, no. 1, p. 45 Retitricolporites v. D. Hammen 1956 ex v. D. Hammen & Wijmstra 1964.

Type species: *Retitricolporoidites microreticulatus* Math.

Diagnosis: Reticulate tricolporoidate sporomorphs.

1. Retitricolporoidites religiosus Shaw sp. nov. Figs. 150-153

Holotype: Slide OK-1 1719-(1); Figs. 150-151; film P14-35-36, P14-36-37; CPC Micropaleontology Lab.

Description: Grains tricolporate, prolate-spheroidal to subprolate; 14-17 x 15-22 μm; colpi 11-13 μm long; surface view finely reticulate; lateral view verrucate to gemmate; exine 0.5 μm.

Stratigraphic occurrence: Eocene (OK-1 well, 1545m, 1719m).

Taxonomic affinity: This form species ressembles to the pollen of *Crataeva religiosa.*

Family 12. CHENOPODIACEAE

Genus 1. Chenopodipollis Krutzsch 1966

Geologie, Beiheft 55, p. 35

Type species: *Chenopodipollis multiplex* (Weyl. & Pfl. 1957) Krtz., ibid.

Diagnosis: Amb circular, figura globular; with a medium to very large number of pores that are partly open. partly closed by a thin membrane, approx. 2 μm diameter, regularly distributed over the whole surface leaving only little room between them; wall between pores more or less distinctly minutely columellate, in vertical view appearing 'punctate'; pores slightly recessed; wall ca. 1-2 μm thick; overall size small to medium large.

1. Chenopodipollis microporatus (Nakoman) Liu Figs. 95, 96

Chenopodipollis taiwanensis Huang, 1980.

Selected slide: OK-3 1750-(1); Figs. 95, 96; film PF9-7, PF9-8; CPC Micropaleontology Lab.

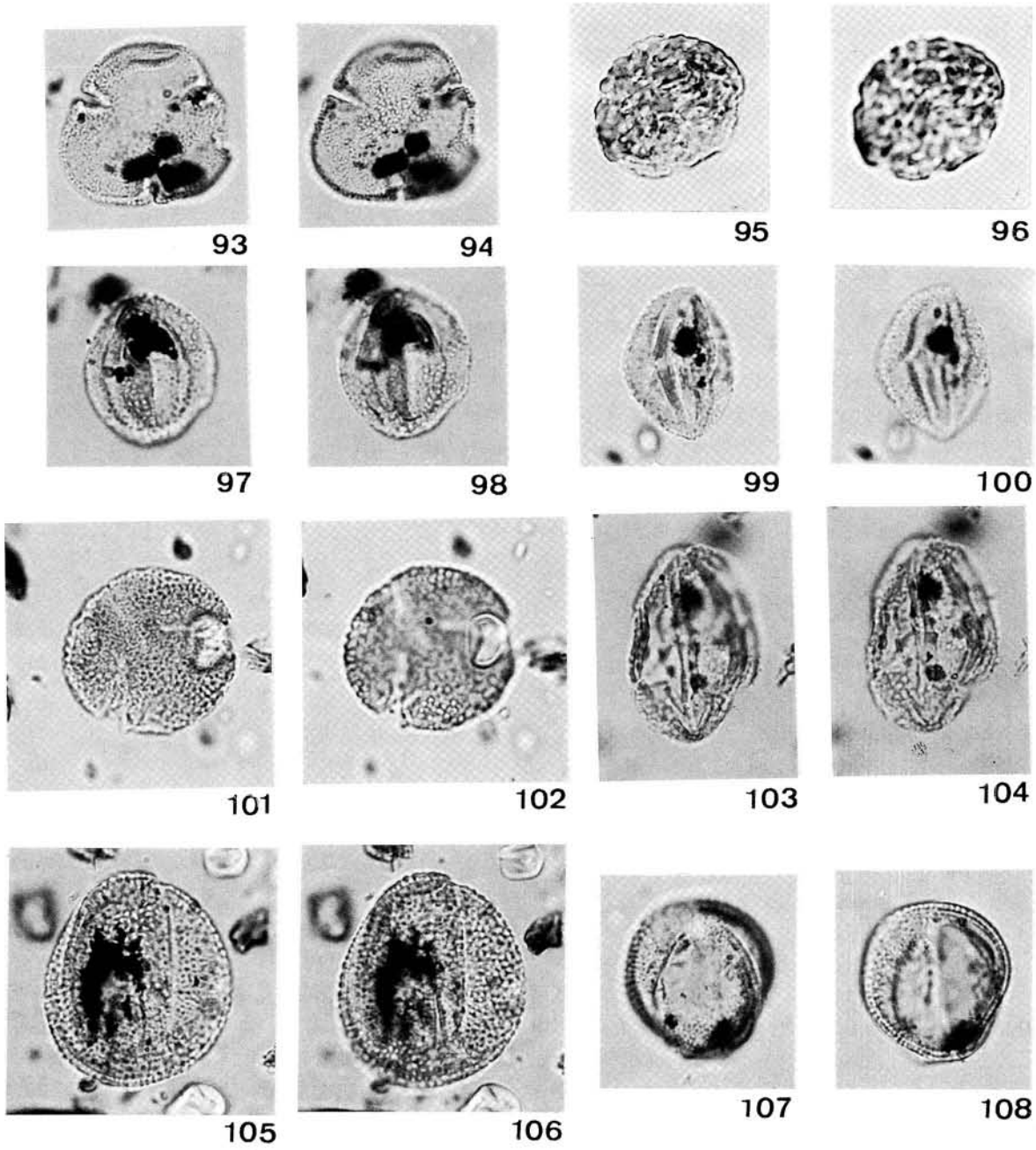
Description: Grains pantoporate, spheroidal to subspheroidal; 17-24 μm; surface view foveolate; lateral view verrucate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

Taxonomic affinity: This form species ressembles to the species of *Chenopodium.*

Family 13. COMBRETACEAE

Genus 1. Retitricolporoidites Mathur 1966



Figs. 93-94. *Bombacacidites taiwanensis* Shaw *sp. nov.* OK-1; 1435m-5, S9-15, 16, 27 x 25 μm. Figs. 95-96. *Chenopodipollis microporatus* (Nakoman) Liu OK-3; 1750m-1, PF9-7, 8, 25 x 24 μm. Figs. 97-102. *Retitricolporoidites verus* Shaw *sp. nov.* OK-1; 1768m-3, S4-27, 28, 25 x 21 μm; OK-1; 1588BL-3, P9-1-3, P9-2-4, 17.5 x 24 μm; OK-3; 1760m-5, PF46-22, 23, 27 x 26 μm. Figs. 103-104. *Retitricolporoidites racemosus* Shaw *sp. nov.* OK-1; 1768m-5, S5-20, 21, 31 x 20 μm. Figs. 105-106. *Retitricolpites cruciferus* Shaw *sp. nov.* OK-1; 1545m-1, P10-9-8, P10-10-9, 31 x 34 μm. Figs. 107-108. *Retitricolpites vandellius* Shaw *sp. nov.* OK-1; 1435m-1, P13-23-24, P13-24-25, 25 x 24 μm. (BOMBACEAE, CHENOPODIACEAE, OLEACEAE, COMBRETACEAE, CRUCIFERAE, SCROPHULAREIACEAE).

Quart. J. Geol. Min. Metall. Soc. India, v. 38, no. 1, p. 45 Retitricolporites v. D. Hammen 1956 ex v. D. Hammen & Wijmstra 1964.

Type species: *Retitricolporoidites microreticulatus* Math.
Diagnosis: Reticulate tricolporoidate sporomorphs.

1. Retitricolporoidites racemosus Shaw sp. nov. Figs. 103-104

Holotype: Slide OK-1 1768-(5); Figs. 103-104; film S5-20, S5-21; CPC Micropaleontology Lab.

Description: Grains tricolporate, prolate-spheroidal to prolate; 30-32 x 19-21 μm; colpi 26-29 μm long; surface view reticulate; lateral view verrucate; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1768m).

Taxonomic affinity: This form species ressembles to the pollen of *Lumnitzera racemosa.*

Family 14. COMPOSITAE

Genus 1. Ageratumpollenites Huang 1980.

Taiwania, vol.25 p. 72-73.
Type species: *Ageratumpollenites taiwanensis* Huang 1980 .
Dagnosis: Grains 3-colporate; amb circular; exine echinate, granulate.

1. Ageratumpollenites formosensis Shaw sp. nov. Figs. 114, 115

Holotype: Slide OK-1 1638-(5); Figs. 114, 115; film S8-23, S8-24; CPC Micropaleontology Lab.

Description: Grains tricolporate, amb circular to subcircular; 21-24 μm wide; colpi 15 μm long; ora indistinct; surface view irregular granulate; lateral view echinate, the echini 1-3 μm long; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1638m).

Taxonomic affinity: This form species ressembles to the species of *Ageratum.*

Genus 2. Artemisiaepollenites Nagy 1969.

Eticulate surfa
Type species: *Artemisiaepollenites sellularis* Nagy.
Diagnosis: Small tricolporate pollen with small spines on the tegillum; inter-baculate with reticulate surface.

1. Artemisiaepollenites annus Huang and Huang Figs. 116, 117

Selected slide: OK-2 1750-(5); Figs. 116,117; film W36-24, 25; CPC Micropaleontology Lab.

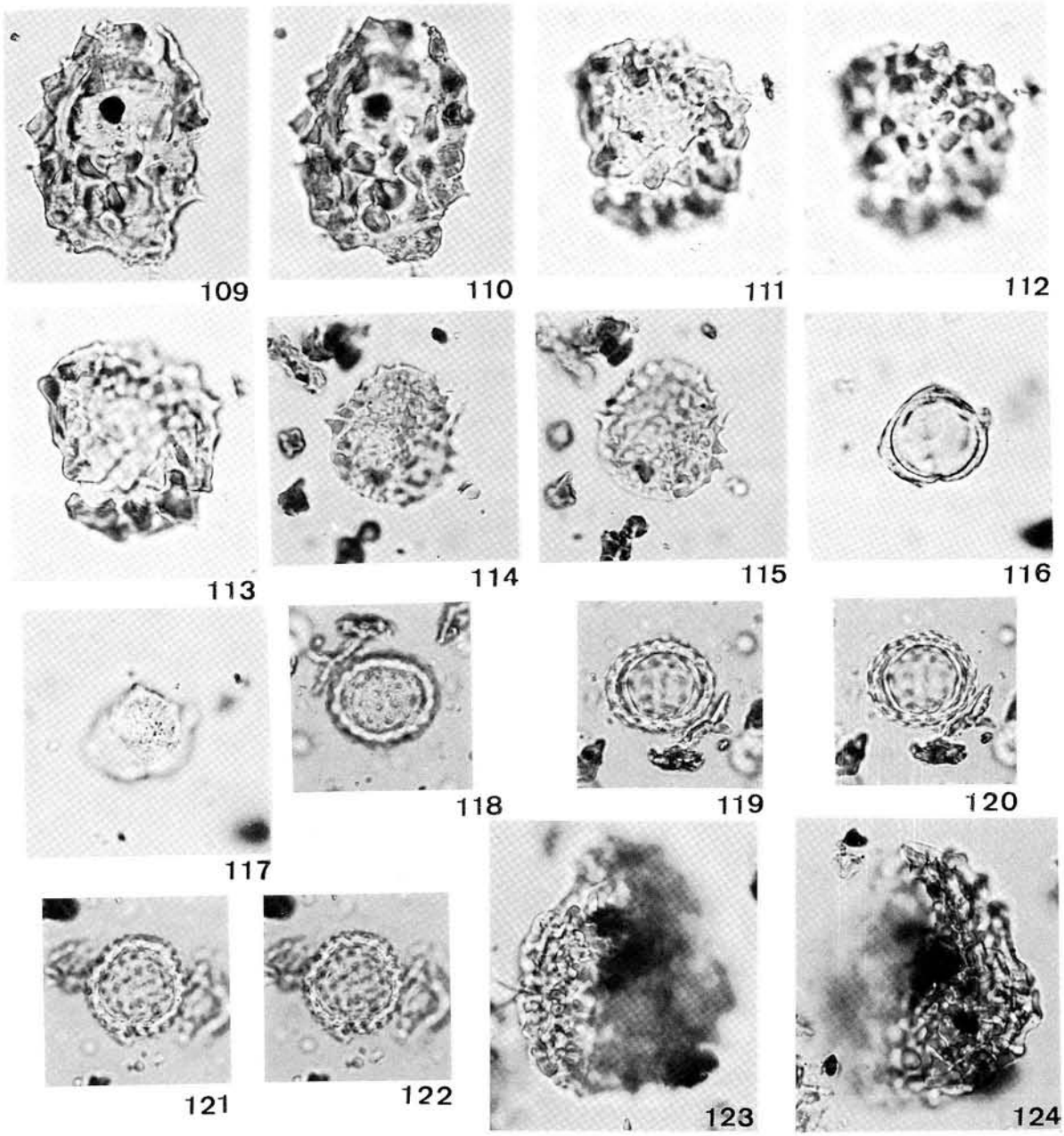
Description: Grains tricolporate, amb circular to subcircular, 17-19 μm wide; surface view finely granulate; lateral view scabrate to subpsilate, the echini 1-3 μm long; exine 0.5-1 μm; exine 1.5-2 μm thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1750m).

Taxonomic affinity: This form species ressembles to the pollen of *Ageratum annus* L. of the Compositae (Huang 1972).

Genus3. Compositoipollenites Potonie 1951 ex Potonie 1960

Synopsis III, p. 105
Type species: *Compositoipollenites rizophorus* (Pot.) Pot., ibid.



Figs. 109-113. *Compositoipollenites taiwanensis* Shaw *sp. nov.* OK-1; 1638m-2, WA60-30, 31, 37 x 27 μm; OK-3; 1750m-1, PF9-2, 3, 4, 32 x 31 μm. Figs. 114-115. *Ageratumpollenites formosensis* Shaw *sp. nov* OK-1; 1638m-5; 2, S8-23, 24, 21 x 24 μm. Figs. 116-117. *Artemisiaepollenites annus* OK-2; 1750m-5, W36-24, 25, 19 x 17.1 μm. Figs. 118-122. *Compositoipollenites pengchiahsuensis* Shaw *sp. nov* OK-2; 1418m-2, PF56-32, 33, 34, 17 x 15 μm; OK-2; 1827m-3, PF56-29, 30, 16 x 16 μm. Figs. 123-124. *Thladiantkapollenites taiwanensis* Shaw *sp. nov* OK-1; 1768m BL-3, S4-36, 37, 47 x 38 μm. (COMPOSITAE, CUCURBITACEAE).

Diagnosis: Spherical pollen; 3 pores (and colpi?); exine all over ornamented with spinae, which are often irregular and often bent; spinae 3-4 μm in holotype, at their bases separated by a negative reticulum.

1. Compositoipollenites taiwanensis Shaw sp. nov. Figs. 109-113

Holotype: Slide OK-1 1638-(2); Figs. 109-110; film WA60-30, 31; CPC Micropaleontology Lab.

Description: Grains tricolporate, amb circular to subcircular; 27-37 μm wide; colpi 19μm long; ora indistinct; surface view irregularly granulate; lateral view echinate, echini 3-7 μm long; exine 1-2 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1638m).

Taxonomic affinity: This form species ressembles to the species of Compositae.

2. Compositoipollenites pengchiahsuensis Shaw sp. nov Figs. 118-122

Holotype: Slide OK-2 1418-(2); Figs. 118-120; film PF 56-32, 33, 34; CPC Micropaleontology Lab.

Description: Grains tricolporate, amb circular to subcircular; 15-17 μm wide; colpi 10 μm long; ora indistinct; surface view irregularly granulate; lateral view echinate, the echini 1-1.5 μm long; exine 1-1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1418m, 1827m).

Taxonomic affinity: This form species ressembles to the species of Compositae.

Family 15 CRUCIFERAE

Genus 1. Retitricolpites van der Hammen 1956 emend. Pierce 1961

Type species: *Retitricolpipites ornatus* (van der Hammen) Pierce.

Diagnosis: Reticulate tricolpate sporomorphs, spheroidal to perprolate; colpi straight.

1. Retitricolpites cruciferus Shaw sp. nov. Figs. 105-106

Holotype: Slide OK-1 1545-(1); Figs. 105-106; film P10-9-8, P10-10-9; CPC Micropaleontology Lab.

Description: Grains tricolpate, prolate-spheroidal; 36-32 x 31-28 μm; colpi 28 μm long; surface view reticulate; lateral view gemmate to verrrucate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1545m).

Taxonomic affinity: This species is similar to the extant species of Cruciferae.

Family 16 CUCURBITACEAE

Genus 1. Thladiantkapollenites gen. nov.

Type species: *Thladiantkapollenites taiwanensis* Shaw *gen. nov.*

Diagnosis: Grains tricolpate, medium to large size, polar view circular to semi-angular; surface view reticulate to lopho-reticulate; lateral view clavate.

1. Thladiantkapollenites taiwanensis Shaw sp. nov. Figs. 123-124

Holotype: Slide OK-1 1768bl-(3); Figs. 123-124; film S4-36, S4-37; CPC Micropaleontology Lab.

Description: Grains tricolpate, polar view circular to semi-angular; 38-47 μm wide; colpi length 14 μm or more; surface view reticulate; lateral view clavate; exine 1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1768m).

Taxonomic affinity: This species is similar to the extant species of *Thladiantka* of Cucurbitaceae.

Family 17. DROSERACEAE
Genus 1. Droserapollis Krutzsch 1970

Palaeontol. Abhandl., Abt. B, Bd. 3, p. 413.

Type species: *Droserapollis lusaticus* Krutzsch 1959.

Diagnosis: Tetrahedral tetards of multicycloporate pollen with a fine echinate sculpture. Pores small, simple, arrange along a circle on the proximal face at the end of radial ridges, in part poorly defined, wall not thick.

1. Droserapollis taiwanensis Shaw sp. nov. Figs. 125-127

Holotype: Slide OK-3 1750-(3); Figs. 125-127; film PF-17-32, PF-17-33, PF-17-34; CPC Micropaleontology Lab.

Description: Grains tetrahedral tetards, or monad; circular to subcircular 30-39 μm wide; aperture indistinct; surface view finely irregular granulate, lateral view echinate; exine thin, less than 1 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

Taxonomic affinity: This form species ressembles to the species of *Drosera* of Droceraceae.

Family 18. ELAEAGNACEAE
Genus 1. Slowakipollis Krutzsch

Type species: Slowakipollis cechovici (Pacl.) Krtz.

Diagnosis: "Tricolporate pollen; amb triangular, or square, germinals with complex pentapollenoid" structure, usually with only a short exocolpus, the lateral view with psilate or with weak structure."

1. Slowakipollis cechovici (Pacl.) Krtz. Figs. 128, 129

Selected slide: OK-1 1638-(4); Figs. 128, 129; film WA61-5, 6; CPC Micropaleontology Lab.

Description: Grains 3-colporate, amb sem-angular to subangular, sides slightly convex, 26-30 μm wide; pore with pronounced triangular outlines; wall ca. 1 μm thick; surface view granulate, lateral view subpsilate to scabrate.

Stratigraphic occurrence: Eocene (OK-1 well, 1638m).

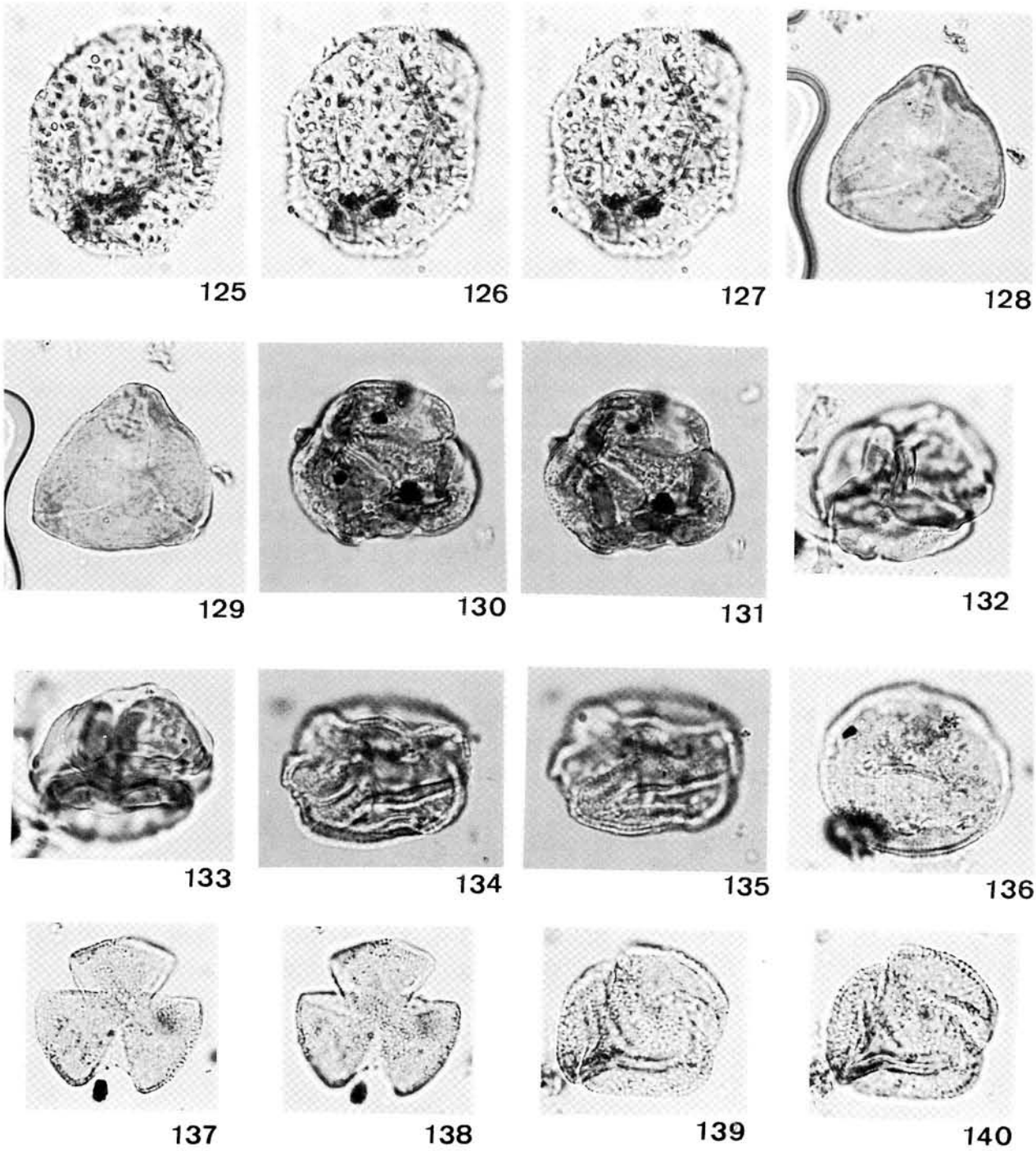
Taxonomic affinity: This form species ressembles to the species of *Elaeagnus*. (Huang, 1972).

Family 19 ERICACEAE
Genus 1. Ericipites Wodehouse 1933

Bull. Torrey Botanical Club, v. 60, p. 516.

Type species: *Ericipites longisulcatus* Wodehouse

Diagnosis: Tetrahedral tetards of tircolporate pollen with smooth, punctate, granulate to weakly verrucate sculpture. Colpi arranged into meridional pairs, of various length, mostly narrow slits. Pores in part indistinct, usually in the joining region between two individual grains. Individual grains isopolar.



Figs. 125-127. *Droserapollis taiwanensis* Shaw *sp. nov* OK-3, 1750m-3, PF17-32, 33, 34, 30-39 μm. Figs. 128-129. *Slowakipollis cechovici* (Pacl.) Krtz. OK-1; 1638m-4, WA61-5, 6, 29.1 x 27 μm. Figs. 130-133. *Ericipites ovalifolia* Huang OK-1;1699mBL-1, P8-27-30, P8-28-31, 28 x 32 μm;. OK-3; 1760m-5, PF47-37. 38, 31 x 25 μm. Figs. 134-136. *Periporopollenites formosana* Huang *medius var. nov* OK-1 2028-(1); film S1-2-3, S1-3-4 21 x 29 μm; OK-1; 1306m-1, WA64-15, 29 x 32 μm. Figs. 137-138. *Tricolpites pengchiahsuensis* Shaw *sp. nov.* OK-3, 1750m-5, PF28-34, 35, 27-28 μm. Figs. 139-140. *Verbenaceaepollenites vitexensis* Shaw *sp. nov.* OK-3, 1750m-5, PF28-36, 37, 26-30 μm. (DROSERACEAE, ELAEAGNACEAE, ERICACEAE, HAMAMELIDACEAE, AIZOACEAE, VERBENACEAE).

1. Ericipites ovalifolia Huang 1980 Figs. 130-133

Selected slide: OK-1 1669-bl-(1); Figs. 130-131; film P8-27-30, P8-28-3; OK-3 1760-(5); Figs. 132-133; film PF47-37-38; CPC Micropaleontology Lab.

Description: Grains tetrahedral tetards; tircolporate; 29-34 μm wide; surface view finely reticulate to obscure pattern, lateral view scabrate; exine 1-1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This form species ressembles to the pollen of *Lyonia ovalifolia*.

Family 20. EUPHORBIACEAE

Genus 1. Euphorbiacites Zakl. 1965 ex Li, Sung & Li 1978

Type species: *Euphorbiacites (al. tricol) f. communis* Raatz.

Diagnosis: Grains 3-colporate; subprolate to prolate; colpi long, nearly as long as P axes; ora circular, distinct and large, sexine reticulate to clavate process.

1. Euphorbiacites wallensenensis (Pflug) Li, Sung & Li. Figs. 141-147

Selected slide: Figs. 141-147; OK-1, 1788m. BL-4, P2-2-4, P2-3-5, P2-4-6, 26 x 45 μm ; OK-1; 1768m-1, S4-22, 23, 25 x 47 μm; OK-1, 1699m. BL-2, P8-0-1, P8-1-2, 26 x 43 μm; CPC Micropaleontology Lab.

Description: Grains tricolporate, subprolate to prolate; 24-26 x 42-47 μm; colpi 39 μm long, ora circular, 7 μm wide; surface view reticulate; lateral view finely verrucate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m, 1768m, 1788m).

Taxonomic affinity: This species is similar to the pollen of *Sapium* of Euphorbiaceae (Zhu Z., L. Wu, P. Xi, Z. Song, & Y. Zhang, 1985).

2. Euphorbiacites granostriatus Song et Zhu Figs. 148, 149

Selected slide: OK-1 1699m. BL-2, Figs. 148, 149; film P8-0-1, P 8-1-3; CPC Micropaleontology Lab.

Description: Grains tricolporate, prolate; 31 x 56 μm; colpi 47-49 μm long, ora circular, 12-13 μm wide; surface view reticulate; lateral view finely verrucate; exine 1-2 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1638m)

Taxonomic affinity: This species is similar to the pollen of *Sapium* of Euphorbiaceae (Song Z., X. Guan, Z. Li, Y. Zheng, W. Wang and Z. Hu, 1985).

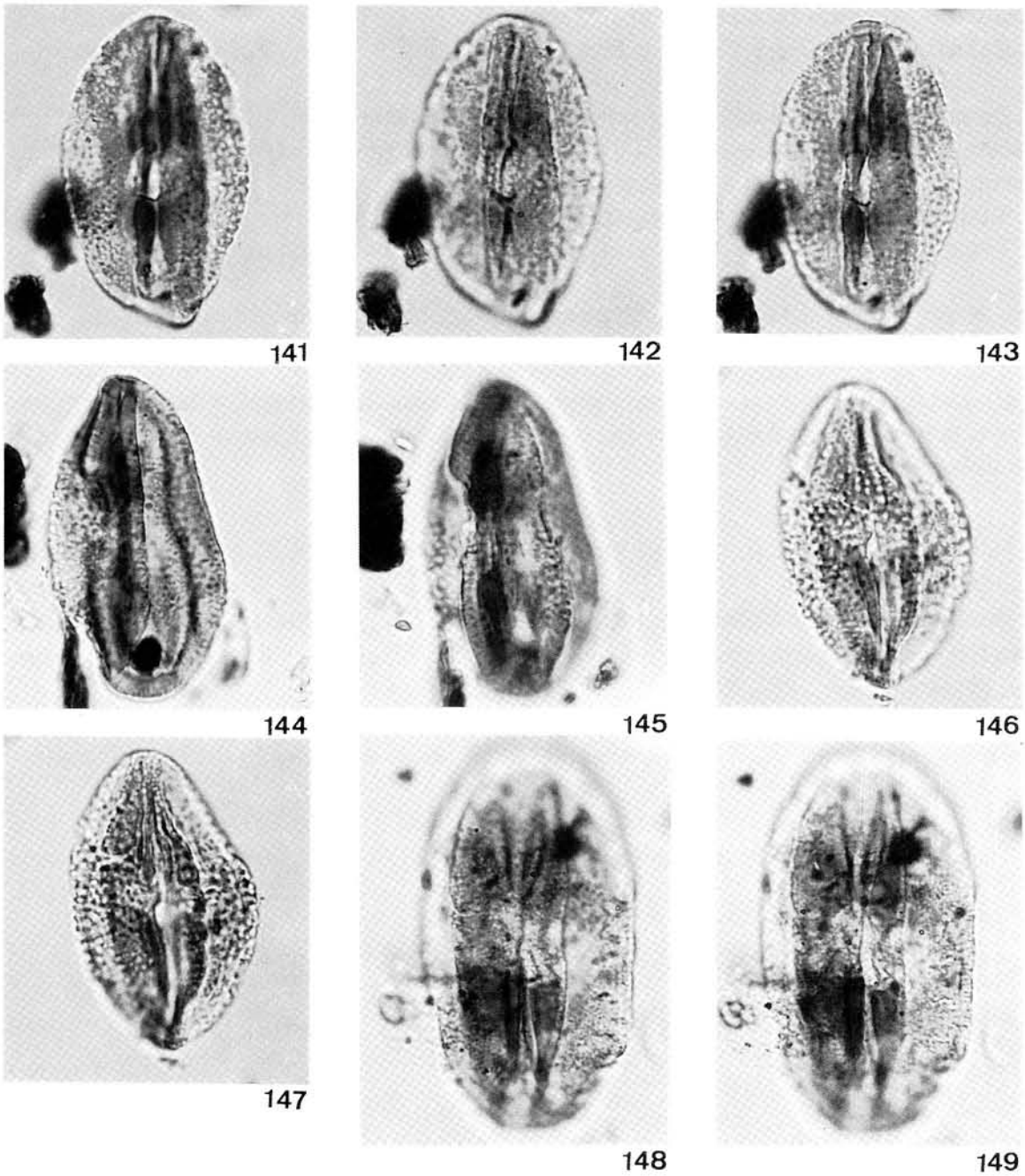
3. Euphorbiacites pacatus (Pflug) Ye Figs. 162, 163

Selected slide: OK-3 1730m-2; Figs. 162, 163; film TL11-37, 38; CPC Micropaleontology Lab.

Description: Grains tricolporate, prolate; 27 x 34 μm; colpi 49 μm long, ora circular, 12-13 μm wide; surface view finely reticulate; lateral view scabrate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1730m).

Taxonomic affinity: This species is similar to the pollen of *Sapium* of Euphorbiaceae (Song Z., X.*et al.*, 1985).



Figs. 141-147. *Euphorbiacites wallensenensis* (Pflug) Li, Sung 7 Li. OK-1, 1788m BL-4, P2-2-4, P2-3-5, P2-4-6, 26 x 45 μm; OK-1; 1768m-1, S4-22, 23, 25 x 47 μm; OK-1, 1699m BL-2, P8-0-1, P8-1-2, 26 x 43 μm. Figs. 148-149. *Euphorbiacites granostriatus* Song et Zhu OK-1; 1638m-2, S8-3, 4, 31 x 56 μm. (EUPHORBIACEAE).

Genus 2. Mallotuspollenites Shaw gen. Nov.

Type species: *Mallotuspollenites taiwanensis* Shaw.

Diagnosis: Grains tricolporate, spheroidal to oblate-spheroidal, amb circular, colpi long, ora transversally parallel, surface view finely granulate to obscure pattern; lateral view subpsilate to scabrate.

1. Mallotuspollenites taiwanensis Shaw sp. nov. Figs. 154-157

Holotype: Slide OK-3 1750-(2); Figs. 154-155; film PF14-31, 32; CPC Micropaleontology Lab.

Description: Grains 3-colporate; spheroidal to oblate-spheroidal, 18-20 x 18-20 μm, amb circular, colpi long, ora transversally parallel, surface view finely granulate to obscure pattern; lateral view subpsilate to scabrate; exine 1-2 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

Taxonomic affinity: This species is similar to the pollen of *Mallotus* of Euphorbiaceae.

Genus 3. Acalyphapollenites Shaw gen. nov.

Type species: *Acalyphapollenites taiwanensis* Shaw

Diagnosis: "Grains tricolporate, amb circular to semi-anglar, colpi short, ora transversally elliptic, surface view finely granulate, finely reticulate or obscure pattern; lateral view scabrate.

1. Acalyphapollenites taiwanensis Shaw sp. nov. Figs. 158-161

Holotype: Slide OK-1 1588bl-(3); Figs. 160-161; film P9-33-35, P9-34-36; CPC Micropaleontology Lab.

Description: Grains 3-colporate; amb circular to semi-anglar, 20-24 μm wide; colpi short, 5 μm long ; ora common type, 2 μm wide; surface view finely granulate to finely reticulate; lateral view scabrate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1588m).

Taxonomic affinity: This species is similar to the pollen of *Acalypha* of Euphorbiaceae.

Family 21. FAGACEAE

Genus 1. Tricolporopollenites Pflug & Thomson in Thomson & Pflug 1953

Palaeontographica Bd. 94, Abt. B, p. 98.

Type species: *Tricolporopollenites dolium* (Potonie) Th. & Pfl.

Diagnosis: Pollen with three symmetrically distributed germinals, each cnonsists of a meriditional colpus with an equatorial pore.

1. Tricolporopollenites megaexactus (Potonie) Th. & Pfl. Figs. 194-197

Selected slide: OK-1 1669-bl-(1); Figs. 194-195; film P8-34-37, P 8-35-38; CPC Micropaleontology Lab.

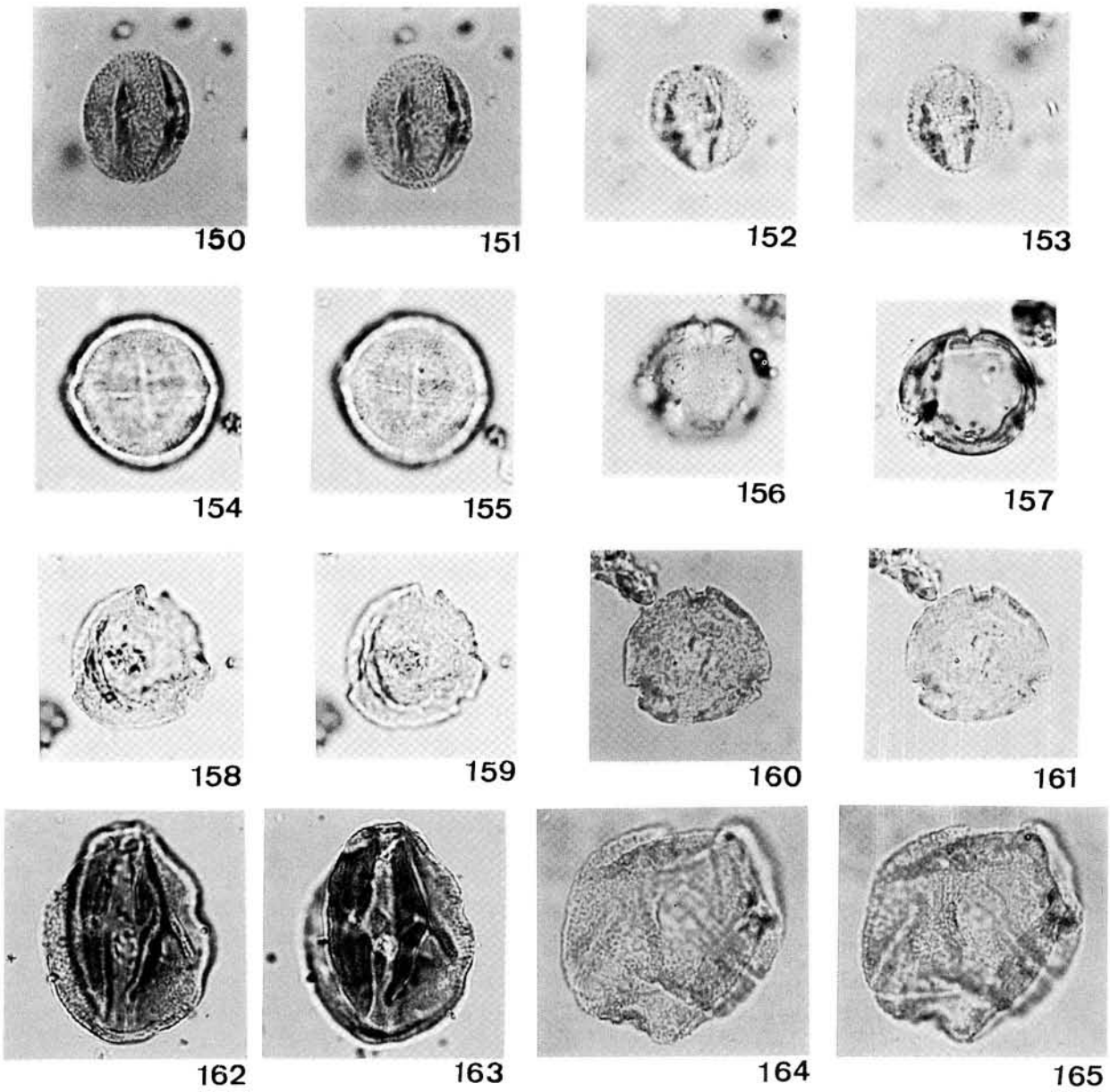
Description: Grains 3-colporate; equatorial view suboblate, spheroidal to oblate-spheroidal; 12-15 x 13-16 μm; colpi 12-13 μm long, pore distinct; surface view smooth to obscure pattern; lateral view subpsilate; exine 1-1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This species is similar to the extant species of Fagaceae.

2. Tricolporopollenites amygdalifolius Huang Figs. 166-173

Selected slide: Figs. 166-173; OK-1, 1788m BL-4, P1-33-35, P1-34-36, 7 x 13.5 μm; OK-1, 1788m. BL-4, P2-27-29, P2-28-30, 15 x 6; OK-1, 1788m. BL-4, P2-00-1, P2-1-3, 14 x 18.5 μm; OK-1, 1588m. BL-3, P9-15-17, P9-14-16, 9 x 13 μm; CPC Micropaleontology Lab.



Figs. 150-153. *Retitricolporoidites religiosus* Shaw *sp. nov.* OK-1, 1719m -1, P14-35-36, P14-36-37, 17 x 22 μm; OK-1, 1545m -1, P11-34-36, P11-33-35, 14 x1 5 μm. Fig. 154-157. *Mallotuspollenites taiwanensis* Shaw *sp. nov.* OK-3,1750m-2, PF14-31, 33, 20 x 20 μm; OK-2, 1827m-3, W37-26, 27, 18 x 21 μm. Figs. 158-161. *Acalyphapollenites taiwanensis* Shaw *sp. nov.* OK-3, 1750m-4, PF21-22, 23, 22 x 22 μm; OK-1, 1588m BL-3, P9-33-35, P9-34-36, 21 x 23 μm. Figs. 162-163. *Euphorbiacites paciatus* (Pflug) Ye OK-3; 1730m-2; TL11-37, 38; 27 x 34 μm. Figs. 164-165. *Fupingopollenites wackersdorfensis* (Thiele-Pfeiffer) Liu OK-1, 1699m BL-2; P8-2-5, P8-3-6; 34 x 40 μm. (CAPPARIDACEAE, EUPHORBIACEAE, INCERTAE).

Description: Grains 3-colporate; equatorial view prolate to perprolate; 13-15 x 6-9 μm; ora transverally parallel, the width less than 1 μm; surface view obscure pattern; lateral view subpsilate to scabrate; exine thin, 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1588m, 1788m).

Taxonomic affinity: This species is similar to the extant species of *Lithocarpus* of Fagaceae.

3. Tricolporopollenites minus Huang Figs. 174-177

Selected slide: Figs. 174-177; OK-1, 1768m. BL-1, P4-22-25, P4-23-26; OK-1; 1768m. BL-1, P3-10-11, P3-12-13; CPC Micropaleontology Lab.

Description: Grains 3-colporate; equatorial view prolate to perprolate; 6-7 x 11-15 μm; ora transverally parallel, the width less than 1-2 μm; surface view smooth; lateral view subpsilate to psilate; exine thin, 1 μm thick or less.

Stratigraphic occurrence: Eocene (OK-1 well, 1768m).

Taxonomic affinity: This species is similar to the extant species of *Lithocarpus* of Fagaceae.

4. Tricolporopollenites perprolatus Huang Figs. 178-185

Selected slide: Figs. 178-185; OK-1, 1545m-1, P11-16-18, P11-17-19; OK-1, 1435m-5, S4-35, 36; OK-1, 1545m-5, S9-1, 2; OK-1, 1545m-1, P10-20, 21; OK-1, 1545m-3, S8-35; CPC Micropaleontology Lab.

Description: Grains 3-colporate; equatorial view prolate to perprolate; 9-13 x 17-20 μm; surface view finely granulate to obscure pattern; lateral view subpsilate to scabrate; exine thin, 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1545m).

Taxonomic affinity: This species is similar to the extant species of Fagaceae.

5. Tricolporopollenites gilvatus Shaw sp. nov. Figs. 186-189

Holotype: Slide OK-1 1545-(1); Figs. 186-187; film P10-13-12, P10-14-13; CPC Micropaleontology Lab.

Description: Grains 3-colporate; equatorial shape prolate-spheroidal to subprolate; 12-16 x 23-26 μm; ora circular, 3-4 μm wide; surface view obscure pattern; lateral view subpsilate to scabrate; exine thin 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1545m, 1768m).

Taxonomic affinity: This species is similar to the extant species of *Quercus gilva* of Fagaceae.

6. Tricolporopollenites pengchiahsuensis Shaw sp. nov. Figs. 198-201

Holotype: Slide OK-3 1730-(2); Figs. 198-199; film TL11- 9, 10; CPC Micropaleontology Lab.

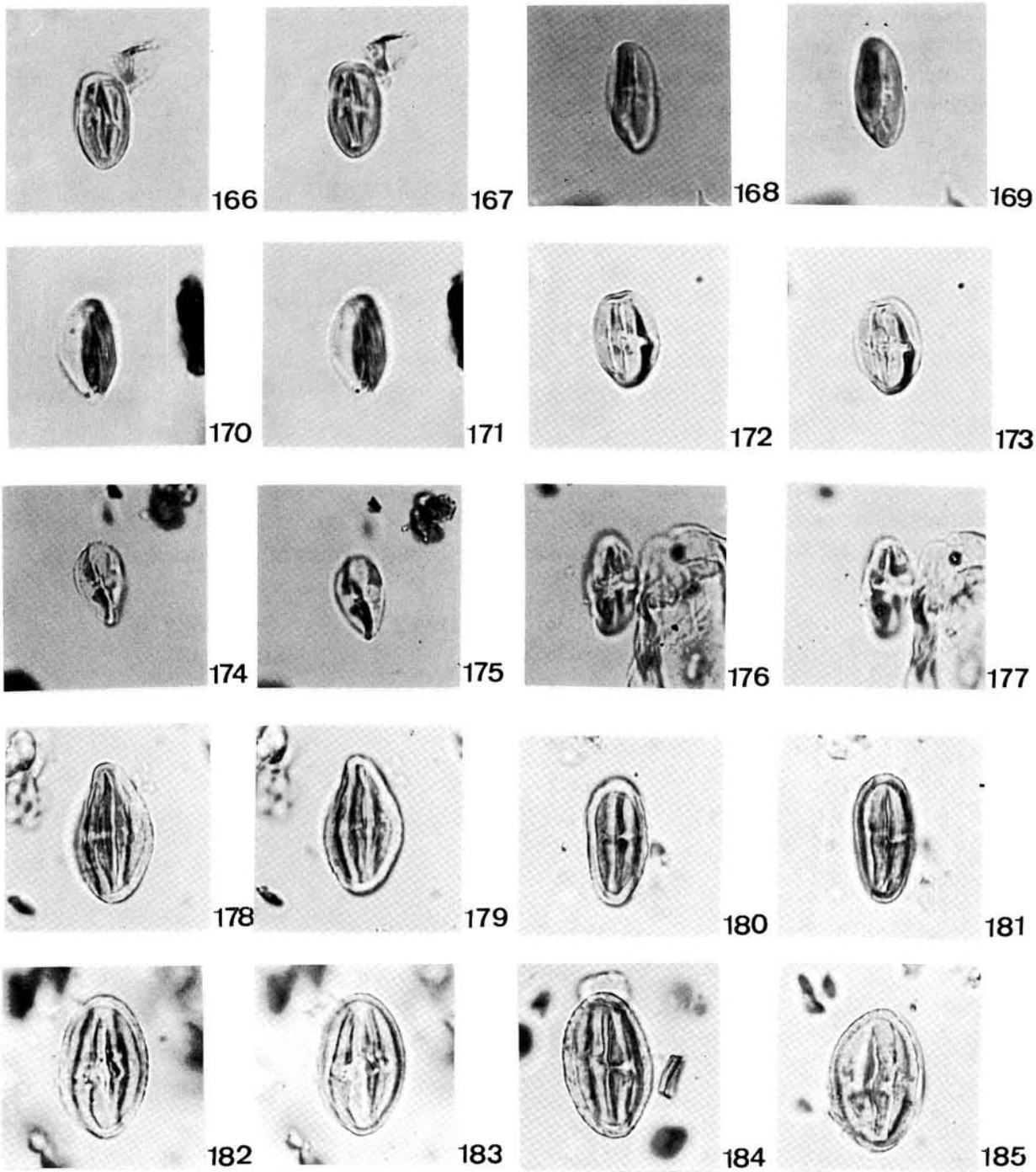
Description: Grains 3-colporate; equatorial shape prolate-spheroidal to subprolate; 21-24 x 30-32 μm; ora transverally elliptic, 4-9 μm wide; surface view smooth; lateral view psilate; exine thin, 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1730m, 1750m).

Taxonomic affinity: This species is similar to the extant species of Fagaceae.

7. Tricolporopollenites perprolatus Huang psilatus Shaw var. nov. Figs. 190-193

Holotype: Slide OK-1, 1545m-1; Figs. 190-191; P11-0-1, P11-0-2; CPC Micropaleontology Lab.



Figs. 166-173. *Tricolporopollenites amygdalifolius* Huang OK-1, 1788m BL-4, P1-33-35, P1-34-36, 7 x 13.5 μm; OK-1, 1788m BL-4, P2-27-29, P2-28-30, 15 x 6 μm; OK-1, 1788m BL-4, P2-00-1, P2-1-3, 14 x 18.5 μm; OK-1, 1588m BL-3, P9-15-17, P9-14-16, 9 x 13 μm. Figs. 174-177. *Tricolporopollenites minus* Huang OK-1, 1768m BL-1, P4-22-25, P4-23-26, 6.5 x 11 μm; OK-1; 1768m BL-1, P3-10-11, P3-12-13, 7 x 15 μm. Figs. 178-185. *Tricolporopollenites perprolatus* Huang OK-1, 1545m-1, P11-16-18, P11-17-19, 11 x 19.5 μm; OK-1, 1435m-5, S4-35, 36, 9 x17 μm; OK-1, 1545m-5, S9-1, 2, 12 x 20 μm; OK-1, 1545m-1, P10-20, 12 x 20 μm; OK-1, 1545m-3, S8-35, 13 x 20 μm. (FAGACEAE).

Description: Grains 3-colporate; equatorial view prolate to perprolate; 10-13 x 17-20 μm; surface view smooth; lateral view psilate; exine thin 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1545m, 1765m).

Note: This variety is similar to the species of *Tricolporopollenites perprolatus* Huang 1980 but differs in having smooth and psilate exine.

Family 22. HAMAMELIDACESE

Genus 1. Periporopollenites Pflug & Thomson in Tomson & Pflug 1953.

Diagnosis: Grains pantoporate; subspheroidal; exine scabrate, reticulate.

1. Periporopollenites formosana Huang medius var. nov. Figs. 134-136

Holotype: Slide OK-1 2028-(1); Figs. 134-135; film S1-2-3, S1-3-4; CPC Micropaleontology Lab.

Description: Grains pantoporate; subspheroidal; 21-32 μm wide; pores 2-3 μm wide; exine 1 μm thick; tectum with scabrate processes; sexine finely reticulate.

Stratigraphic occurrence: Eocene (OK-1 well, 2028m, 1306m).

Taxonomic affinity: This species is similar to the extant species of *Liquidamber*.

Family 23. JUGLANDACEAE

Genus 1. Caryapollenites Raatz (1937) 1938 ex Potonie 1960

1938 Abhandl., Preuss. Geol. Landesanst., 1937, n. s., H. 183, p. 19, 1960 Synopsis, part Ill, p. 123.

Type species: *Caryapollenites simplex f. communis* Raatz.

Diagnosis: Shape more or less globular; outline smooth, surface distinctly punctate to granulate; exine two-layered; pores circular, arranged subequatorially.

Key to species

1. Grains 4-porate ..... (3) *Caryapollenites quadriporus*
1. Grains 3-porate
   2. Grains more than 23 μm wide; exine 1-1.5μm thick ..... (1) *Caryapollenites pengchiahsuensis*
   2. Grains less than 23μm wide; exine less than 1μm thick ..... (2) *Caryapollenites verus*

1. Caryapollenites pengchiahsuensis Shaw sp. nov. Figs. 208-211

Holotype: Slide OK-1 1425-(1); Figs. 210-211; film P13-29-30, P13-30-31; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb circular to semi-angular, 24-28 μm wide; pores circular arranged subequatorially, 2-2.5 μm wide; surface view obscure pattern, lateral view psilate; exine 1-1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1425m).

Taxonomic affinity: This form species ressembles to the species of *Carya*.

2. Caryapollenites verus Shaw sp. nov. Figs. 222-227

Holotype: Slide OK-1 1788- (5); Figs. 224-225; film S4-5, S4-6; CPC Micropaleontology Lab.

Description: Grains triporate; shape circular to subcircular; 14-22 μm wide; pores circular arranged equatorially or slightly subequatorially surface view smooth to obscure pattern; lateral view psilate; exine thin less than l μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1788m).

Taxonomic occurrence: This form species ressembles to the species of *Carya*.

3. Caryapollenites quadriporus Shaw sp. nov. Figs. 212, 213

Holotype: Slide OK-1 1669- (1); Figs. 212, 213; film S7-27, S7-28; CPC Micropaleontology Lab.

Description: Grains 4-porate; shape circular; 21-24 μm wide; pores circular arranged equatorially or slightly subequatorially, 2-3 μm wide; surface view smooth; lateral view psilate; exine thin 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic occurrence: This form species ressembles to the species of *Carya*.

Genus 2. Engelhartioipollenites Potonie 1951 ex Potonie 1960

Palaeontographica, bd. 91. Abt. B, P. 145; Pl. 20, Fig. 34-38.

Type species: *Engelhardtioipollenites punctatus* (Pot.) Pot, 1951 ex Pot. 1960.

Diagnosis: Shape oblate; equator neatly round triangular; triporate, pore not aspidate, without annulus; infratexture finely flecked, exolamella smooth, round the pores somewhat invaginated.

1. Engelhartioipollenites pengchiahsuensis Shaw sp. nov. Figs. 220, 221

Holotype: Slide OK-1 1669bl-(2); Figs. 220, 221; film P6-23-25, P6-24-26; CPC Micropaleontology Lab.

Description: Grains 3-porate; polar shape circular to round triangular; 13-18 μm wide; surface view smooth; lateral view psilate; exine thin, 0.5 μm thick; pore common type.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This form ressembles to the species of *Engelhartia* of Juglandaceae.

Genus 3. Juglanspollenites Raatz 1939

Abhandl., prouss. Geol. Landesanst., n. s., H. 183, p. 18.

Type species: *Juglanspollenites verus* Raatz

Diagnosis: Polyporate pollen; amb. oval to subcircular to polygonal; exine smooth to weakly punctate; pores irregularly distributed, ca. 6-8 in number; exine thin, often folded.

1. Juglanspollenites pengchiahsuensis Shaw sp. nov. Figs. 214-216

Holotype: Slide OK-1 1501-(1); Figs. 214-216; film P12-5-7, P12-6-8, P12-7-9; CPC Micropaleontology Lab.

Description: Grains pantoporate (6-8 pore); polar shape circular to subcircular; size

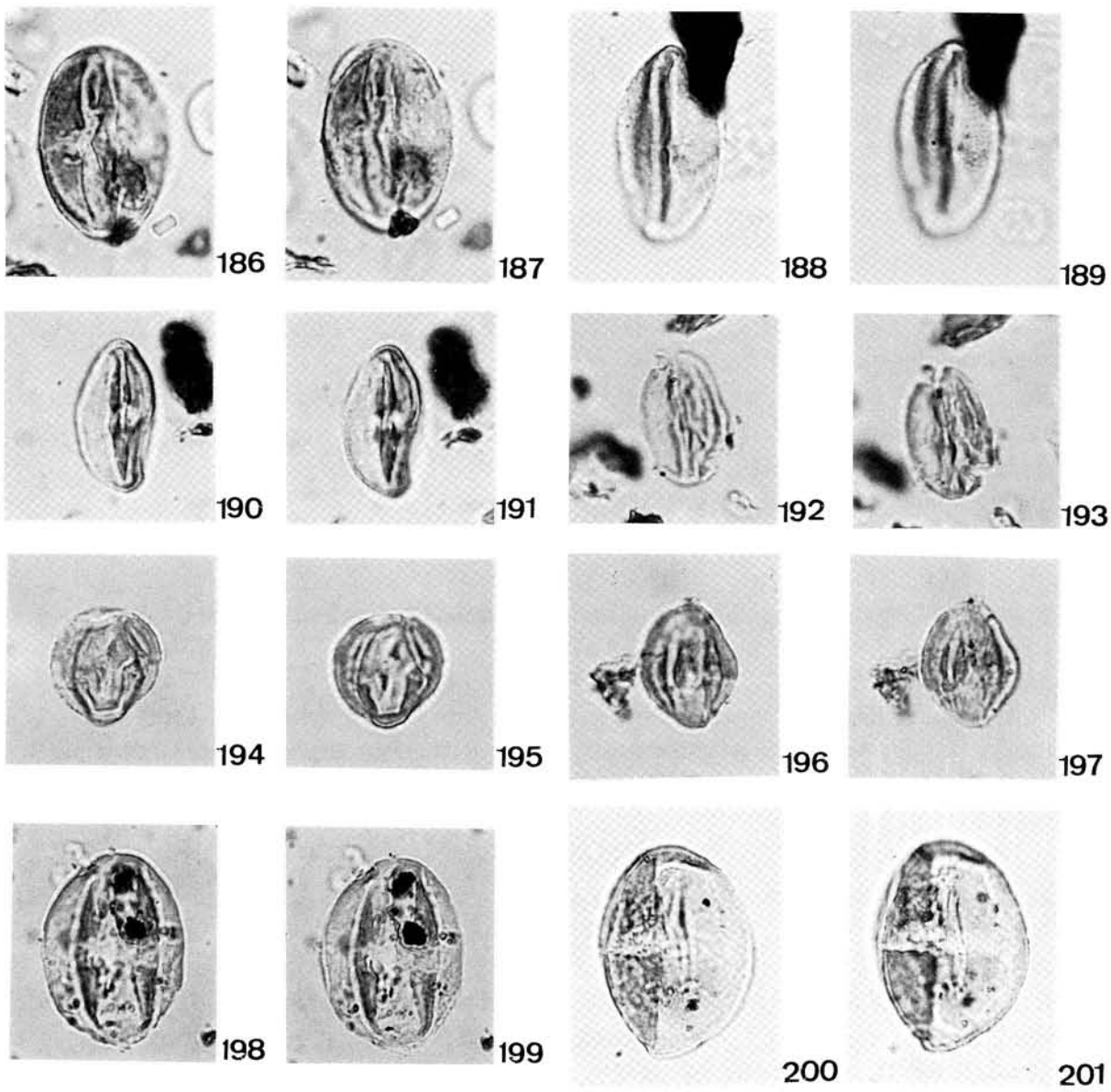
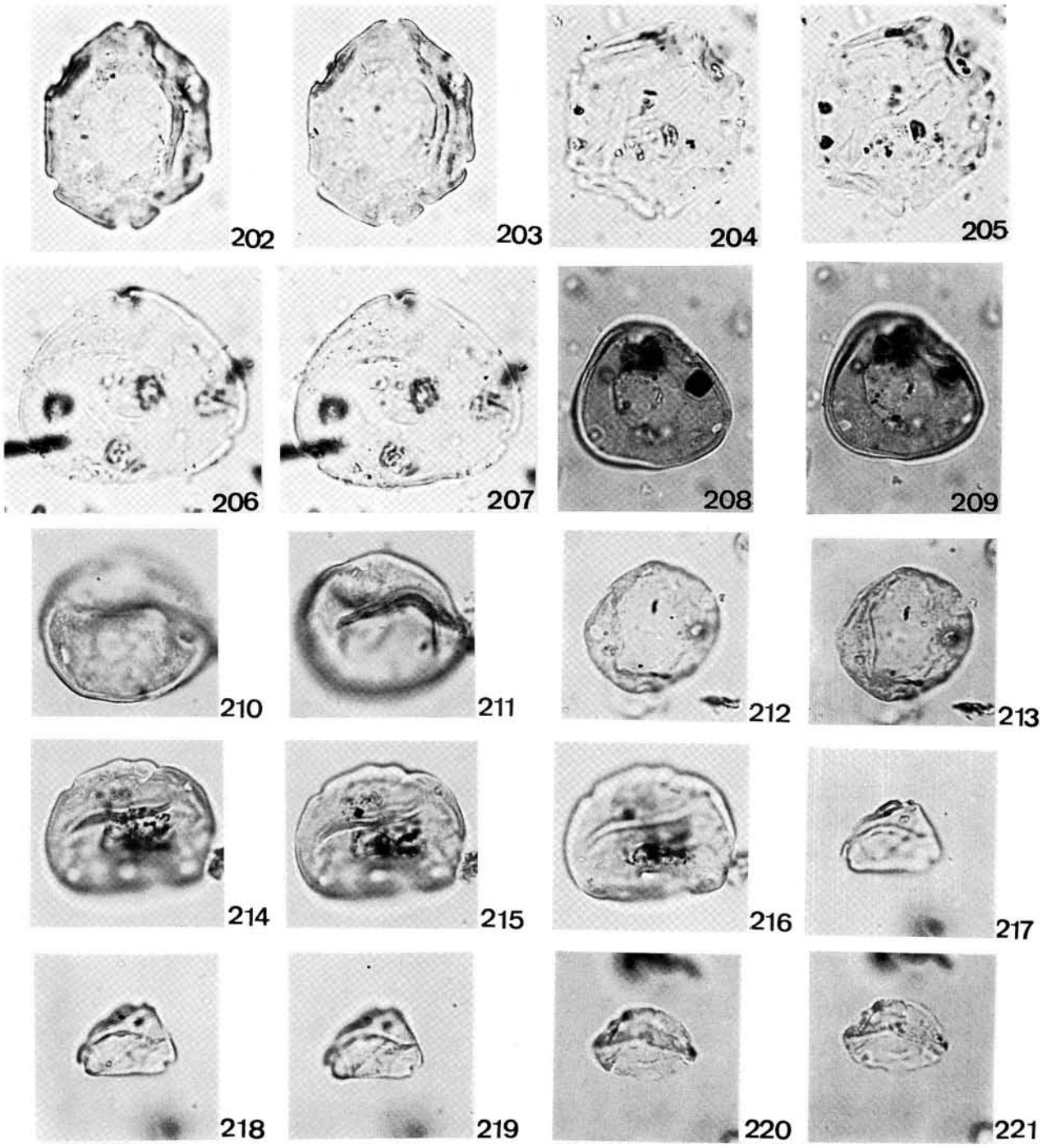


Fig. 186-189. *Tricolporopollenites gilvatus* Shaw *sp. nov.* OK-1, 1545m-1, P10-14-13, P10-13-12, 16 x 25 μm; OK-1, 1768m BL-1, P4-10-13, P4-11-14, 12.5 x 25 μm. Figs. 190-193. *Tricolporopollenites perprolatus* Huang *psilatus* Shaw *var. nov.* OK-1, 1545m-1, P11-0-1,P11-0-2, 10 x 20 μm; OK-1, 1768bl-1, P3-27-28, P3-28-29, 11 x 17 μm. Figs. 194-197. *Tricolporopollenites megaexactus* (Potonie) Th. & Pfl. OK-1, 1699m BL-1, P8-34-37, P8-35-38, 14.5 x 14.5 μm; OK-1, 1788m BL-4, P1-31-33, P1-32-34, 12 x 15 μm. Figs. 198-201. *Tricolporopollenites pengchiahsuensis* Shaw *sp. nov.* OK-3, 1730m-2, TL11-9, 10, 21 x 30 μm; OK-3, 1750m-2, PF12-30, 31, 24 x 32 μm. (FAGACEAE).

22-29 μm wide; pore common type, uniform, 1 μm wide; surface view smooth; lateral view psilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1501m).

Taxonomic affinity: This form ressembles to the species of *Juglans*.



Figs. 202-205. *Polyatriopollenites taiwanensis* Huang OK-3, 1750m-4, PF22-30, 31, 27.5 x 34 μm; OK-2, 1901m-5, W39-36-37, 30 x 30 μm. Figs. 206-207. *Momipites pengchiahsuensis* Shaw *sp. nov.* OK-2, 1901m-3, W39-1, 2, 33 x 38 μm. Figs. 208-211. *Caryapollenites pengchiahsuensis* Shaw *sp. nov.* YKL-6, 1200m-1, TL16-10, 11, 25 x 27 μm; OK-1, 1425-1, P13-29-30, P13-30-31, 24 x 28μm. Figs. 212-213. *Caryapollenites quadriporus* Shaw *sp. nov.* OK-1, 1669m-1, S7-27, 28, 22 x 23 μm. Figs. 214-216. *Juglanspollenites pengchiahsuensis* Shaw *sp. nov.* OK-1, 1501m-1, P12-5-7, P12-6-8, P12-7-9, 23 x 29 μm. Figs. 217-219. *Platycaryapollenite formosensis* Huang OK-1, 1545m-1, P12-20-21, P12-21-22, P12-22-23, 12 x 16 μm. Figs. 220-221. *Engelhartioipollenites pengchiahsuensis* Shaw *sp. nov.* OK-1, 1669m BL-2, P6-24-26, P6-23-25, 13-18 μm. (JUGLANDACEAE).

Genus 4. **Momipites** Wodehouse 1933

Type species: *Momipites coryloides* Wodeh.

Diagnosis: Grains spheroidal or oblately flattened and somewhat triangular in outline, pore three on the equator, circular to meridionally elongate, exine 1-1.5 μm thick; psilate to faintly scabrate or foveolate. Texture smooth.

1. Momipites pengchiahsuensis Shaw sp. nov. Figs. 206, 207

Holotype: Slide OK-2 1901-(3); Figs. 206, 207; film W39-1, 2; CPC Micropaleontology Lab.

Description: Grains triporate; polar shape semiangular to subangular; size 31-35 x 36-40 μm; pore circular to meridionally elongate; simple type surface view smooth; lateral view psilate; exine 1 μm thick. occasionally appear concave structure in polar tip.

Stratigraphic occurrence: Eocene (OK-2 well, 1901m).

Taxonomic affinity: Palynomorph of this genus is related to those of extant *Engelhartea* and *Alfaroa*, in part with some characters of *Carya*.

Genus 5. **Platycaryapollenites** Nagy 1969

Type species: *Platycaryapollenites simplex f. communis* Raatz.

Diagnosis: Grains 3-porate; 12-17 μm wide; sexine with 2-3 depressed furrows.

1. Platycaryapollenite formosensis Huang Figs. 217-219

Selected slide: OK-1 1545-(2); Figs. 217-219; film P12-20-21, P12-21-22, P12-22-23; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular, or circular-lobate, 12-17 μm wide; surface view smooth, lateral view psilate; exine less than 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1545m).

Taxonomic affinity: This form species ressembles to the species of *Platycarya*.

Genus 6. **Polystriopollenites** Pflug 1953

Palaeontographica, Bd. 95, Abt. B, p. 115.

Type species: *Polyatriopollenites stellatus* Pot. ex Pflug.

Diagnosis: Normally with more than three pores; pores equatorial or subequatorial; with atrium or postatrium.

1. Polyatriopollenites taiwanensis Huang Figs. 202-205

Selected slide: Figs. 202-205; OK-3, 1750-4, PF22-30, 31; OK-2, 1901-5, W39-36-37; CPC Micropaleontology Lab.

Description: Grains pantoporate (6 pores); shape polygonal; 27-35 μm wide; pore common type, uniform, 1-1.5 μm wide; surface view smooth; lateral view psilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1901m; OK-3 well, 1750m).

Taxonomic affinity: These forms resemble to those of *Pterocarya* of Juglandaceae.

Family 24. LABIATAE
Genus 1. Retihexacolpities Mathur 1966

Type species: *Retihexacolpities brevicolpatus* Math.
Diagnosis: "Reticulate hexacolpate sporomorphs."

1. Retihexacolpites pengchiahsuensis Shaw sp. nov. Figs. 234, 235

Holotype: Slide OK-1 1638- (4); Figs. 234, 235; film S8-15, S8-16,; CPC Micropaleontology Lab.

Description: Grains 5-6-colpate, prolate, 26 x 33 μm; surface view finely reticulate, muri ca. 0.5 μm wide; lateral view scabrate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1638m).

Taxonomic occurrence: This form species ressembles to the species of *Salvia*.

Genus 2. Tricolpites Cookson ex Couper 1953

New Zealand Geol. Surv., Paleontol. Bull. 22, p. 61

Type species: Tricolpites reticulata Cookson 1947 ex Couper, ibid.; B. A. N. Z. A. R. E., Repts., ser. A, v. 2, pt. 8, p. 134, pl. 15, fig. 45.

Diagnosis: Free, isopolar, tricolpate. Exine variable in thickness and sculpture. Size variable.

1. Tricolpites stachysus Shaw sp. nov. Figs. 230-233

Holotype: Slide OK-1 1545-(1); Figs. 232-233; film P10-15-14, P10-16-15; CPC Micropaleontology Lab.

Description: Grains tricolpate, amb circular, equatorial view spheroidal to prolate-spheroidal, 11-16 x 16 μm ; colpi long, 3/4 of the radius; surface view finely granulate; lateral view scabrate; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1545m).

Taxonomic affinity: This species is similar to the extant species of *Stachys*.

Family 25 LORANTHACEAE
Genus 1. Cranwella Srivastava 1966

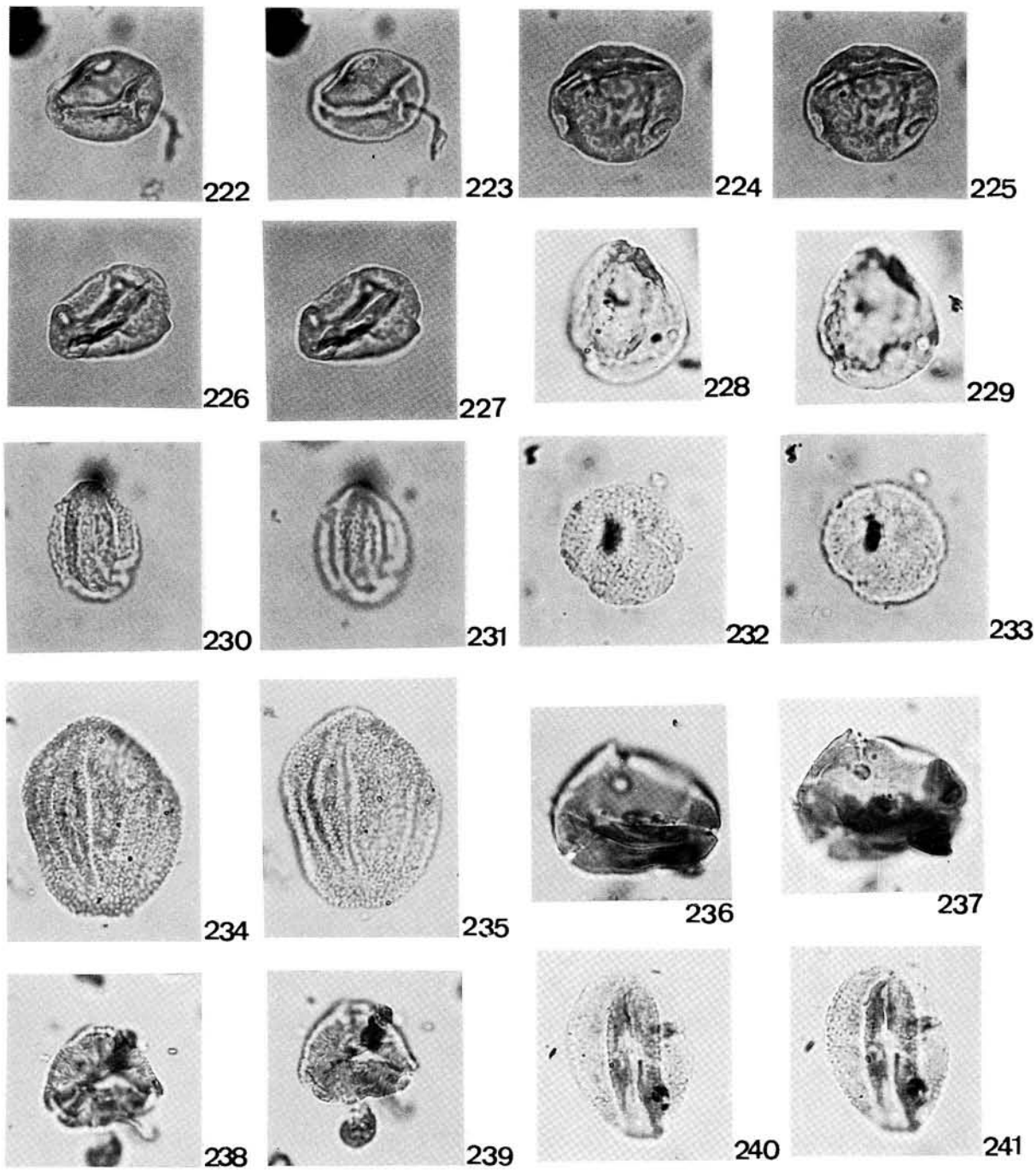
Pollen et Spore, vol. 8, no. 3, p. 537.

Type species: *Cranwellia striata* (Coup.) Sriv.

Dagnosis: Grains tricolpate or tricolporate; amb tirangular with concave, straight or slightly convex sides; pore conspicuous to inconspicuous; colpi short, equatorial angular protrusions are well developed; exine granulate, granules arranged in a line pattern, giving a striate appearance, striations starting from the middle of each interradial region and running across to the middle of the inter-radial region of the adjacent side, striations parallel to each other and perpendicular to the radius from the pole to the apex of each equatorial angular protrusion.

1. Cranwellia taiwaniana Shaw sp. nov. Figs. 236, 237

Holotype: Slide OK-1 1669-bl-(2); Figs. 236, 237; film P 7-9-11, P7-8-10; CPC Micropaleontology Lab.



Figs. 222-227. *Caryapollenites verus* Shaw *sp. nov.* OK-1, 1699m BL-2, P4-27-29, P4-28-30, 22 x 28 μm; OK-1, 1788-(5), S4-5, 6, 19 x 22 μm; OK-1, 1669BL-1, P8-33-36, P8-31-34, 14 x 19 μm. Figs. 228-229. *Triporopollenites coryloides* (Potonie) Th. & Pfl. *minor var. nov.* OK-1, 1545m-1, P11-2-4, P11-3-5, 19 x 23 μm. Figs. 230-233. *Tricolpites stachysus* Shaw *sp. nov.* OK-1, 1768m BL-1, P4-20-23, P4-21-24, 12.5 x 16 μm; OK-1, 1545m-1, P10-15-14, P10-16-15, 16 x 16 μm. Figs. 234-235. *Retihexacolpites pengchiahsuensis* Shaw *sp. nov.* OK-1, 1638m-4, S8-15, 16, 26 x 33 μm. Figs. 236-237. *Cranwellia taiwaniana* Shaw *sp. nov.* OK-1, 1699m BL-2, P7-8-10, P7-9-11, 22-28 μm. Figs. 238-239. *Cranwellia pengchiahsuana* Shaw *sp. nov* OK-1, 1719m-2, S3-3, 4, 17-20 μm. Figs. 240-241. *Rhoipites taiwanensis* Shaw sp. nov. OK-1, 1768m BL-2; P5-9-11, P5-10-12, 20 x 28 μm. (JUGLANDACEAE, BETULACEAE, LABIATAE, ANACARDIACEAE, LORANTHACEAE).

Description: Grains tricolporate, amb semiangular to angular; 22-28 μm; colpi 8-10 μm long; surface view striate, the striae parallel to each other and perpendicular to the radius from the pole to the apex of each equatorial angular protrusion; lateral view scabrate; exine 1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This species is similar to the extant species of Loranthaceae.

2. Cranwellia pengchiahsuana Shaw sp. nov. Figs. 238, 239

Holotype: Slide OK-1 1719-(2); Figs. 238, 239; film S3-3, S3-4; CPC Micropaleontology Lab.

Description: Grains tricolporate, amb semiangular to angular; 17-20 μm; colpi 6-7 μm long; surface view striate, the striae parallel to each other and perpendicular to the radius from the pole to the apex of each equatorial angular protrusion; lateral view scabrate,; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1719m).

Taxonomic affinity: This species is similar to the extant species of Loranthaceae.

Family 26. MYRICACEAE

Genus 1. Triatriopollenites Pflug in Thomson & Pflug 1953.

Type species: *Triatriopollenites rurensis* Pflug & Thomson in Thomson & Pflug

Diagnosis: Grains 3-porate; amb angular; inner wall of pore rough; exine psilate, smooth.

1. Triatriopollenites taiwanensis Huang Figs. 242-243

Selected slide: OK-1 1669-bl-(1); Figs. 242-243; film P8-25-28, P8-26-29; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb angular; 25-26 μm wide; pores 1.5-2.5 μm wide; exine 1-2.5 μm thick; tectum psilate; sexine obscure pattern to smooth.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This form resembles to the species of *Myrica* (Huang, 1972).

2. Triatriopollentites minus Huang Figs. 244-245

Selected slide: OK-1 1375-(1); Figs. 244-245; film P14-13-14, P14-14-15; CPC Micropaleontology Lab.

Description: Grain 3-porate; amb semi-angular; 17.5-20 μm wide; aperture atrium type; exine 1 μm thick; tectum psilate; sexine smooth.

Stratigraphic occurrence: Eocene (OK-1 well, 1375m).

Taxonomic affinity: This form similar to the genera of Myricaceae.

Family 27. MYRTACEAE

Genus 1. Myrtaceidites Cookson & Pike 1954.

Type species: *Myrtaceidites mesonesus* Cookson & Pike

Diagnosis: Grains 3-colporate, angulaperturate; arcus distinct; sexine smooth or granulate.

1. Myrtaceidites pengchiahsuensis Shaw sp. nov. Figs. 252-253

Holotype: Slide OK-1 1719- (1); Figs. 252-253; film P15-13-15 P15-14-16; CPC Micropaleontology Lab.

Description: Grains tri-syncolporate, circular to subcircular; 18-20 μm; colpi 7-10 μm long, ora 1.5-2 μm wide; surface view obscure pattern; lateral view scabrate to subpsilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1719m).

Taxonomic affinity: This species is similar to the extant species of Myrtaceae.

2. Myrtaceidites formosensis Shaw sp. nov. Figs. 250-251

Holotype: Slide OK-1 1588bl-(3); Figs. 250-251; film P9-7-9, P9-8-10; CPC Micropaleontology Lab.

Description: Grains tricolporate, semiangular; 18-20 x 18-21 μm; colpi 8-9 μm long, ora 1.5 μm wide; surface view obscure pattern; lateral view psilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1588m).

Taxonomic affinity: This species is similar to the extant species of Myrtaceae.

Family 28. NYMPHACEAE
Genus 1. Nymphaeacidites Sah 1967

Mus. Roy. Afrique Centu., Tervuren; Ann. in 80, Sci. geol., no 57, p. 108.

Type species: *Nymphaeacidites typicus* Sah.

Diagnosis: Pollen grains usually large, amb spheroidal to prolate-spherodial; 1-aperturate. aperture operculate; ornamentation reticulate, spiniferous or baculate.

1. Nymphaeacidites pengchiahsuensis Shaw sp. nov. Figs. 254-257

Holotype: Slide OK-1 1588-bl-(4); Figs. 256-257; film S8-31, 32; CPC Micropaleontology Lab.

Description: Grains zonosulcites; 18-25 μm wide; polar shape circular; the sulcus 0.5-1 μm wide; surface view reticulate; lateral view verrucate to gemmate process; exine 0.8μm thick; zonosulcate concurrent circle.

Stratigraphic occurrence: Eocene (OK-1 well, 1588m).

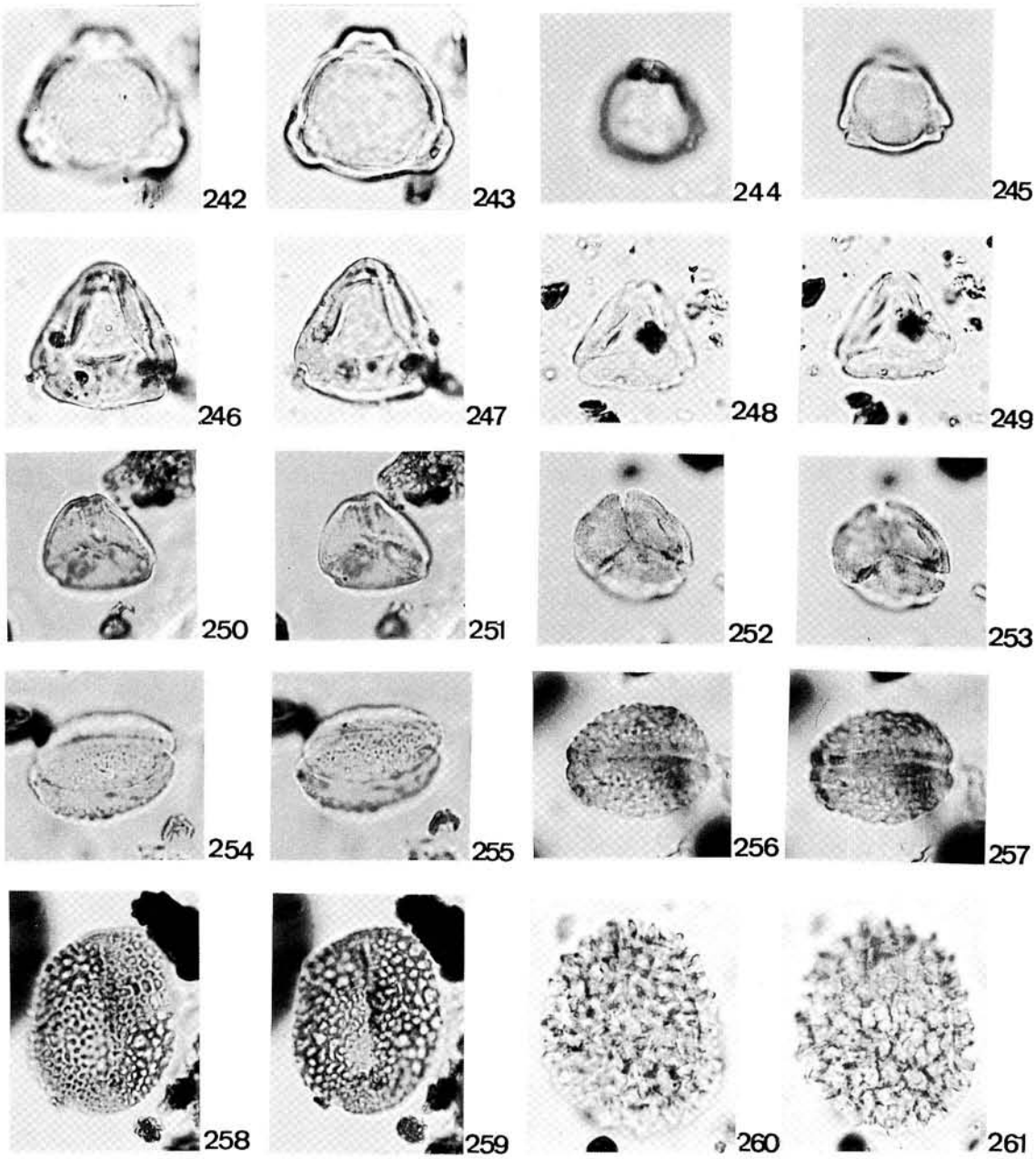
Taxonomy affinity: This form ressembles to the species of *Nymphaea*.

Familly 29. OENOTHERACEAE
Genus 1. Corsinipollenites Nakoman 1965

Ann., Soc. geol. Nord. v. 85. no. 2. p. 155.

Type species: *Corsinipollenites oculusnoctis* (Thierg.) Nakoman.

Diagnosis: Triporate pollen grains; equator rounded triangular; shape lenticular; pores approx. equatorial but variably positioned due to the compression after fossilization; in polar view the pores often displaced to one of the hemispheres but still showing distinctly in the amb; the pore has a peculiar structure due to an annular thickening of the endexine that in turn is enveloped by the ectexine; total exine relatively thin, may vary from 2-5 μm.



Figs. 242-243. *Triatriopollenites taiwanensis* Huang, OK-1; 1669m-2, P8-25-28, P8-26-29, 25 x 25 μm. Figs. 244-245. *Triatriopollentites minus* Huang, OK-1, 1375m-1, P14-13-14, P14-15-16, 17 x 19.5 μm. Figs. 246-427. *Symplocoipollenites taiwanensis* Shaw *sp. nov.* OK-2, 1901m-1, W38-20, 21, 20-23 μm. Figs. 248-249. *Symplocoipollenites pengchiahsuensis* Shaw *sp. nov.* OK-2, 1875m-3, W38-13, 14, 15-17 μm. Figs. 250-251. *Myrtaceidites pengchiahsuensis* Shaw *sp. nov.* OK-1, 1588m. BL-3, P9-8-10, P9-7-9, 18 x 19 μm. Figs. 252-253. *Myrtaceidites formosensis* Shaw *sp. nov.* OK-1, 1719m-1, P15-13-15, P15-14-16, 19 x 19.5 μm. Figs. 254-257. *Nymphaeacidites pengchiahsuensis* Shaw *sp. nov* OK-1, 1588m BL-3; P9-23-25, P9-24-26; 18 x 24 μm; OK-1, 1588m. BL-4; S8-31, 32, 19 x 24 μm. Figs. 258-259. *Retitricolpites jasminus* Shaw *sp. nov.* YKL-3; 1145m-6, TL6-13, 14, 26 x 32 μm. Figs. 260-261. *Persicarioipollis vulgaris* (Huang) Shaw OK-2, 1810m-3, W36-37, 38, 28 x 36 μm. (MYRICACEAE, SYMPLOCACEAE, MYRTACEAE, NYMPHACEAE, OLEACEAE, POLYGONACEAE).

1. Corsinipollenites granulatus Shaw sp. nov. Figs. 262, 263

Holotype: Slide OK-1 1669-bl-(1); Figs. 114, 115; film P8-25-28, P8-26-29; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular; 27-32 μm wide; ora 4-6 μm wide, annuluses 10-12 μm wide; surface view finely granulate; lateral view scabrate process; exine thin 1-1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This species ressembles to the species of *Ludwigia* (Huang, 1972).

2. Corsinipollenites pengchiahsuensis Shaw sp. nov. Figs. 264, 265

Holotype: Slide YKL-3 1030-(1); Figs. 264, 265; film W43-8, W43-9; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular; ca. 16-21 μm wide; ora 1-2 μm wide, annulusses 8-11 μm wide; surface view smooth; lateral view psilate; exine thin 1 μm thick.

Stratigraphic occurrence: Eocene (YKL-3 well, 1030m).

Taxonomic affinity: This species ressembles to the species of *Oenotheraceae* (Huang, 1971).

Familly 30. OLEACEAE

Genus 1. Retitricolpites van der Hammen 1956 emend. Pierce 1961

Type species: *Retitricolpites ornatus* (van der Hammen) Pierce

Diagnosis: Reticulate tricolpate sporomorphs, subprolate to perprolate; colpi straight.

1. Retitricolpites jasminus Shaw *sp. nov.* Figs. 258, 259

Holotype: Slide YKL-3 1145-(6); Figs. 258, 259; film TL6-13, 14; CPC Micropaleontology Lab.

Description: Grains tricolate, prolate-spheroidal; 26 x 32 μm; colpi 22 μm long; surface view reticulate; lateral view verrucate; exine 1 μm or less thick.

Stratigraphic occurrence: Eocene (YKL-3 well, 1145m).

Taxonomic affinity: This species ressembles to the species of *Jasminum* (Huang, 1971).

Genus 2. Retitricolporoidites Mathur 1966

Quart. J. Geol. Min. Metall. Soc. India, v. 38, no. 1, p. 45 Retitricolporites v. D. Hammen 1956 ex v. D. Hammen & Wijmstra 1964.

Type species: *Retitricolporoidites microreticulatus* Math.

Diagnosis: Reticulate tricolporoidate sporomorphs.

1. Retitricolporoidites verus Shaw sp. nov. Figs. 97-102

Holotype: Slide OK-1 1768-(3); Figs. 97-98; film S4-27, S4-28; CPC Micropaleontology Lab.

Description: Grains tricolporate, prolate-spheroidal to prolate; 17-21 x 24-27 μm; colpi 24-20 μm long, ora crustate; surface view reticulate; lateral view verrucate; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1768m).

Taxonomic affinity: This form species ressembles to the species of *Osmanthus.*

Family 31. POLYGALACEAE
Genus 1. Polygalacidites Sah & Dutta 1966

Type species: *Polygalacidites clarus* Sah & Dutta.

Diagnosis: Grains pantocolporate; ora colpi transversally parallel; exine smooth to finely sculptured.

1. Polygalacidites pengchiahsuensis Shaw sp. nov. Figs. 266, 267

Holotype: Slide YKL-3 1750-(1); Figs. 266, 267; film PF10-16, 17; CPC Micropaleontology Lab.

Description: Grains 6-(?)-colporate; perprolate; 14 x 26 μm; colpi 23 μm long; ora colpi transversally parallel; exine 1 μm or less thick; surface view rough pattern; lateral view scabrate.

Stratigraphic occurrence: Eocene (YKL-3 well, 1750m).

Taxonomic affinity: These forms resemble to those of Polygalaceae (Huang, 1971).

2. Polygalacidites formosensis Shaw sp. nov. Figs. 268, 269

Holotype: Slide OK-2 1936-(2); Figs. 268, 269; film W46-22, 23; CPC Micropaleontology Lab.

Description: Grains 5-(?)-colporate; subprolate to prolate; 23 x 34 μm; colpi 28-29 μm long; ora colpi transversally parallel; exine 1 μm or less thick; surface view rough pattern; lateral view scabrate.

Stratigraphic occurrence: Eocene (OK-2 well, 1936m)

Taxonomic affinity: These forms resemble to those of Polygalaceae (Huang, 1972).

Family 32. POLYGONACEAE
Genus 1. Persicarioipollis Krutzsch 1962. Geologie, Jahrg. 11, no. 3, p. 282; Krutzsch 1966 Geologie, Beih. 55, p. 29.

Type Species: *Persicarioipollis meusell* Krtz.

Polygonacidites Sah & Dutta 1968; Huang in Taiwania 25: 94. 1980.

New diagnosis in Krutzsch 1966(Geologie, Beih. 55, p. 29): Amb circular to oval, figure broadly lenticular to globular; surface with reticulum palisades (= polyforate) with a covering reticulum; underneath the major sculpture often a double row of "verrucae" that isfused in part; further verrucae may occur in the foramina; pores small, only one in every 2-5 foramina open and thus strongly variable in number; inner wall layer distinctly smooth (Jansonius and Hill, 1976)

1. Persicarioipollis vulgaris (Huang) Shaw 1998 Figs. 260, 261

Polygonacidites vulgaris Huang, in Taiwania 25: 95. 1980.

Selected slide: OK-2 1810-(3); Figs. 260, 261; film W36-37, W36-38; CPC Micropaleontology Lab.

Description: Grains pantoporate; spheroidal to subspheroidal; 27-37 μm wide; surface view lopho-reticulate, lacuna 3-8 μm wide, muri 2-3.5 μm thick; lateral view baculate, clavate or echinate; exine 1.5-5 μm thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1810m).

Taxonomic affinity: This species is similar to the extant species of *Polygonum* of Polygonaceae.

Family 33. ROSACEAE
Genus 1. Sanguisorbapollenites gen. nov.

Type species: *Sanguisorbapollenites taiwanensis* Shaw *sp. nov.*

Diagnosis: Grains 5-6-colporate; subprolate to perprolate; colpi long; aperture common type; surface view finely reticulate; lateral view scabrate, exine thin.

27. Sanguisorbapollenites taiwanensis Shaw sp. nov. Figs. 270, 271

Holotype: Slide OK-1 1719-(1); Figs. 270, 271; film P15-10-12, P15-11-13; CPC Micropaleontology Lab.

Description:Grains 5-6-colporate; prolate; 26 x 47 μm; colpi 37-39 μm long; ora lalongate to transversally parallel; surface view finely-reticulate; lateral view scabrate, exine thin less than 0.7 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1719m).

Taxonomic affinity: This species is similar to the extant species of *Sanguisorba* of Rosaceae.

Family 34. RUTACEAE
Genus 21. Retitricolporoidites Mathur 1966

Quart. J. Geol. Min. Metall. Soc. India, v. 38, no. 1, p. 45 Retitricolporites v. D. Hammen 1956 ex v. D. Hammen & Wijmstra 1964.

Type species: *Retitricolporoidites microreticulatus* Math.

Diagnosis: Reticulate tricolporoidate sporomorphs.

34. Retitricolporoidites nitidus Shaw sp. nov. Figs. 272-276

Holotype: Slide OK-1 1425-(1); Figs. 272-274; film P13-26-27, P13-27-28, P13-28-29; CPC Micropaleontology Lab.

Description: Grains tricolporate, spheroidal to prolate-spheroidal; 21-23 x 22-25 μm; colpi 15-17 μm long; ora circular 3 μm wide, surface view reticulate; lateral view clavate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1425m).

Taxonomic affinity: This form species ressembles to the pollen of *Fagara nitida.*

Family 35. SALICACEAE
Genus 1. Retitricolporoidites Mathur 1966

Quart. J. Geol. Min. Metall. Soc. India, v. 38, no. 1, p. 45 Retitricolporites v. D. Hammen 1956 ex v. D. Hammen & Wijmstra 1964.

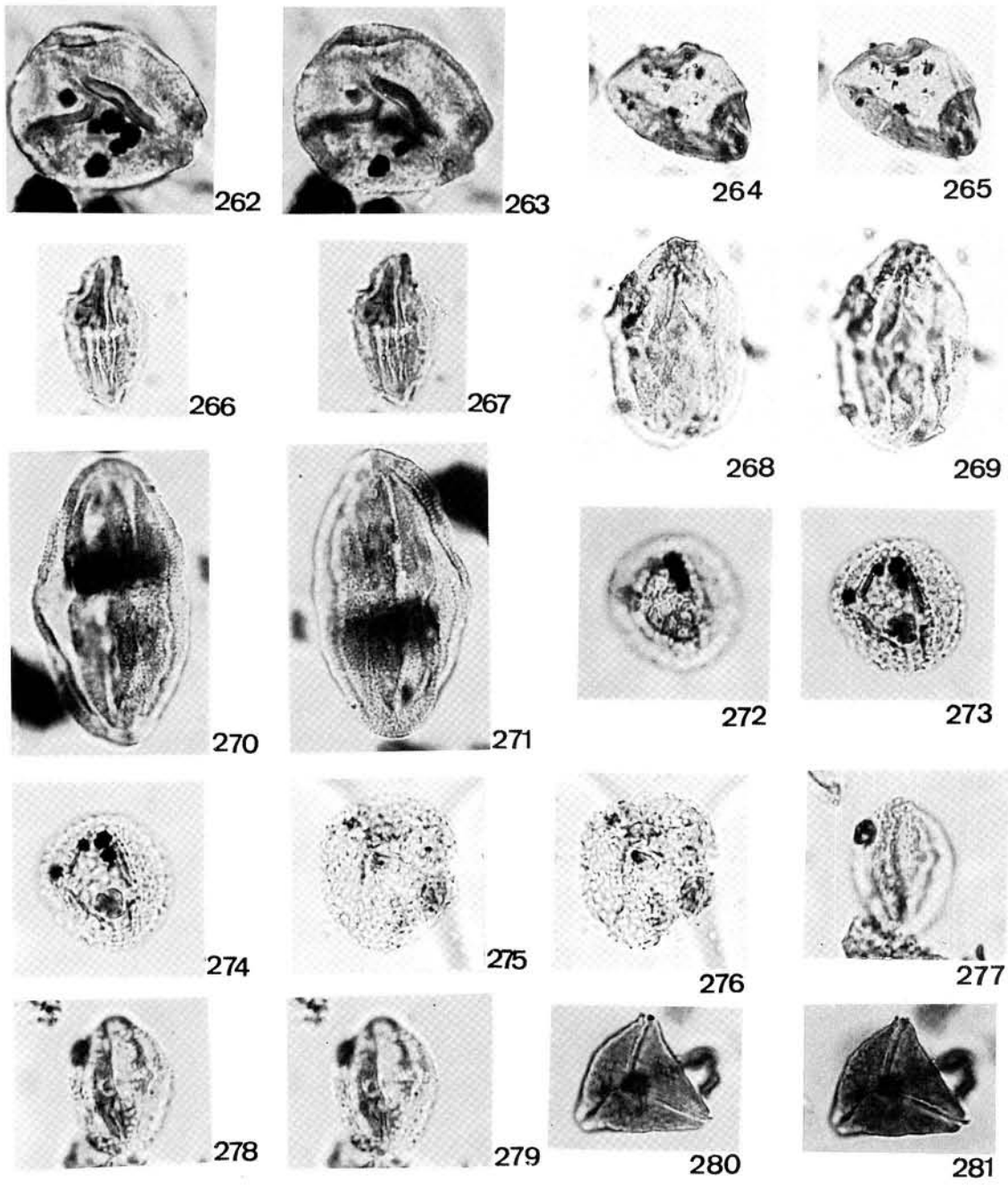
Type species: *Retitricolporoidites microreticulatus* Math.

Diagnosis: Reticulate tricolporoidate sporomorphs.

1. Retitricolporoidites formosensis Shaw sp. nov. Figs. 277-279

Holotype: Slide OK-1 1768-bl-(1); Figs. 277-279; film P3-24-25, P3-25-26, P3-26-27; CPC Micropaleontology Lab.

Description: Grains tricolporate, subprolate to prolate; 19-21 x 14-15 μm; colpi 15-16 μm long; surface view finely reticulate; lateral view verrucate to gemmate; exine 0.5-1 μm thick.



Figs. 262-263. *Corsinipollenites granulatus* Shaw *sp. nov.* OK-1, 1699m BL-1, P8-25-28, P8-26-29, 27 x 32 μm. Figs. 264-265. *Corsinipollenites pengchiahsuensis* Shaw *sp. nov.* YKL-3, 1030-1, W43-8, 9, 16 x 21 μm. Figs. 266-267. *Polygalacidites pengchiahsuensis* Shaw *sp. nov.* OK-3, 1750m-1, PF10-16, 17, 14 x 26 μm. Figs. 268-269. *Polygalacidites formosensis* Shaw *sp. nov.* OK-2, 1936m-2, W46-22, 23, 23 x 34 μm. Figs. 270-271. *Sanguisorbapollenites taiwanensis* Shaw *sp. nov.* OK-1, 1719m-1, P15-10-12, P15-11-13, 26 x 47 μm. Figs. 272-276. *Retitricolporoidites nitidus* Shaw *sp. nov.* OK-1, 1425m-1, P13-26-27, P13-27-28, P13-28-29, 22 x 22 μm; OK-3, 1750m-2, PF11-6, 7, 23 x 25 μm. Figs. 277-279. *Retitricolporoidites formosensis* Shaw *sp. nov.* OK-1, 1768m. BL-1, P3-24-25, P3-25-26, P3-27-28, 15 x 20 μm. Figs. 280-281. *Yenjisapollis formosensis* Shaw *sp. nov.* OK-1, 1825-1, S3-18, 19, 19-22 μm. (OENOTHERACEAE, POLYGALACEAE, ROSACEAE, RUTACEAE, SALICACEAE, SAPINDACEAE).

Stratigraphic occurrence: Eocene (OK-1 well, 1768m).

Taxonomic affinity: This form species ressembles to the species of *Salix*.

2. Retitricolporoidites pengchiahsuensis Shaw sp. nov. Figs. 282-286

Holotype: Slide OK-1 1669-bl-(4); Figs. 285-286; film S6-24, 25, P7-34-36; CPC Micropaleontology Lab.

Description: Grains tricolporate, prolate to perprolate; 9-10 x 15-17 μm; colpi 13 μm long; ora circular to lalongate; surface view finely reticulate; lateral view verrucate to finely gemmate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This form species ressembles to the species of *Salix*.

Family 36 SAPINDACEAE

Genus 1. Yenjisapollis (Yu, 1981) Wan, Sun & Zhao 1987

Type species: *Yenjisapollis rostralis* Yu

Yenjisapollis rostralis Yu p. 100, Pl. 2, figs. 47-48.

Diagnosis emendation: Pollen grains short polar axis, amb triangular to subtriangular, sides straight or convex. Tricolporate, colpi long slender, about 3/4 the radius of the grain in length. Colpi are not connecting each other at the polar area. Exine two layered, sexine thicker than nexine. Surface granulate sculptured.

1. Yenjisapollis formosensis Shaw sp. nov. Figs. 280, 281

Holotype: Slide OK-1 1825-(1); Figs. 280, 281; film S3-18, S3-19; CPC Micropaleontology Lab.

Description: Pollen grains short polar axis, diameter 19-23 μm; amb triangular to subtriangular, sides straight or convex. Tricolporate, colpi long slender, 3/4 the radius of grains in length; ora indistinct; surrface view finely granulate to obscure pattern; lateral view scabrate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1825m).

Taxonomic affinity: This form species ressembles to the species of Sapindaceae.

Family 37 SCROPHULAREIACEAE

Genus 1. Retitricolpipites van der Hammen 1956 emend. Pierce 1961

Type species: *Retitricolpipites ornatus* (van der Hammen) Pierce

Diagnosis: Reticulate tricolpate sporomorphs, spheroidal to perprolate; colpi straight.

1. Retitricolpites vandellius Shaw sp. nov. Figs. 107-108

Holotype: Slide OK-1 1435-(1); Figs. 107-108; film P 13-23-24, P13-24-25; CPC Micropaleontology Lab.

Description: Grains tricolpate, spheroidal to prolate-spheroidal; 24 x 25 μm; colpi 17-21 μm long; surface view reticulate; lateral view gemmate to verrucate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1435m).

Taxonomic affinity: This species is similar to the extant species of *Vandellia* of Scrophulariaceae.

Family 38. SOLANACEAE
Genus 1. *Solanaceaepollenites* Shaw gen. nov.

Type species: *Solanaceaepollenites taiwanensis* Shaw *sp. nov.*

Diagnosis: Grains tricolporate; amb circular to semiangular; aperture transversally elliptic to transversally parallel; surface view with finely granulate, finely reticulate to obscure pattern.

1. *Solanaceaepollenites taiwanensis* Shaw sp. nov. Figs. 291-293.

Holotype: Slide YKL-3 1145-(1); Figs. 291-293; film W43-5, 6, 7; CPC Micropaleontology Lab.

Description: Grains 3-colporate; amb semiangular; 24-28 μm wide; pore indistinct; surface view with finely granulate to obscure pattern; lateral view scabrate to subpsilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (YKL-3 well, 1145m).

Taxonomic affinity: This species is similar to the extant species of Solanaceae.

Family 39. STERCULIACEAE
Genus 1. *Pterospermumpollenites* gen. nov.

Type species: *Pterospermumpollenites taiwanensis sp. nov.*

Diagnosis: Grains 3-5-porate; amb circular; pore crassimarginate; tectum with echinate processes; exine thin.

1. *Pterospermumpollenites taiwanensis* Shaw sp. nov. Figs. 294-299

Holotype: Slide OK-1 1768-(1); Figs. 296-297; film P3-37-38, P3-36-37, CPC Micropaleontology Lab.

Description: Grains 3-5-porate; shape spheroidal to elliptical; 16-23.5 μm wide; pore crassimarginate, 2 μm thick; surface view with small granulate to echinate processes; lateral view echinate, 0.5-0.8 μm in length; exine less than 0.7 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1719m, 1768m; OK-3 well, 1750m).

Taxonomic affinity: This species is similar to the extant species of *Pterospermum* of Sterculiaceae.

Diagnosis: Grains 3-5-porate; amb circular; pore crassimarginate; tectum with echinate processes; exine thin.

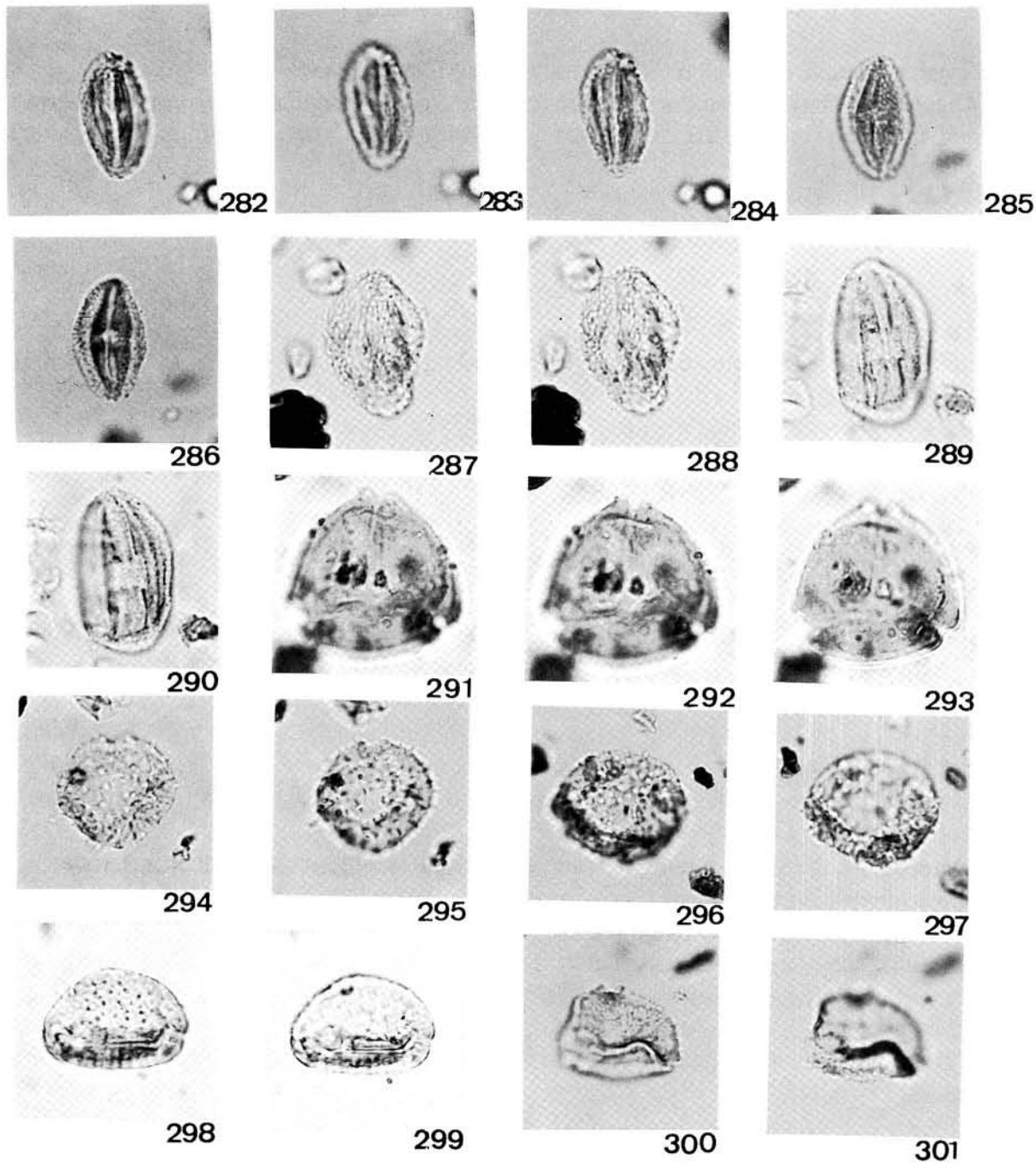
2. *Pterospermumpollenites pengchiahsuensis* Shaw sp. nov. Figs. 300-301

Holotype: Slide OK-1 1669bl-(2); Figs. 300-301; film P7-18-20, P7-17-19, CPC Micropaleontology Lab.

Description: Grains 3-porate; amb semi-angular; 14-19 μm wide; pore somewhat crassimarginate, 1 μm thick; colpi indistinct; surface view with finely-granulate to echinate processes; lateral view echinate to scabrate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: This species is similar to the extant species of *Pterospermum* of Sterculiaceae.



Figs. 282-286. *Retitricolporoidites pengchiahsuensis* Shaw *sp. nov.* OK-1, 1699. BL-2, p7-34, 35, 36, 9 x 16 μm; OK-1, 1669m-4, S6-24, 25, 10 x 16 μm. Figs. 287-290. *Retitricolporoidites triumfettus* Shaw *sp. nov.* OK-1, 1699mbl-1, P6-5-7, P6-6-8, 14 x 20 μm; OK-1, 1588m-4, S8-33, 34, 13 x 22 μm. Figs. 291-293. *Solanaceaepollenites taiwanensis* Shaw *sp. nov* YKL-3, 1145m-1, W43-5, 6, 7, 26-27 μm. Figs. 294-299. *Pterospermumpollenites taiwanensis* Shaw *sp. nov.* OK-1, 1719m-1, P15-1-3, P15-2-4,18 x 19 μm; OK-1, 1768m BL-1, P3-36-37, P3-37-38, 18 x 22 μm; OK-3, 1750m-5, PF28-16, 17, 23 x 16.5 μm. Figs. 300-301. *Pterospermumpollenites pengchiahsuensis* Shaw *sp. nov.* OK-1, 1669m BL-2, P7-17-19, P7-18-20, 14.5 x 19 μm. (SALICACEAE, TILIACEAE, SOLANACEAE, STERCULIACEAE).

Family 40. SYMPLOCACEAE

Genus 1. Symplocoipollenites Potonie 1951 ex Potonie 1960

Type species: *Symplocoipollenites vestibulum*. (Pot.) Pot. Ibid.

Diagnosis: Lenticular (oblate) pollen; equator more or less triangular; exine granulate to rugulate; outline finely dentate; colpi short, vestibulum distiinct.

1. Symplocoipollenites taiwanensis Shaw sp. nov. Figs. 246, 247

Holotype: Slide OK-2 1901-(1); Figs. 246, 247; film W38-20, 21; CPC Micropaleontology Lab.

Description: Grains 3-colporate; amb semi-angular; 21-25 μm wide; aperture club type; pores 1-1.5 μm wide, crassimarginate, the margo 2-3 μm thick; colpi short, indistinct; surrface view finely granulate to obscure pattern; lateral view scabrate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1904m).

Taxonomic affinity: This species is similar to the extant species of *Symplocos*.

2. Symplocoipollenites pengchiahsuensis Shaw sp. nov. Figs. 248, 249

Holotype: Slide OK-2 1875-(3); Figs. 248, 24; film W38-13, 14; CPC Micropaleontology Lab.

Description: Grains 3-colporate; amb semi-angular; 15-18 μm wide; aperture club type; pores 1 μm wide, crassimarginate, the margo 1-1.5 μm thick; colpi short, indistinct; surface view finely granulate to obscure pattern; lateral view scabrate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1875m).

Taxonomic affinity: This species is similar to the extant species of *Symplocos*.

Family 41. TILIACEAE

Genus 1. Retitricolporoidites Mathur 1966

Quart. J. Geol. Min. Metall. Soc. India, v. 38, no. 1, p. 45 Retitricolporites v. D. Hammen 1956 ex v. D. Hammen & Wijmstra 1964.

Type species: *Retitricolporoidites microreticulatus* Math.

Diagnosis: Reticulate tricolporoidate sporomorphs.

1. Retitricolporoidites triumfettus Shaw sp. nov. Figs. 287-290

Holotype: Slide OK-1 1588-(4); Figs. 289-290; film S8-33, S8-34; CPC Micropaleontology Lab.

Description: Grains tricolporate, prolate-spheroidal to prolate; 13-14 x 20-22 μm; colpi 16-18 μm long; ora transversally parallel to lalongate; surface view reticulate; lateral view scabrate; exine 0.5-1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1588m).

Taxonomic affinity: This form species ressembles to the pollen of T*riumfetta racemosa.*

Genus 2. Tiliaepollenites Potonie 1931.

Type species: *Tiliaepollenites indubitabllis Pot*.

Emended diagnosis by Pot. 1960: Lenticular pollen, amb circular to rounded triangular;

the germinals not in the corners, but in the middle of the sides; they may protrude somewhat, vestibulum distinct, exine more or less thickened around exopore; exine on outline smooth to roughened; the columellae so arrange that in topview they produce an infrareticulate pattern.

1. Tiliaepollenites formosensis Shaw **quadriporus** Shaw var. nov. Figs. 306, 307

Holotype: Slide OK-2 1936-(1); Figs. 306, 307; film W45-13, 14; CPC Micropaleontology Lab.

Description:Grains 4-porate; amb circular to quadrigonal; 33-47 μm wide; pore crassimarginate, 3-4 μm thick; surface view reticulate; lateral view scabrate; exine 1.5 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1936m).

Note: This variety is similar to the species of *Tiliaepollenites formosensis* Shaw 1997 but differs in having four pores.

2. Tiliaepollenites pengchiahsuensis Shaw Figs. 302-305

Selected slide: OK-3 1827-(1); Figs. 304, 305; film W37-7, 8; CPC Micropaleontology Lab.

Description: Grains 3-porate; amb circular; 19-27 μm wide; pore crassimarginate, 1-1.5 μm thick; surface view reticulate to finely reticulate; lateral view scabrate; exine 1 μm thick.
Stratigraphic occurrence: Eocene (OK-3 well, 1827m).

Family 42. ULMACEAE

Genus 1. Celtispollenites Ke et Shi, 1978

Sci. Press, Peking, p. 114, pl. 38, figs. 7-11.

Types species: *Celtispollenites dongyingensis* Ke et Shi, 1978.

Diagnosis: Grains pantoporate; amb circular; pore irregularly distribution; exine thin.

1. Celtispollenites taiwanensis Shaw sp. nov. Figs. 319-322

Holotype: Slide OK-1 1425-(1); Figs. 319-320; film P13-24-25, P13-25-26; CPC Micropaleontology Lab.

Description: Grains pantoporate (4-5-); shape spheroidal to elliptical; 25-30 μm wide; pore common type, uniform, 1.5 μm wide; surface view smooth; lateral view psilate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1425m; OK-3 well, 1750m).

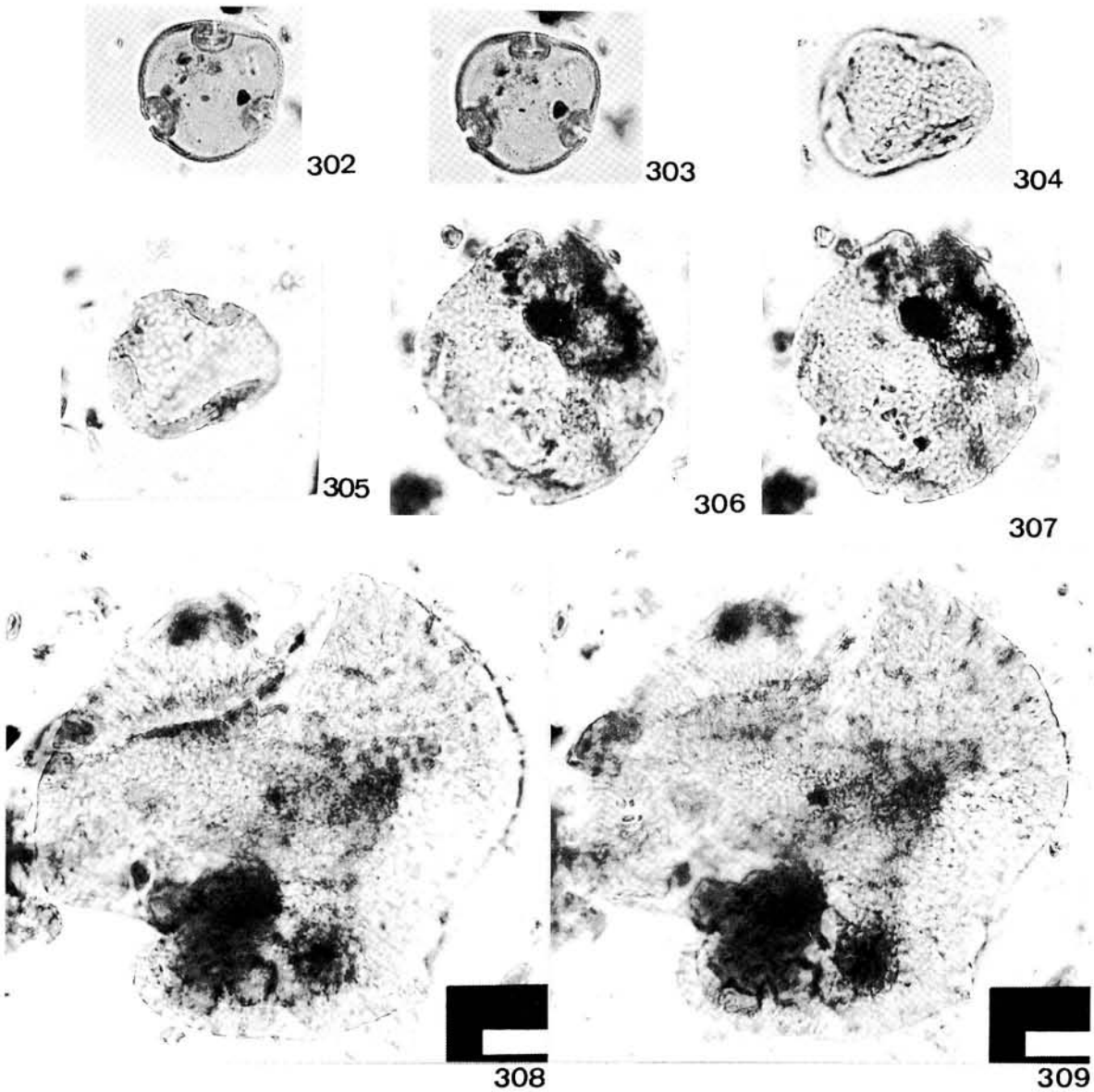
Taxonomic affinity: This species is similar to the extant species of *Celtis* of Ulmaceae.

Genus 2. Ulmipollenites Wolff 1934

Arb., Inst. Palaobbot., nie 1960, Synopsis III, p. 131): Pollen oblate, equator polygonal to + circular, Petrogr. Brennst., Bd. 5, p. 75

Type species: *Ulmipollenites undulosus* Wolff, ibid., P. 775, pl. 5, fig. 25.

Diagnosis (after Poto 4 to 5 equatorial germinals that isinterconnected by very weak arcus and that are distinctly annulate; exine rugulate, ca. 1 μm thick.



Figs. 302-305. *Tiliaepollenites pengchiahsuensis* Shaw OK-3, 1760m-3, WA65-30, 31, 23 x 25 μm; OK-2, 1827-1, W37-7, 8, 23.2 x 27 μm. Figs. 306-307. *Tiliaepollenites formosensis* Shaw *quadriporus* Shaw *var. nov.* OK-2,1936m-1, W45-13, 14, 40 x 38 μm. Figs. 308-309. *Patriniapollenites pengchiahsuensis* Shaw *sp. nov.* OK-3, 1750m-3, PF16-32, 33, 75 x 79 μm. (TILIACEAE, VALERIANACEAE).

1. Ulmipollenites taiwanensis Huang Figs. 310-318

Selected slide: OK-3 1750-(5); Figs. 310-311; film PF29-31, 32; CPC Micropaleontology Lab.

Description: Grains 4-6-porate; amb quadrangular to polygonal; 22-30 x 30-34 μm wide; pores drop type, crassimarginate, 1-2 μm wide, the margo 1-1.5 μm thick; exine 1 μm thick; tectum verrucate; sexine rugulate.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

Taxonomic affinity: This species is similar to the extant species of *Ulmus* of Ulmaceae.

Family 43. UMBELLIFERAE
Genus 1. Umbelliferaepites Biswas

Bull. Geol. Mining Metallurg. Soc. India, no. 25, p. 44

Type species: *Umbelliferaepites paleoaromata* Biswas, I. c., pl. 10, fig. 6.

Diagnosis: Grains slightly pinched at the equator along the transverse furrow, a characteristic feature of the pollen morphology of the family; longitudinal furrows are not conspicuous, though present; exine moderately thick, nearly smooth; previous records of fossilized remains of the Umbelliferae are not known to the writer, but the pollen morohology of the species is diagnostic of this predominantly herbaceous family.

1. Umbelliferaepites taiwanensis Shaw sp. nov. Figs. 323-325

Holotype: Slide OK-3 1750-(2); Figs. 323-325; film PF14-23, 24, 25; CPC Micropaleontology Lab.

Description: Grains tricolporate; prolate to perprolate; 22 x 37 μm wide; colpi 26-30 μm long; ora transversally parallel 3 μm wide; surface view finely pitted to rough pattern; lateral view scabrate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

Taxonomic affinity: This species is similar to the extant species of *Sanicula* of Umbelliferae.

Family 44. VALERIANACEAE
Genus 1. Patriniapollenites Huang & Huang

Type species: *Patriniapollenites taiwanensis* Huang & Huang.

Diagnosis: Grains 3-colpate; exine ca. 2.5 μm thick, with echinate processes.

1. Patriniapollenites pengchiahsuensis Shaw sp. nov. Figs. 308, 309

Holotype: Slide OK-3 1750-(3); Figs. 308, 309; film PF16-32, PF16-33; CPC Micropaleontology Lab.

Description: Grains 3-colpate; amb circular, 68-79 μm wide; exine 3 μm thick, with echinate processes in lateral view, the surface view granulate.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

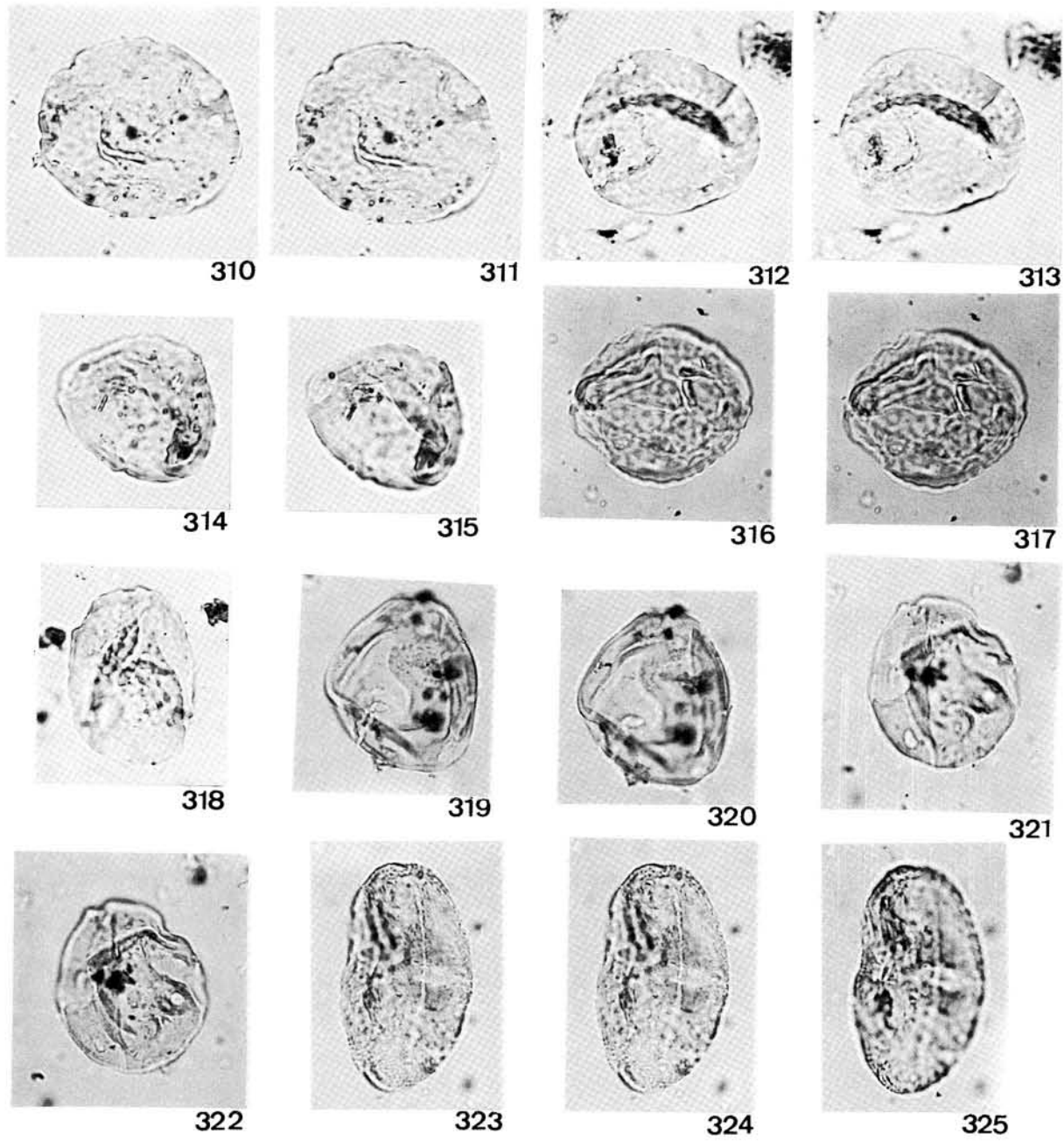
Note: This species is named after the Pengchiahsu Basin of the type locality.

Taxonomic affinity: This species is similar to the extant *Patrinia* of the Valerianaceae (Huang, 1972).

Family 45. VERBENACEAE
Genus 1. Verbenaceaepollenites gen. nov.

Type species: *Verbenaceaepollenites taiwanensis* Shaw *sp. nov.*

Diagnosis: Grains 3-colpate; amb circular to subcircular; verrucate to gemmate processes in lateral view, surface view finely reticulate.



Figs. 310-318. *Ulmipollenites taiwanensis* Huang OK-3, 1750m-5, PF29-31, 32, 30 x 33 μm; OK-3; 1750m-3, PF19-35, 36, 45 x 44 μm; OK-3, 1800m-4, PF50-22-23, 30 x 30 μm; OK-3, 1720m-1, TL8-5, 6, 31 x 22 μm; OK-3, 1750m-5, PF27-28, 22 x 30 μm. Figs. 319-322. *Celtispollenites taiwanensis* Shaw *sp. nov.* OK-1, 1425m-1, P13-24-25, P13-25-26, 25 x 30 μm; OK-3, 1750m-1, PF10-14,15, 26 x 28 μm. Figs. 323-325. *Umbelliferaepites taiwanensis* Shaw *sp. nov.* OK-3, 1750m-2, PF14-23, 24, 25, 37 x 22 μm. (ULMACEAE, UMBELLIFERAE).

1. Verbenaceaepollenites taiwanensis Shaw sp. nov. Figs. 326-330

Holotype: Slide YKL-6 1128-(3); Figs. 229, 330; film WA75-12, 13; CPC Micropaleontology Lab.

Description: Grains 3-colpate; amb circular, 30-40 μm wide; exine 1-2 μm thick; verrucate to gemmate processes in lateral view, surface view finely reticulate.

Stratigraphic occurrence: Eocene (YKL-6 well, 1128m).

Taxonomic affinity: This species is similar to the extant *Callicarpa* of the Verbenaceae (Huang, 1972).

2. Verbenaceaepollenites vitexensis Shaw sp. nov. Figs. 139, 140

Holotype: Slide OK-3 1750-(5); Figs. 139, 140; film PF28-36, 37; CPC Micropaleontology Lab.

Description: Grains 3-colpate; amb circular, 25-30 μm wide; exine 1 μm thick; verrucate to gemmate processes in lateral view, surface view finely reticulate.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

Taxonomic affinity: This species is similar to the extant *Vitex* of the Verbenaceae (Huang, 1972).

Family 46. VITACEAE
Genus 1. Leeapollenites gen. nov.

Type species: *Leeapollenites taiwanensis* Shaw *sp. nov.*

Diagnosis: Grains tricolporate, medium size, spheroidal to prolate-spheroidal; colpi long; ora circular, surface view reticulate; lateral view verrucate to clavate.

1. Leeapollenites taiwanensis Shaw sp. nov. Figs. 331, 332

Holotype: Slide OK-1 1638-(3); Figs. 331, 332; film WA61-7, 8; CPC Micropaleontology Lab.

Description: Grains tricolporate, spheroidal to prolate-spheroidal; 38-42 x 43-47 μm; colpi 31-40 μm long; ora circular 3 μm wide, surface view reticulate; lateral view verrucate to clavate; exine 1.5-2 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1638m).

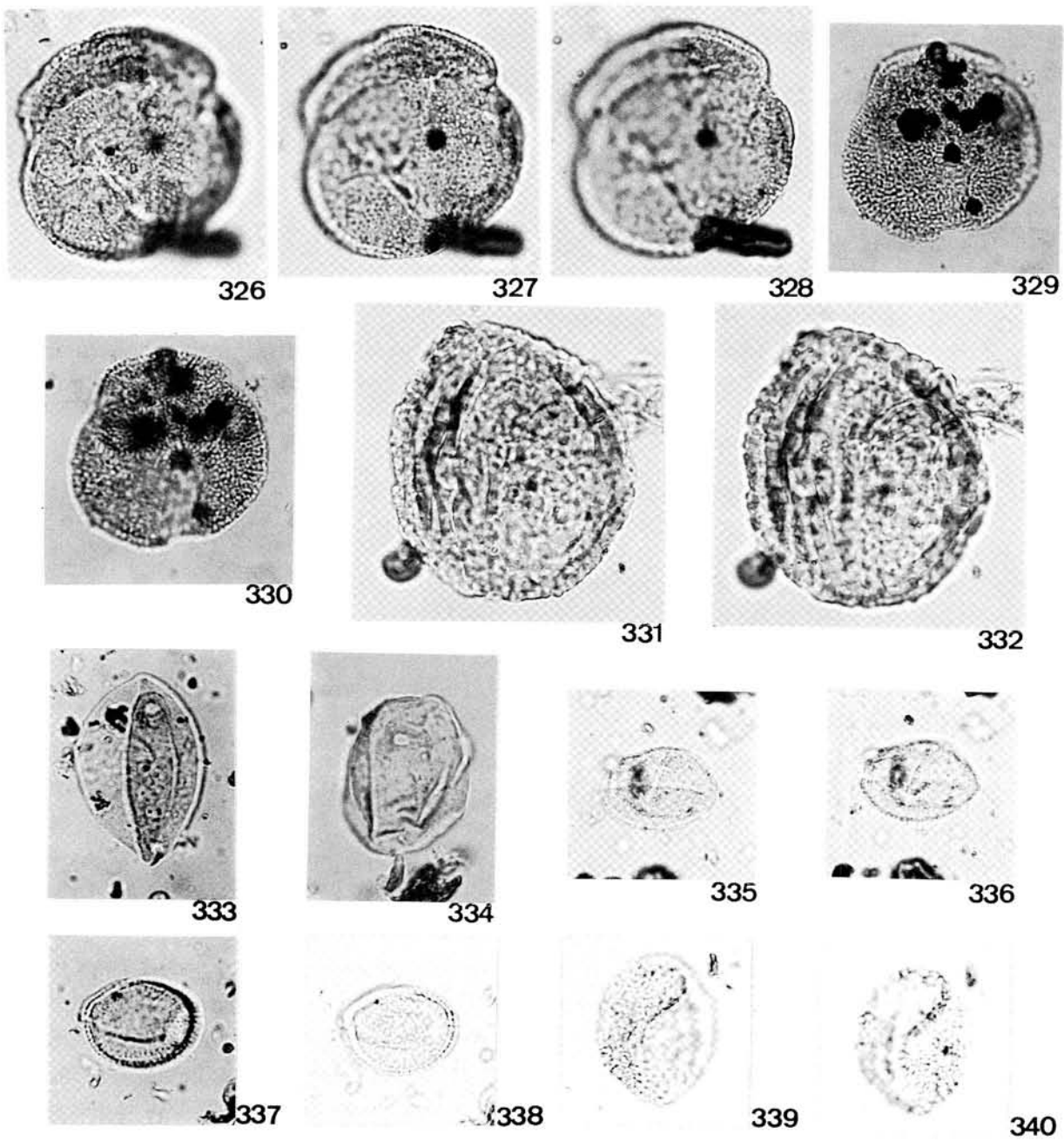
Taxonomic affinity: This species is similar to the extant *Leea manillensis* of the Valerianaceae (Huang, 1972).

Family 47. INCERTAE
Genus 1. Fupingopollenites Liu, 1985

Acta Palaeontologica Sinica, Vol. 24, No. 1, p. 64-70.

Type species: *Fupingopollenites wackersdorfensis* (Thiele-Pfeiffer) Liu 1985

Diagnosis: Pollen grain subspherical to spherical, medium to large in size. Polar view triangular, roundtriangular to subcircular; lateral view oblate to circular. Tricolporate, colpi narrow and straight, about 2/3 the length of radiate; inner pores large, oblate, visible only under right polar or equatorial view. Exine columnar, not homogeneous thickness because of special development of exine columnar structure in certain areas; thickening on both poles approximately "Y" form, which combine with those in mesocolpium areas to form nine



Figs. 326-330. *Verbenaceaepollenites taiwanensis* Shaw *sp. nov.* OK-1, 1283m-1, WA63-23, 24, 25, 36-39 μm; YKL-6, 1128m-3, WA75-12, 13, 31-32 μm. Figs. 331-332. *Leeapollenites taiwanensis* Shaw *sp. nov.* OK-1, 1638m-4, WA61-7, 8, 40 x 45 μm. Figs. 333, 334. *Graminidites glabratus* Huang OK-2, 1916m-1, W41-5, 31 x 21; OK-1 1768-(3), S4-26, 27 x 21 μm. Figs. 335-338. *Potamogetonacidites taiwanensis* Shaw *sp. nov.* OK-2, 1916m-1, W41-7, 8, 13-20 μm; OK-2, 1916m-2, W42-26, 27, 15-20 μm. Figs. 339-340. *Potamogetonacidites pengchiahsuensis* Shaw *sp. nov.* OK-3, 1750m-5, PF28-31, 32, 21-25 μm. (VERBENACEAE, VITACEAE, POACEAE, POTAMOGETONACIDITES).

1. Fupingopollenites wackersdorfensis (Thiele-Pfeiffer) Liu 1985 Figs. 164, 165

Selected slide: OK-1 1669-BL-(2); Figs. 164, 165; film P8-2-5, P8-3-6; CPC

Micropaleontology Lab.

Description: Grains 3-colp(or)ate; polar view circular, with pseudopolygonal-lacuna 7-10 x 7-16 μm (become thin membrane); 28-43 μm wide; colpi 28 μm long; lateral view scabrate; surface view finely reticulate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m).

Taxonomic affinity: Unknown.

Genus 2. Taiwanipollis gen. nov.

Type species: *Taiwanipollis verus* Shaw *sp. nov.*

Diagnosis: Grains tricolporate to pericolporate, medium size, prolate-spheroidal to subprolate; colpi short; ora lolongate, surface view finely reticulate to extervermiculate; lateral view clavate.

1. Taiwanipollis verus Shaw sp. nov. Figs. 341-349

Holotype: Slide OK-1 1669-bl-(2); Figs. 343-345; film P8-11-14, P8-12-15, P8-13-16; CPC Micropaleontology Lab.

Description: Grains tricolporate to pericolporate, medium size, prolate-spheroidal to subprolate; 28-35 x 42-54 μm; colpi short, 28 μm long; ora lolongate, 6.5 x 3 μm, surface view finely reticulate to extervermiculate; lateral view clavate; exine 2-2.5 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1669m, 1768m).

Taxonomic affinity: Unknown.

CLASS 2. MONOCOTYLEDONEAE

Family 48. POACEAE

Genus 1. Graminidites Cookson 1947 ex Potonie 1960

1947 B. A. N. Z. A. R. E., Reps, ser. A, v. 2, pt. 8, p. 134. 1960 Synopsis III, p. 111.

Type species: *Graminidites media* Cooks. ex Pot.

Diagnosis (after Potonie): "More or less spherical spores with one pore which is surrounded by an annulus; exine thin, finely "granulated" (infragranulate to granulate). "Larger than *Sparganiaceaepollenites,* and with thinner and less sculptured exine, hence with more secondary folds.

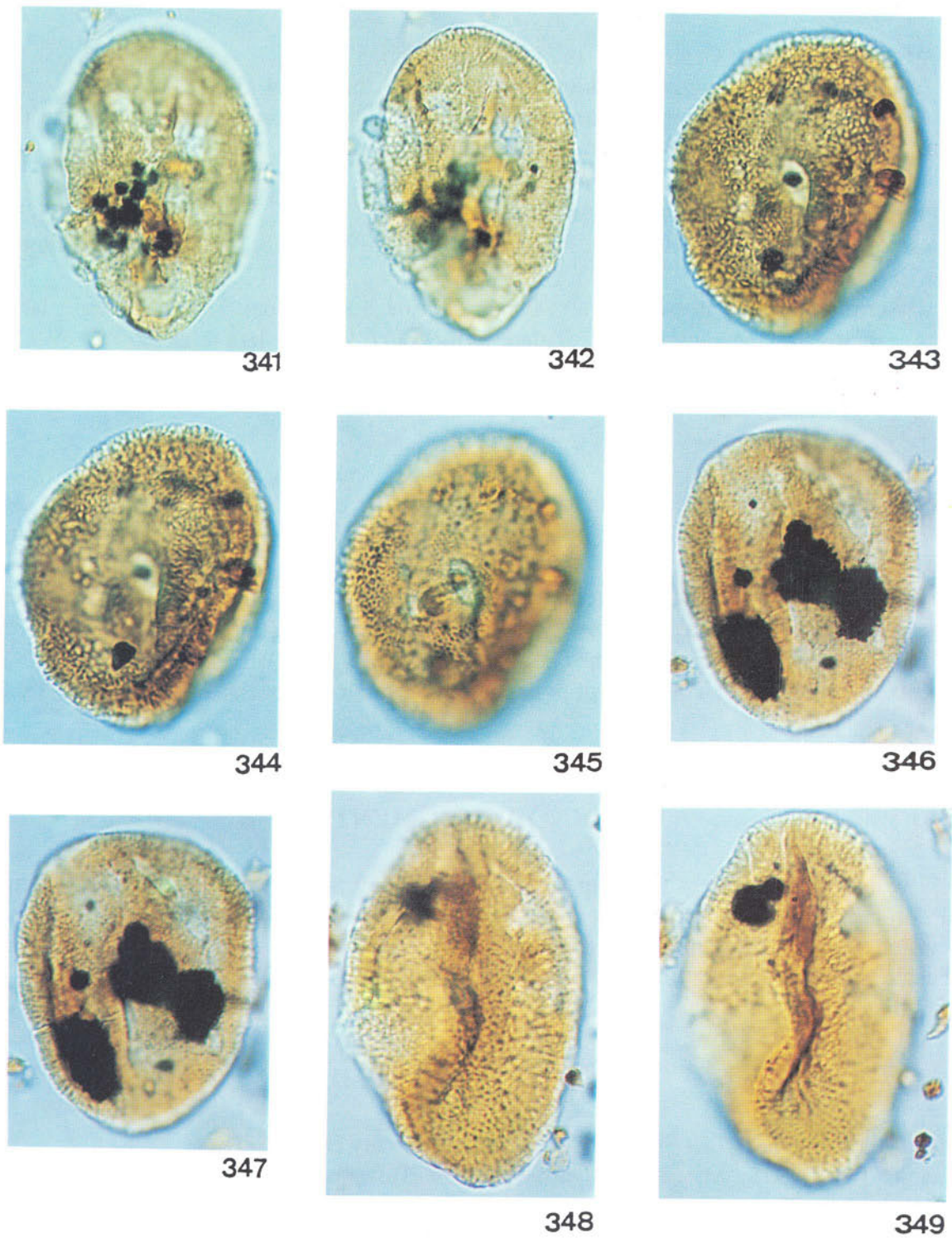
1. Graminidites glabratus Huang Figs. 333, 334

Selected slide: OK-1 1768-(3); Figs. 334; film S4-26; CPC Micropaleontology Lab.

Description: Grains 1-porate; spheroidal; 21-32 μm wide; pore circular, 2-2.5 μm wide, the annulus distinct; lateral view psilate; surface view obscure pattern; exine thin 0.5 μm or less thick.

Stratigraphic occurrence: Eocene (OK-1 well, 1768m; OK-2 well, 1916m).

Taxonomic affinity: This form of pollen grain is similar to those of grasses (Huang, 1972).



Figs. 341-349. *Taiwanipollis verus* Shaw *sp. nov.* OK-1, 1669m-1, S7-29, 30, 29 x 44 μm; OK-1, 1669m BL-1, P8-11-14, P8-12-15, P8-13-16, 35 x 44 μm; OK-1, 1768m-5, S5-14, 15, 35 x 44 μm; OK-1, 1669m-4, S6-20, 21, 54 x 55 μm. (INCERTAE).

Family 49. POTAMOGETONACEAE
Genus 1. Potamogetonacidites Sah 1967

Mus. Roy. Afrique Centr.; Ann. In 8°, Sci. geol., no. 57, p. 48.

Type species: *Potamogetonacidites cenozoicus* Sah, ibid., pl. 4, fig. 18.

Diagnosis: Pollen grains non-aperturate; amb spheroidal to sub-spheroidal; exine thin, sexine as thick as nexine, usually finely reticulate; muri simplibaculate.

1. Potamogetonacidites taiwanensis Shaw sp. nov. Figs. 335-338

Holotype: Slide OK-2 1916-(1); Figs. 335-336; film W41-7, 8; CPC Micropaleontology Lab.

Description: Grains non-aperturate; spheroidal to sub spheroidal; 13-20 μm wide; lateral view scabrate; surface view finely reticulate; exine thin 0.5 μm or less thick.

Stratigraphic occurrence: Eocene (OK-2 well, 1916m).

Taxonomic affinity: This form of pollen grain is similar to those of *Potamogeton* (Huang, 1972).

2. Potamogetonacidites pengchiahsuensis Shaw sp. nov. Figs. 339, 340

Holotype: Slide OK-3 1750-(5); Figs. 339, 340; film PF28-31, 32; CPC Micropaleontology Lab.

Description: Grains non-aperturate; spheroidal to sub spheroidal; 21-26 μm wide; lateral view gemmate to verrucate; surface view reticulate; exine 0.5 μm thick.

Stratigraphic occurrence: Eocene (OK-3 well, 1750m).

Taxonomic affinity: This form of pollen grain is similar to those of *Potamogeton* (Huang, 1972).

ACKNOWLEDGMENTS

I would like to express my deep appreciation to the Exploration and Research Institute, CPC for providing facilities to conduct this study, the Offshore and Oversea Petroleum Division, CPC for providing subsurface rock samples. This work was supported by National Science Council of the Republic of China under contract NSC89-2116-M-326-001.

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台灣始新統被子植物化石花粉

蕭承龍[1]

（收稿日期：1999 年 9 月 30 日；接受日期：1999 年 11 月 5 日）

摘　　要

本文報導發現於台灣基隆北方海域始新世地層中，被子植物花粉化石共計九十七個形態分類群;它們分別屬於二綱，四十九科，六十七形態屬，其中雙子葉植物綱計有六十五形態屬，九十四形態分類群，單子葉植物綱計有二形態屬，三形態分類群，其中十形態屬為新屬，六十六種為新種 (*Striatopollis verus* Shaw *sp. nov.; Retitricolpites verus* Shaw *sp. nov.; Tricolpites pengchiahsuensis* Shaw *sp. nov.; Tricolpopollenites pengchiahsuensis* Shaw *sp. nov.; Alangiopollis taiwanensis* Shaw sp. nov.; *Rhoipites taiwanensis* Shaw sp. nov.; *Anodendronpolleniites taiwanensis* Shaw *sp. nov.; Retitricolpites schefflerus* Shaw *sp. nov.; R. acanthopanasus* Shaw *sp. nov.; Alnipollenites firmaensis* Shaw *sp. nov.; Ostryoipollenites taiwanensis* Shaw *sp. nov.; Carpinipites pengchiahsuensis* Shaw *sp. nov.; Retitricolpites campanulatus* Shaw *sp. nov.; Bombacacidites taiwanensis* Shaw *sp. nov.; Retitricolporoidites religiosus* Shaw *sp. nov.; R. racemosus* Shaw *sp. nov.; Ageratumpollenites formosensis* Shaw *sp. nov.; Compositoipollenites taiwanensis* Shaw *sp. nov.; C. pengchiahsuensis* Shaw *sp. nov.; Retitricolpites cruciferus* Shaw *sp. nov.; Thladiantkapollenites taiwanensis* Shaw *sp. nov.; Droserapollis taiwanensis* Shaw *sp. nov.; Mallotuspollenites taiwanensis* Shaw *sp. nov.; Acalyphapollenites taiwanensis* Shaw *sp. nov.; Tricolporopollenites gilvatus* Shaw *sp. nov.; T. pengchiahsuensis* Shaw *sp. nov.; Caryapollenites pengchiahsuensis* Shaw *sp. nov.; C. verus* Shaw *sp. nov.; C. quadriporus* Shaw *sp. nov.; Engelhartioipollenites pengchiahsuensis* Shaw *sp. nov; .Juglanspollenites pengchiahsuensis* Shaw *sp. nov.; Momipites pengchiahsuensis* Shaw *sp. nov.; Retihexacolpites pengchiahsuensis* Shaw *sp. nov.; Tricolpites stachysus* Shaw *sp. nov.; Cranwellia taiwaniana* Shaw *sp. nov.; C. pengchiahsuana* Shaw *sp. nov.; Myrtaceidites pengchiahsuensis* Shaw *sp. nov.*; *M. formosensis* Shaw *sp. nov.; Nymphaeacidites pengchiahsuensis* Shaw *sp. nov.; Corsinipollenites granulatus* Shaw *sp. nov.; C. pengchiahsuensis* Shaw *sp. nov.; Retitricolpites jasminus* Shaw *sp. nov.; Retitricolporoidites verus* Shaw *sp. nov.; Polygalacidites pengchiahsuensis* Shaw *sp. nov.; P. formosensis* Shaw *sp. nov.; Sanguisorbapollenites taiwanensis* Shaw *sp. nov.; Retitricolporoidites nitidus* Shaw *sp. nov.; R, formosensis* Shaw *sp. nov.; R. pengchiahsuensis* Shaw *sp. nov.; Yenjisapollis formosensis* Shaw *sp. nov.; Retitricolpites vandellius* Shaw *sp. nov.; Solanaceaepollenites taiwanensis* Shaw *sp. nov;. Pterospermumpollenites taiwanensis* Shaw *sp. nov.; P. pengchiahsuensis* Shaw *sp. nov.; Symplocoipollenites taiwanensis* Shaw *sp. nov.; S. pengchiahsuensis* Shaw *sp. nov.; Retitricolporoidites triumfettus* Shaw *sp. nov.*; *Celtispollenites taiwanensis* Shaw *sp. nov.; Umbelliferaepites taiwanensis* Shaw *sp. nov.; Patriniapollenites pengchiahsuensis* Shaw *sp. nov.; Verbenaceaepollenites taiwanensis* Shaw *sp. nov.; V. vitexensis* Shaw *sp. nov. Leeapollenites taiwanensis* Shaw *sp. nov.; Taiwanipollis verus* Shaw *sp. nov.; Potamogetonacidites taiwanensis* Shaw *sp. nov.; P. pengchiahsuensis* Shaw *sp. nov.*), 四種為新變種 (*Triporopollenites coryloides* (Potonie) Th. & Pfl. minor var. nov.; Tricolporopollenites perprolatus Huang psilatus Shaw var. nov.; *Periporopollenites formosana* Huang *medius var. nov.; Tiliaepollenites formosensis* Shaw *quadriporus* Shaw *var. nov.*)。

關鍵詞：始新統，被子植物化石花粉，分類，台灣。

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