

NEW ACRITARCHS FROM THE EARLY DEVONIAN (LATE GEDINNIAN)
HARAGAN FORMATION OF OKLAHOMA, U.S.A.

ALFRED R. LOEBLICH, JR.

and

WARREN S. DRUGG

CHEVRON OIL FIELD RESEARCH COMPANY, LA HABRA, CALIFORNIA

CONTENTS

	Page
I. ABSTRACT	129
II. INTRODUCTION	129
III. ACKNOWLEDGMENTS	129
IV. TYPES	129
V. SYSTEMATIC DESCRIPTIONS	130

I. ABSTRACT

Three distinctive new genera of acritarchs, microplankton of probable algal origin, are described from the Early Devonian (Late Gedinnian) Haragan Formation of Oklahoma. *Ozotobrachion* includes two new species: *O. dactylos* (type species) and *O. dicros*. *Fimbriaglomerella* (type species, *F. divisa*) and *Riculusphaera* (type species, *R. fissa*) are both, for the present, monotypic.

II. INTRODUCTION

Paleozoic acritarchs of North America are as yet relatively poorly known. They are an important group in the Paleozoic and Late Precambrian, and may be the only phytoplankton organisms preserved in these rocks. Their wide distribution and the demonstratively short geologic ranges of many taxa make them good index fossils for purposes of age dating and zonation of strata. Much additional work is required for the establishment of stratigraphic ranges for both genera and species throughout the Paleozoic.

During the course of generic studies by

one of us (ARL) in preparation of a portion of the *Treatise on Invertebrate Paleontology*, some distinctive Early Devonian acritarchs were found. As these were not referable to previously known taxa, descriptions of three new genera and four new species are here presented. All are from the Early Devonian (Late Gedinnian) Haragan Formation of Oklahoma, a deposit consisting of beds of limestone with varying amounts of intercalated calcareous shale. The species described herein were from a shaly interval in the lower part of the formation.

III. ACKNOWLEDGMENTS

We are indebted to Helen Tappan Loeblich for critical reading of the manuscript and for aid in mounting the plates. Samples used in the present study were collected by Helen Tappan Loeblich and A. R. Loeblich, Jr.

IV. TYPES

Type specimens are deposited in the Helen Tappan Loeblich collection at the De-

EDITORIAL COMMITTEE FOR THIS PAPER:

FRITZ H. CRAMER, Department of Geology, Florida State University, Tallahassee, Florida

W. A. S. SARJEANT, Department of Geology, University of Oklahoma, Norman, Oklahoma

partment of Geology, University of California, Los Angeles, California.

V. SYSTEMATIC DESCRIPTIONS

Genus OZOTOBRACHION

Loeblich and Drugg, n. gen.

Derivation from *ozotos*, Gr. branched + *brachion*, Gr. arm. Gender: masculine.

Type species: *Ozotobrachion dactylos* Loeblich and Drugg, n. sp.

Vesicles triangular in plan view, more rarely ovate or subquadrangular. An elongate process is present at each angle; commonly there are three, rarely only two or as many as four processes. The thin-walled processes are dichotomously branched or digitate and may be open or closed distally. Proximally they are closed by a thickened plug at the juncture of the vesicle. Probable pylome represented by a split or rent between two processes. Vesicle wall thicker than that of processes, the possibility of a two-layered wall impossible to determine optically.

Remarks: *Ozotobrachion* differs from *Verybanchium* Deunff in possessing processes that are not in communication with the interior of the vesicle. It differs from *Triangulina* Cramer in lacking the tapering processes of that genus, in having processes that may be opened or closed distally, and in having distinct plugs at their juncture with the vesicle. It differs from *Onondagella* Cramer in having the processes closed proximally

by a plug. Of species in the latter genus, *Onondagella deunffi* Cramer is similar in construction to the type species *O. asymmetrica* (Deunff) Cramer, but *O. sanpetrensis* Cramer seems closer to *Triangulina*. *Ozotobrachion* further differs from all the above-mentioned genera in the terminally dichotomously branched or digitate processes.

OZOTOBRACHION DACTYLOS

Loeblich and Drugg, n. sp.

Pl. 1, figs. 1-6

Derivation from *dactylos*, Gr. finger.

Triangular vesicle flattened, wall about 1 μ in thickness, surface finely granulate. Wall commonly with thinner areas near the base of the processes. A typically three-armed specimen has three such light areas behind the plugs, leaving a relatively broad Y-shaped darker central region. Triangular specimens have three processes, one at each of the body angles, rare tetrahedral specimens have four processes and a single ovate specimen had only two processes. The cavities of the processes and central body are separated at their juncture by distinct plugs 2 μ in thickness. At the plug, the wall thins abruptly and the processes are translucent. Processes are of nearly uniform width for most of their length, but widen distally to become broadly digitate with open ends. The processes are ornamented at

→

PLATE 1

Figures

Page

- 1-6 *Ozotobrachion dactylos* Loeblich and Drugg, n. sp. 1, paratype, showing triangular body, prominent plug at juncture of central body and processes and processes with nearly uniform diameter, until they widen distally to become broadly digitate. Cat. No. 67-193(4)53-106. 2, paratype, showing generally triangular body, with four processes, the broken remnant of the fourth being just to the left of the upper right process. Cat. No. 67-193, 986. 3, paratype, rare two-processed specimen, with finely granulate ovate body, prominent plugs at juncture of central body and processes, and thin translucent processes with digitate terminations. Cat. No. 67-193(1)57-103. 4a, b, paratype, 4a, high focus showing split or rent across lower part of central body between the two processes, which is probably equivalent to a pylome. 4b, same in lower focus showing prominent plugs. 5, holotype, showing finely granulate central body, prominent plugs, thin-walled and distally digitate processes. Cat. No. 67-193, 984. 6, paratype, tetrahedral specimen showing four terminally digitate processes. Cat. No. 67-193(2)30-109. Figs. 1-2, 4a-5, $\times 518$; fig. 3, $\times 960$; fig. 6, $\times 384$ 130

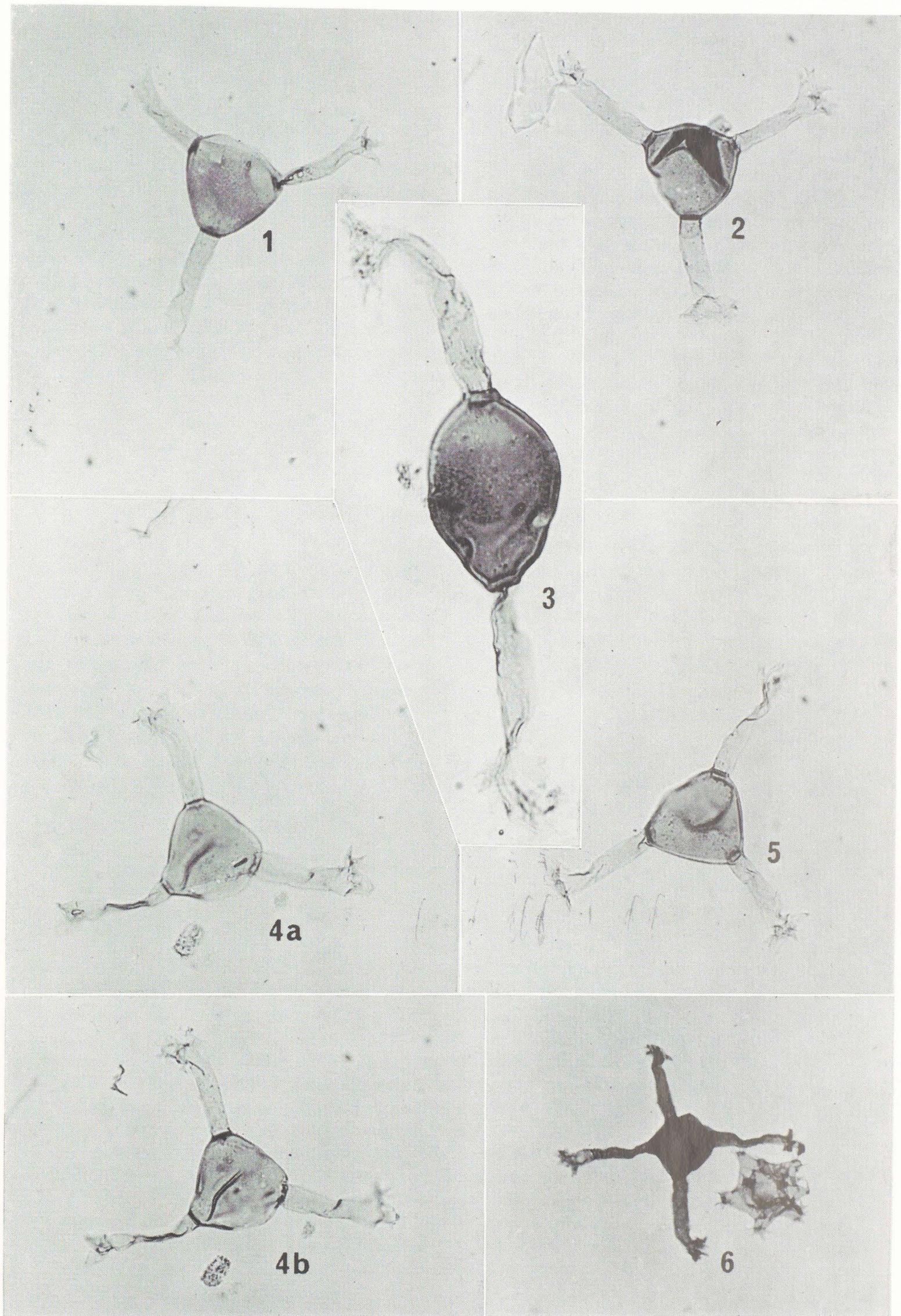


PLATE 1

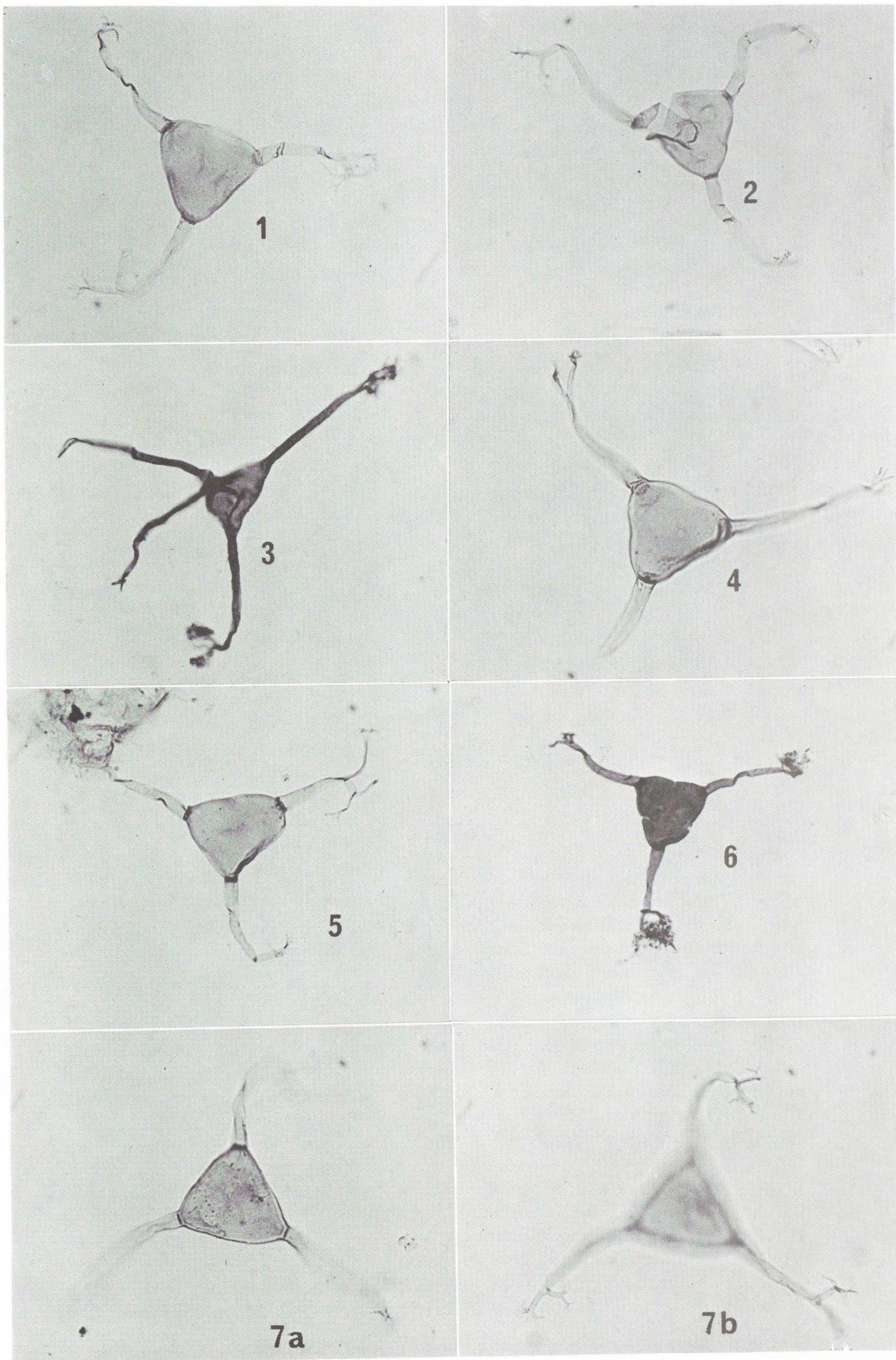


PLATE 2

the surface by scattered grana grading into small prickles.

The central body size ranges from 19 to 27 μ in diameter, most being about 25 μ . The processes range from 22 to 35 μ in length, average 27 μ , and are 4 to 7 μ in width, average 5 μ .

Remarks: *Ozotobrachion dactylos* n. sp. differs from *O. dicros* n. sp. in having open digitate process tips rather than these being closed terminally and dichotomously branching. It is similar in many respects to *Baltisphaeridium palidodigitatum* Cramer, 1967, but differs in having fewer processes (maximum of four observed), whereas *B. palidodigitatum* has a maximum of seven processes, closed proximally by a plug. Those in *B. palidodigitatum* may be pierced by a lumen. Furthermore the central body of *O. dactylos* is finely granulate rather than psilate in *B. palidodigitatum*. The wall of *B. palidodigitatum* is described as bilayered but that of *O. dactylos* appears to be single layered.

Types and Occurrence: All specimens from the lower part of the Haragan Formation (Lower Devonian, Upper Gedinnian) in an escarpment in the NW $\frac{1}{4}$, Sec. 8, T.1S, R.8E., west of Clarita, Coal County, Oklahoma. Collected by H. T. and A. R. Loeblich, Jr., September 3, 1967.

Holotype, Cat. No. 67-193, 984. Paratypes, Cat. Nos. 67-193(4)53-106; 67-193, 986; 67-193(1)57-103 and 67-193(2)30-109.

OZOTBRACHION DICROS

Loeblich and Drugg, n. sp.

Pl. 2, figs. 1-7

Derivation from *dikros*, Gr. forked, cloven.

Similar to the type species, but with processes more slender, tapering gradually, and closed terminally. Near the distal end they branch dichotomously, with two to four successive dichotomies, each branch being of still less diameter. As in the type species, most specimens have three processes, a few have four processes, and one specimen had only two. Process walls are thin, their surface smooth or bearing scattered grana. Plugs at the process bases are about 1 to 2 μ thick. Vesicle wall about 0.5 to 1 μ thick, with smooth to finely granulate surface.

Vesicle from 20 to 27 μ in diameter, commonly about 25 μ . The processes range from 27 to 56 μ in length, average 36 μ , and are 3 to 4 μ in width, average 3 μ .

Remarks: Vesicle may be faintly trilobate, slightly constricted between the processes, and with a tendency for small breaks to occur at the lateral edges where the lobes meet. Occasional specimens have a slit-like opening between two adjacent processes along one lateral margin of the vesicle. As it is a rare feature, it may be accidental. However, this structure has been observed on both species, and probably represents a pylome.

PLATE 2

Figures

1-7

Ozotobrachion dicros Loeblich and Drugg, n. sp. 1, holotype, showing triangular vesicle, and gradually tapering thin-walled processes that branch dichotomously at the distal end. Cat. No. 67-193(6)54-100. 2, paratype, showing bifurcating character of the processes. Cat. No. 67-193(5)46-99. 3, tetrahedral paratype exhibiting four processes. Cat. No. 67-193(3)48-110. 4, paratype, showing faintly trilobate vesicle with walls constricted between processes. Cat. No. 67-193, 980. 5, paratype, showing prominent plugs at juncture of processes with central body, and the distally bifurcating processes. Cat. No. 67-193(4)33-101.5. 6, paratype, showing prominent plugs at juncture of process with central body and small breaks in the vesicle that generally occur at the indentations of the faintly trilobate vesicle. Cat. No. 67-193(3)27-96. 7a, b, paratype, 7a, high focus showing scattered grana on the vesicle wall, and the prominent plugs. 7b, same in low focus, showing dichotomously bifurcating processes at their distal end. Cat. No. 67-193, 988. Figs. 1, 2, 4-7, $\times 518$; fig. 3, $\times 384$

Page

132

Types and Occurrence: All specimens from the lower part of the Haragan Formation (Lower Devonian, Upper Gedinian) in an escarpment in the NW $\frac{1}{4}$, Sec. 8, T.1S., R.8E., west of Clarita, Coal County, Oklahoma. Collected by H. T. and A. R. Loeblich, Jr., September 3, 1967.

Holotype, Cat. No. 67-193(6)54-100. Paratypes, Cat. Nos. 67-193(5)46-99; 67-193(3)48-110; 67-193, 980; 67-193(4)33-101.5; 67-193(3)27-96 and 67-193, 988.

Genus RICULASPHAERA

Loeblich and Drugg, n. gen.

Derivation from *rica*, L. veil, *ricula*, dim. + *sphaera*, L. ball. Gender: feminine.

Type species: *Riculasphaera fissa* Loeblich and Drugg, n. sp.

Vesicle double walled, consisting of a spherical inner body to which are attached laterally two bag-like extensions. Lateral extensions generally open terminally, and resemble a skirt or ruffle, but in occasional specimens may appear to form closed sacs. The vesicle opens by a median splitting resulting in two hemispheres, each with its skirt-like attachment. Rare split specimens consist of the hemispheres alone, lacking the usual extensions.

Remarks: This distinctive genus is unlike any described acritarch. It is closest to *Pterospermopsis* W. Wetzel, but the latter has a single median flange, whereas the present genus has a lateral skirt or sac-like extension at each end of the spherical central body.

RICULASPHAERA FISSA

Loeblich and Drugg, n. sp.

Pl. 3, figs. 1-6

Derivation from *fissa*, L. cleave or split.

Spherical inner body with thin wall, surface commonly finely granulate and wrinkled. A bag-like extension or skirt-like fringe occurs at each side. Inner body may split along a plane midway between, and perpendicular to, these lateral extensions, forming two equal halves. A rather coarse reticulum at the poles opposite the opening apparently results from folding or crushing. Adjacent to the line of rupture a narrow belt of striae or wrinkles lies at right angles to the opening. The outer wall separates below this line to form the lateral extensions or skirts which are usually open ended, but may appear bag-like, nearly closed, with only a minor break or slit distally.

PLATE 3

Figures

Page

- 1-6 *Riculasphaera fissa* Loeblich and Drugg, n. sp. 1, holotype, showing thin-walled, finely granulate, and wrinkled inner vesicle and laterally attached bag-like or skirt-like extensions. Cat. No. 67-193(3)28-91. 2a, b, paratype, 2a, low focus on split one-half of inner vesicle, the attached skirt-like extension showing at the pole opposite the opening, a coarse reticulum resulting from folding or crushing. 2b, high focus showing "aperture" of split central body with attached lateral skirt-like extension. Cat. No. 67-193(2)61-93. 3a, b, paratype, 3a, high focus showing split half of inner vesicle with its laterally attached skirt-like extension, and a belt of striae and wrinkles at right angles to the opening. 3b, low focus showing belt of striae and wrinkles at right angles to the opening of the inner vesicle. Cat. No. 67-193(7)15-94. 4a, b, paratype, 4a, low focus on detached inner vesicle showing wrinkles on pole opposite to the break due to splitting of the vesicle. 4b, high focus showing lines of striae or wrinkles at right angles to the opening of the inner vesicle. Cat. No. 67-193(8)52-112. 5, paratype, showing inner vesicle that has split across the mid region into two halves, each with its attached skirt. Cat. No. 67-193(4)27-106. 6, paratype, 6a, high focus, 6b, low focus, showing median splitting of the inner vesicle and laterally attached skirt-like extensions. Cat. No. 67-193(4)27-106. Figs. 1-4, $\times 960$; figs. 5, 6, $\times 518$ -----

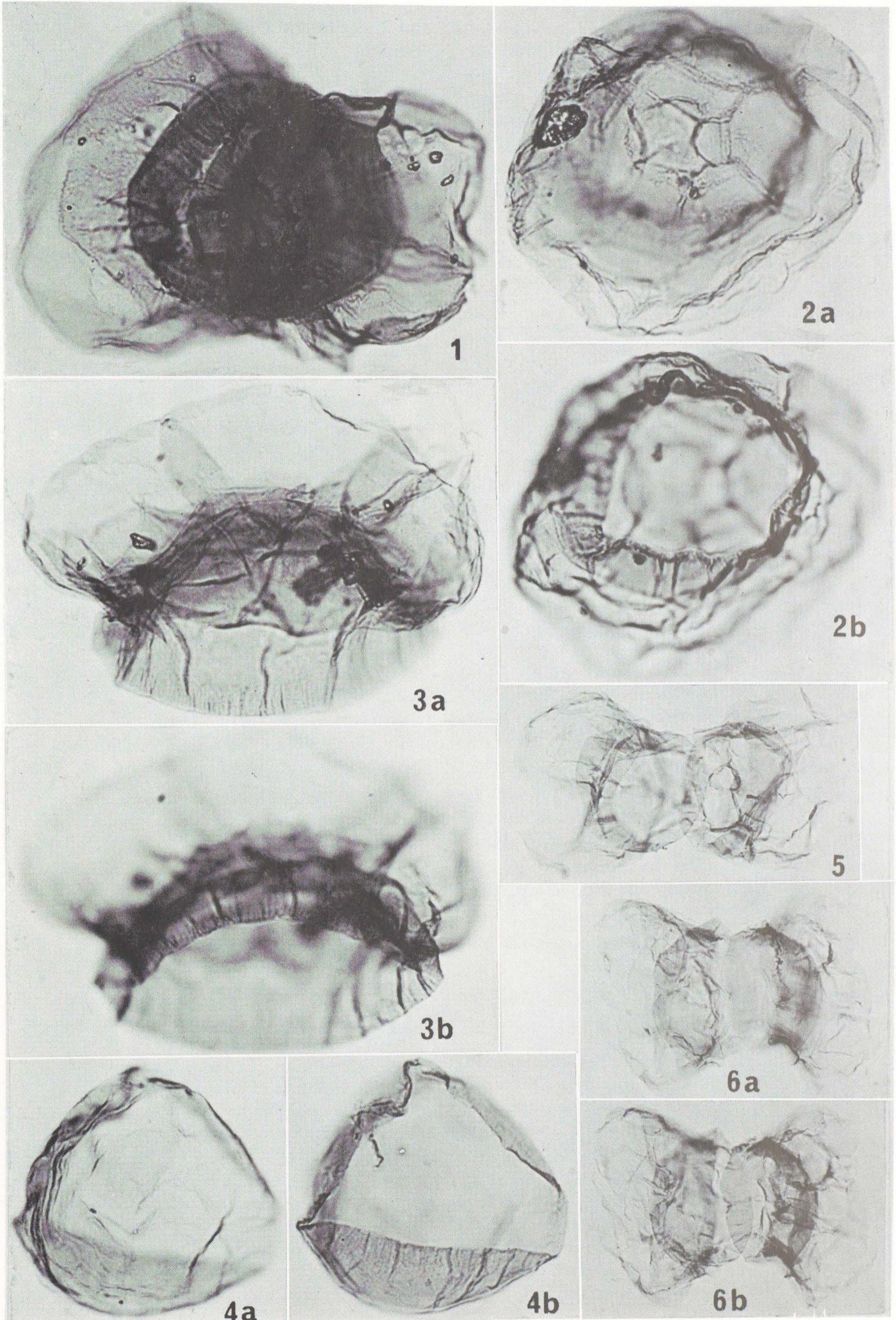


PLATE 3

Inner body ranges from 32 to 43 μ in diameter, commonly about 35 μ . Diameter of lateral extensions ranges from 43 to 56 μ , average 48 μ . Total length of complete specimen ranges between 48 and 72 μ , averaging about 60 μ .

Types and Occurrence: All specimens from the lower part of the Haragan Formation (Lower Devonian, Upper Gedinnian) in an escarpment in the NW $\frac{1}{4}$, Sec. 8, T.1S., R.8E., west of Clarita, Coal County, Oklahoma. Collected by H. T. and A. R. Loeblich, Jr., September 3, 1967.

Holotype, Cat. No. 67-193(3)28-91. Paratypes, Cat. Nos. 67-193(2)61-93; 67-193(7)15-94; 67-193(8)52-112; 67-193(4)27-106 and 67-193(4)27-106.

Genus FIMBRIAGLOMERELLA

Loeblich and Drugg, n. gen.

Derivation from *fimbria*, L. fringe + *glomus*, *glomeris*, L. ball + *ella* dim. Gender: feminine.

Type species: *Fimbriaglomerella divisa* Loeblich and Drugg, n. sp.

Vesicle spherical to ellipsoidal. Wall two-layered, the inner layer thin and finely granulate, outer layer thin and filmy with elevated muri forming a coarse reticulum. The vesicle opens by splitting into two equal parts.

Remarks: *Fimbriaglomerella* somewhat resembles both *Cymatiosphaera* O. Wetzel ex Deflandre and *Cymatiogalea* Deunff. However, *Cymatiosphaera* seemingly exhibits no opening, *Cymatiogalea* has a polar aperture,

and the present genus opens by a median splitting.

FIMBRIAGLOMERELLA DIVISA

Loeblich and Drugg, n. sp.

Pl. 4, figs. 1-6

Derivation from *divido*, *divisus*, L. separate, divide.

The spherical to ellipsoidal inner body is thin walled and finely granulate, with an outer reticulum of thin, filmy, delicate, and commonly wrinkled muri that range between 12 and 14 μ in height. The crudely rectangular to polygonal lumina are about 12 μ in diameter. Vesicle opens by splitting in two roughly equal halves. Ellipsoidal specimens break along the shorter axis.

Inner body ranges from 48 to 58 μ in maximum diameter, and the entire specimen ranges between 70 and 85 μ in total diameter.

Remarks: This species is similar to *Cymatiosphaera mirabilis* Deunff, but differs in being larger and in the distinctive vesicle opening.

Types and Occurrence: All specimens from the lower part of the Haragan Formation (Lower Devonian, Upper Gedinnian) in an escarpment in the NW $\frac{1}{4}$, Sec. 8, T.1S., R.8E., west of Clarita, Coal County, Oklahoma. Collected by H. T. and A. R. Loeblich, Jr., September 3, 1967.

Holotype, Cat. No. 67-193(1)33-110. Paratype Cat. Nos. 67-193(2)58-92; 67-193(5)43-104; 67-193(2)29-110; 67-193(2)29-111 and 67-193(3)49-93.

→

PLATE 4

Figures	Page
1-6	136
<p><i>Fimbriaglomerella divisa</i> Loeblich and Drugg, n. sp. 1, paratype, showing spherical vesicle with its thin filmy reticulum. Cat. No. 67-193(2)58-92. 2, paratype, split half of inner vesicle, with outer filmy reticulum. Cat. No. 67-193(5)43-104. 3, paratype, showing nearly spherical form, outer reticulum and with incipient splitting. Cat. No. 67-193(2)29-110. 4a, b, holotype, 4a, high focus showing ellipsoidal shape, and elevated muri forming a coarse reticulum. 4b, low focus, showing thin filmy reticulum and elevated muri. Cat. No. 67-193(1)33-110. 5, paratype, showing median split, coarse reticulum and finely granulate inner wall layer. Cat. No. 67-193(2)29-111. 6, paratype with elevated muri forming a coarse reticulum. Cat. No. 67-193(3)49-93. Figs. 1, 3, $\times 384$; fig. 2, $\times 518$; figs. 4-6, $\times 960$</p>	

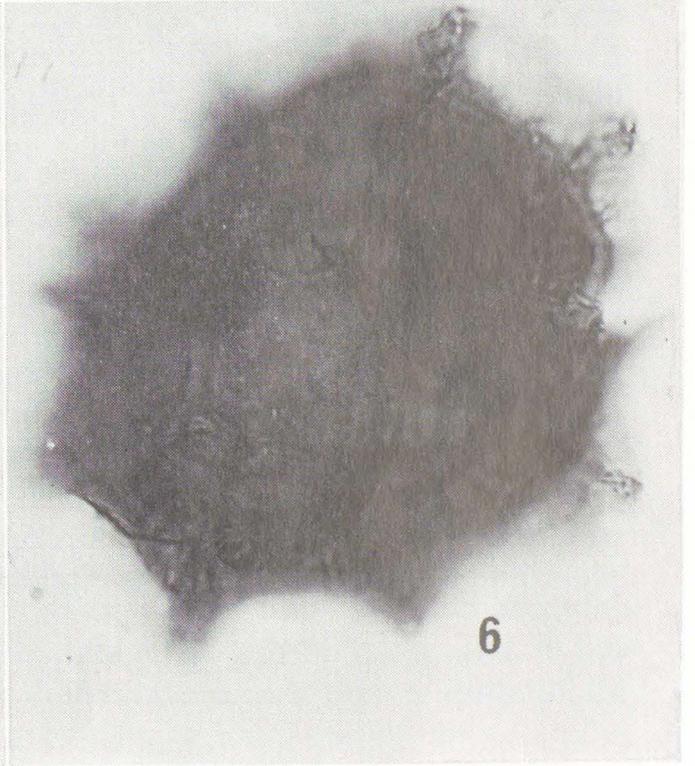
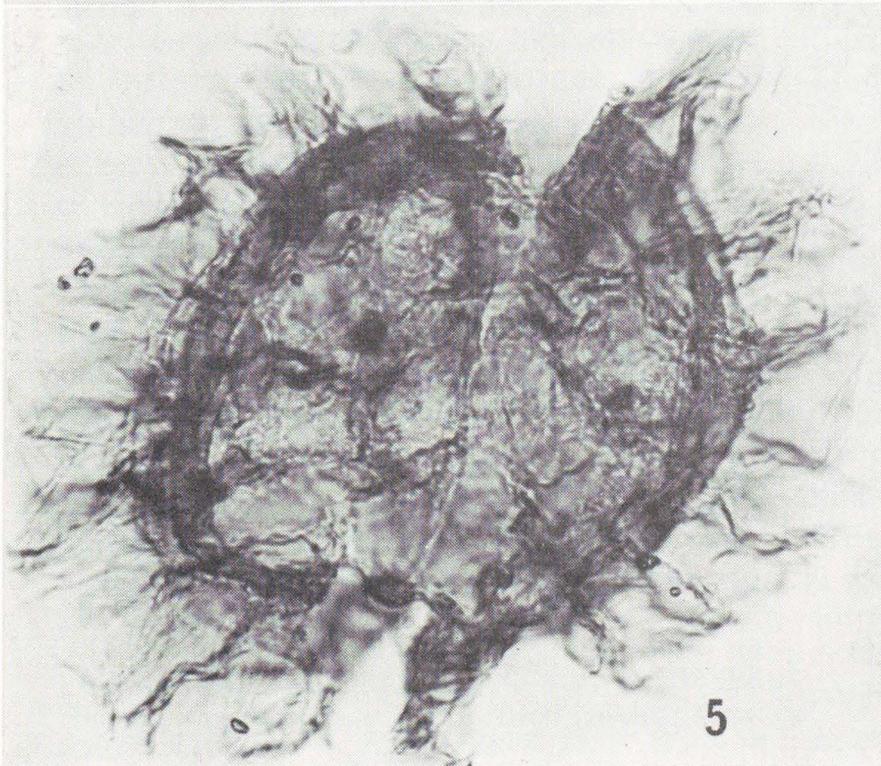
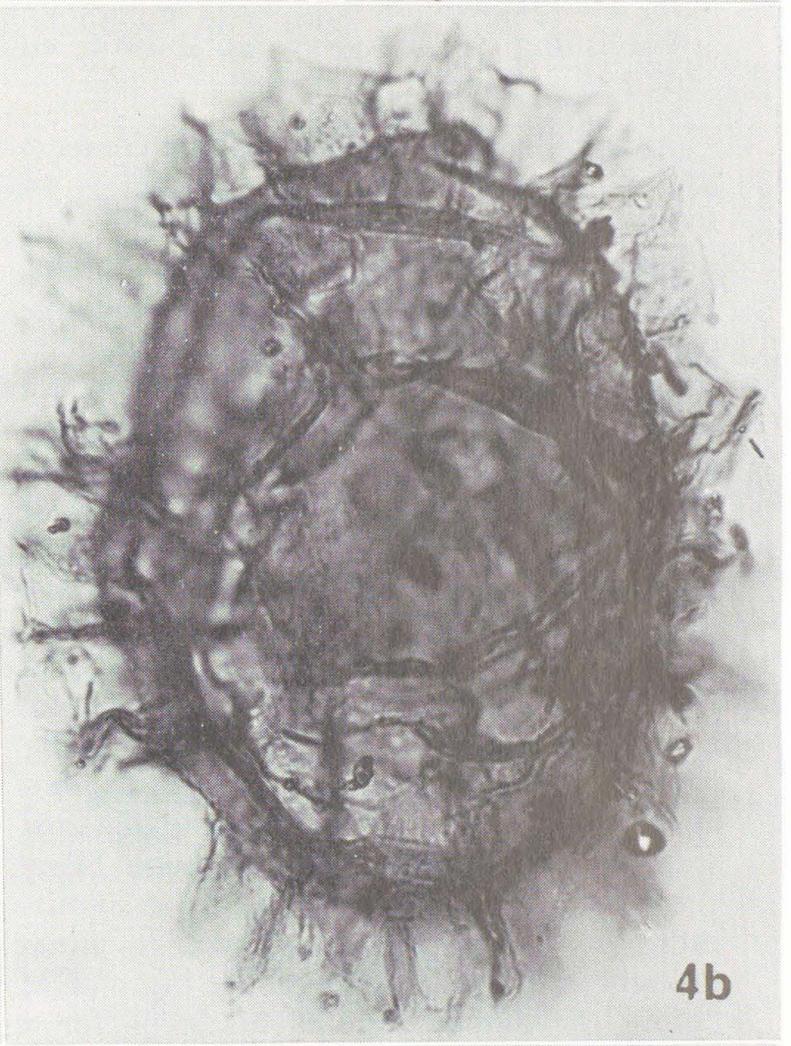
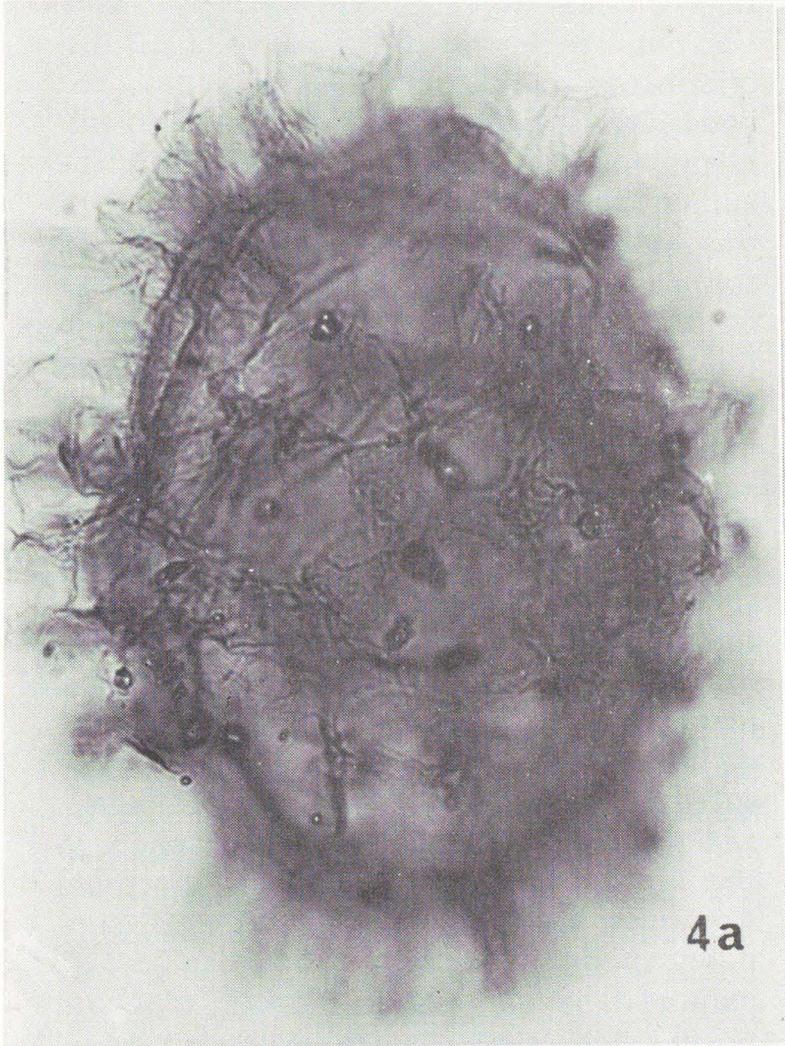
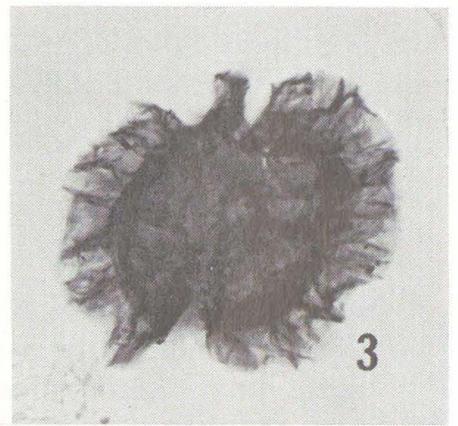
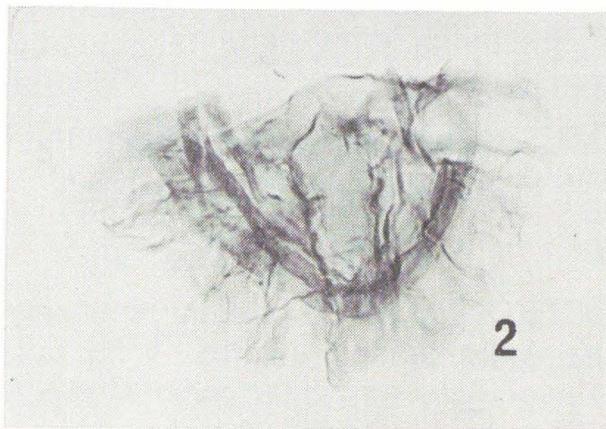
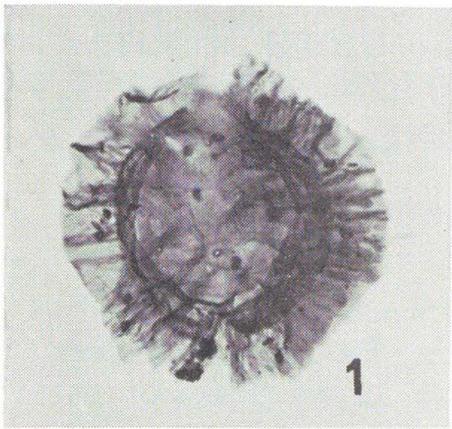


PLATE 4