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Title:
Fossil flora of the Bristol and Somerset coalfield

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Volume I

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Published paper

MEMORANDUM.

"ON THE FOSSIL FLORA OF THE BRISTOL AND SOMERSET COALFIELD".

by Robert Crookall

(Dissertation for the degree of Ph.D.).

Part I published, Geological Magazine, vol. LXII, April, 1925, pp. 145-80.
Part II is now in the press.

This work was conducted independently: the late Dr. Kidston, however, visited Bristol on two occasions, checking the identification of most of the specimens, and expressing agreement with the results obtained, which are as follows:-

| | | |
|---------------------------------|-----------------|--|
| | | Palaeobotanical horizon. |
| RADSTOCK SERIES. | | Radstock Group of the Radstockian Series. |
| | Southern Area. | Keele Group of the Radstockian Series. |
| FARRINGTON SERIES. | ? Central Area. | Newcastle Newcastle-under-Lyme Group of the Staffordian Series. |
| | Northern Area. | Newcastle-under-Lyme Group of the Staffordian Series. |
| PENNANT ROCK. | | (In the Northern Area) Staffordian Series. |
| NEW ROCK AND VOBSTER SERIES. | | Blackband Group of the Staffordian Series. |
| UPPER BEDS OF "MILLSTONE GRIT". | | (probably) Yorkian Series. |

Robert Crookall

June 1st., 1925.

Department of Botany,

UNIVERSITY OF BRISTOL.

ON THE FOSSIL FLORA OF THE BRISTOL AND SOMERSET COALFIELD.

Part II.

by Robert Crookall.

ON THE FOSSIL FLORA OF THE BRISTOL AND SOMERSET COALFIELD.

Part II.

by Robert Crookall.

The present paper is a continuation of that published in the Geological Magazine, vol. LXII, No. IV, April, 1925, pp. 145-180.

I. ADDITIONAL RECORDS.

In recording the additional species of plants from the Bristol and Somerset Coalfield, the following abbreviations for localities are used :-

- CL=Clandown, near Radstock; BR=Braysdown, near Radstock; DK=Dunkerton, near Radstock; K=Kilmersdon, near Radstock; CM=Camerton, 2 miles north of Radstock; R=Radstock, Somersetshire; OM=Old Mills Pit, Farrington Gurney, 7 1/2 miles north of Shepton Mallet, Somersetshire; ML=Marsh Lane Pit, Farrington Gurney; BS=Bishop Sutton New Pit, Bishop Sutton, Somersetshire; MN=Norton Hill Pit, Midsomer Norton, near Radstock; F=Foxcote Pit, near Radstock; FP=Parkfield Pit, near Pucklechurch, Gloucestershire; FC=Coalpit Heath Pit, Gloucestershire; P=Broad Oak Colliery, Pensford, 2 miles north of Clutton, Somersetshire; B=Bromley Colliery, 1 mile west of Pensford, Somersetshire; D=Deep Pit, Kingswood, Bristol; S=Speedwell Pit, Kingswood, Bristol; NR=South Liberty Colliery, Bedminster, Bristol; M=Mells Colliery, Somersetshire; NB=Newbury Colliery, Somersetshire; H=Hanham Pit, Hanham, near Bristol.

Where known, the horizon of the specimen is given after the reference to locality, and, following this, a number indicating the frequency with which the plant occurs at that locality, thus:-

- 8-10 = very common; 6-7 = fairly common; 3-4 = fairly rare; 1-2 = very rare.

PTERIDOSPERMAE AND FILICALES.

- Sphenopteris neuropteroides, Boul.sp., CL(3); ML, 21 in. seam, (1); NR (1).
Sphenopteris macilenta, L & H . CL (1); R (1).
Sphenopteris sp., ML, 21 in. seam, (1); BS (1).
Sphenopteris ? sauveuri, Crépin, B (1).
Corynepteris sternbergii, Ett.sp., ? BS (1).
Renaultia sp., B(1).
? Oligocarpia brongniarti, Stur, FP (1).
Rhodea sp., D (1).
Alloiopteris sp., FP (1).
Crossotheca pinnatafida, Gut.sp., FP (1).
Crossotheca crepini, Zeiller, FP (1).
Radstockia sphenopteroides, Kidst.sp., FP (1).
Alethopteris serlii, Brongt.sp., CL (7); K (6); BR (8); DK (7) CM (6).

- Alethopteris cf costei, Zeiller, FP (2).
- Alethopteris grandini, Brongt.sp., OM (2); R (1).
- Alethopteris aquilina, Schl.sp., P (1).
- Alethopteris aquilina, Brongt.sp., R (1).
- Pecopteris crenulata, Brongt., R, Middle Vein, (1); OM (2); ML, 21 in. seam, (1).
- Pecopteris polymorpha, Brongt., CL (4); K (4); F (3); BR (5).
- Pecopteris arborescens, Schl.sp., OM (3); NR (1); K (3); BR (3); CM (2).
- Pecopteris unita, Brongt., OM (2); K (3); F (3); BR (2).
- Pecopteris miltoni, Artis sp., BS (2); NR (1); K (4); F (5); BR (5); CM (6).
- Pecopteris bucklandii, Brongt., OM (1); BS (1); ML, 21 in. seam, (1); -m, (1); ML, 21 in. seam, (2).
- Pecopteris cyathea, Schl.sp., BS (1).
- Dicksoniites pluckenettii, Schl.sp., F (3); BR (4); R (4).
- Dactylothea plumosa, Art.sp., F (2); CL (2).
- Mariopteris muricata, Schl.sp., OM (1); BS (1); ML, 21 in. seam, (1); NR (1).
- Mariopteris muricata, (Schl.) forma nervosa, Bgt., NR (1).
- Mariopteris sp., Sternb.sp., B (1); FP (1).
- Neuropteris ovata, Hoffm., OM (3).
- Neuropteris rarinervis, Bunb., OM (3); F (3).
- Neuropteris scheuchzeri, Hoffm., K (8); F (8); BR (7); CL (6); CM (5); ● (●).
- Neuropteris fimbriata, Lesqx., R (1); ML (1).
- Neuropteris macrophylla, Brongt., ML (1); K (7); F (6); BR (5); CL (6); CN (5); R (4).
- Neuropteris sp., FP (1).
- Neuropteris flexuosa, Sternb., K (5); F (6); BR (5); DK (6); CL (6); CM (5).
- Neuropteris heterophylla, Brongt., B, No.5 seam, (1).
- Neuropteris obliqua, Brongt., D (2).
- Neuropteris pseudogigantea, Potonié, NB (1).
- Dictyopteris obliqua, Bunb., BS (1).
- Dictyopteris munsteri, Eichw.sp., M (1).
- Cyclopteris sp., Sternb., ML, 21 in. seam, (1); H (1); F (3); CM (3).
- Cyclopteris orbicularis, Brongt., FC (1).
- Rhacophyllum spinosum, Lesqx., FP (1).
- Rhacophyllum goldenbergii, Weiss, FC (1).
- Aphlebia crispa, Gut., BS (1); ML, 21 in. seam, (1).
- Odontopteris lindleyana, Sternb., ML, 21 in. seam, (1).
- Caulopteris anglica, Kidst., R (1).
- Spiropteris sp., K (1).

SEMINA INCERTAE SEDIS.

- Trigonocarpus parkinsoni, Brongt., ML (1).
- Carpolithus sp., D (1).
- ? Radiospermum grande, Arber, BS (1).
- Radiospermum sp., D (1).
- Radiospermum perpusillum, Lesqx.sp., BS (1); P (1).
- Holcospermum sp., D (1).
- ? Whittleseya sp., ML (1).
- Samaropsis sp., NB (1); D (1).

LYCOPDDIALES

- Sigillaria cumulata, Weiss, K (2).
- Sigillaria tessellata, Stein.sp., ML, Inferior Seam, (1); NR (1); K (1).
- Sigillaria rugosa, Brongt., NR (1).
- Sigillaria ovata, Sauv., ML (1); F (1); ? BR (1).

II. REFERENCES, DESCRIPTIONS & REMARKS.

- Sigillaria sp., BR (2); DK (3);
- Sigillariophyllum bicarinatum, L & H sp., R (3); CL (2); H (1); K (4); F (6); BR (5); DK (3); CL (3); CM (4);
- Lepidodendron lanceolatum, Lesqx., ? OM (1); ML, Inferior Seam, (1); NR (1); F (3); BR (3); CM (3); R (2).
- Lepidodendron wortheni, Lesqx., OM (3); NR (1); K (3).
- Lepidodendron simile, Kidst., D (1); S (1); M (1).
- Lepidodendron aculeatum, Sternb., ML (1); K (3); F (4); CM (3).
- Lepidodendron loricatum, Arber (pars), ^{ML} ML, Inferior Seam, (1); OM (1).
- Lepidodendron sp., B (1).
- Lepidophloios laricinus Sternb., ML (1); OM (1).
- Lepidostrobus lanceolatus, L & H sp., CL (2).
- Lepidostrobus majus, Brongt.sp., P (1); NR (1); BR (1).
- Lepidostrobus radians, Schimp. S (1).
- Lepidostrobus minor, Goode, BS (1); CM (1).
- Lepidostrobus sp., BS (1); K (2).
- Stigmara ficoides, Sternb.sp., K (3); F (5); BR (4); DK (3); CL (3); CM (4).
- Stigmara ? minuta, Göpp., FC (1).
- Bark of unknown Lycopod D (1).

EQUISETALES.

- Calamites suckowii, Brongt., K (2); F (2); BR (1).
- Calamites sp., ML, Inferior Seam, (1); NR (1); CL (1); CM (2); R (1).
- Annularia stellata, Schl.sp., R, Middle Vein, (6); K (6); F (4); BR (7); CM (6).
- Annularia sphenophylloides, Zenk.sp., R (6); K (5); F (6).
- Annularia ? microphylla, Sauv., NR (1).
- Asterophyllites charaeformis, Sternb. ^{sp.} D (1).
- Asterophyllites longifolius, Sternb. ^{sp.} FP (1).
- Palaeostachya pedunculata, Will., D (1).
- Pinnularia capillacea, L & H ., NR (1); BR (3); DK (3); CL (4); CM (3).

SPHENOPHYLLALES.

- Sphenophyllum emarginatum, Brongt., NR (1); K (6); BR (6); CL (7); CM (6).
- Sphenophyllum fasciculatum, Lesqx., B (1).
- Sphenophyllum cuneifolium, Sternb., FP (1); ?B, No.4 Seam, (1).
- Sphenophyllum majus, Bronn, ML, 21 in. Seam, (3); ?B (1).
- Sphenophyllum ? oblongifolium, Germ.sp., B(1); FC (1).

CORDAITALES.

- Cordaites sp., OM (1); K (4); F (5); BR (4); DK (6); CM (5).
- Cordaicarpus ovoideus, (Berg.), P (2); D (1).

Brongniart, 9, p.186, pl.49, f.1-3; Kidston, 21, pl.29, f.1-3; 23, pt.4, p.356, pl.83, f.1-5, pl.84, f.1-3.

II. REFERENCES, DESCRIPTIONS & REMARKS.

Remarks: The species PTERIDOSPERMAE & FILICALES, were collected at Deep Pit. They SPHENOPTERIS, Brongniart. (28, p.237.

(1). Sphenopteris ? sauveuri, Crépin. Plate IV. fig.8.

(Kidst. Zeiller, 38*, p.79, pl.9, f.6.---Potonié, 31, No.4, f.1-3.---Gothan, 15, p.28, pl.6, f.1.---Kidston, 28, p.49, pl.5, f.5, pl.8, f.4. acute angle. The pinnules

Remarks: This species being very variable, the single fragment collected is difficult to identify. The rachis is slightly flexuous, the pinnules point forward, and the veins are indistinct, as is usual in S. sauveuri.

(2). ^pSphenopteris sp. Plate IV. fig.6.

Description: Ultimate pinnae alternate, up to 3 cm. long, leaving the longitudinally grooved rachis at an angle of about 40 degrees, directed forward. Pinnules leave rachis at an angle of about 30 degrees, up to 8 mm. long by 2 mm. broad, lanceolate, divided into rounded lobes which are directed forward: lowest pinnules bear 6 pairs of lobes, uppermost 2-4 pairs.

Remarks: The specimen, which was collected at Bishop Sutton New Pit, bears some general resemblance to Urnatopteris tenella,

(Brongt.^o) but the lobes on the pinnules are not so pronounced and are more numerous than in that species.

RHODEA, Presl.

Rhodea sp. Plate IV fig.5.

Description: Rachis smooth. Ultimate pinnae lanceolate, directed forward, leaving the rachis at an angle of about 50 degrees. Pinnules alternate, 2-5 mm. long by 2-3 mm. broad, divided into 2-4 linear⁺ spreading segments, into each of which a single vein enters.

* The serial numbers following an author's name refer to the list of works cited on page 31.

^o Brongniart, 9, p.186, pl.49, f.1.---Kidston, 21, pl.29, f.1-3; 28, pt.4, p.356, pl.83, f.1-5, pl.84, f.1-3.

Remarks: The specimens, which are fragmentary, were collected at Deep Pit. They differ from R. sparsa, Kidst., (28, p.237, pl.56, f.3, pl.59, f.5,6) and from R. goepperti, Ett. sp., (Kidst., 28, p.233, pl.57, f.1) in that both the pinnae and the pinnules leave the rachis at a more acute angle. The pinnules are smaller than in R. goepperti, and not so scattered as in R. sparsa. On the other hand there is some similarity to Sphenopteris schauburg-lippeana, Stur sp., as figured by Kidston (24, pl.3, f.1,2).

RENAULTIA, Zeiller.

Renaultia sp.,

Remark: In general appearance this specimen, collected at Bromley Colliery, is reminiscent of R. germanica, Potonié sp., as figured by Kidston (28, pt.4, p.324, pl.81, f.1,1a), but it is not sufficiently well preserved for specific determination.

RADSTOCKIA, Kidston.

Radstockia sphenopteroides, Kidston sp., Plate IV. fig.3.

Kidston, 28, pt.4, p.373, pl.75, f.3,3a.

Remark: The specimens here recorded are the only ones known other than the type specimen.

OLIGOCARPIA, Göppert.

?Oligocarpia brongniarti, Stur.

Zeiller, 38, p.97, pl.11, f.3-5.---Renier, 32, pl.61.---
Kidston, 28, pt.4, p.289, pl.69, f.2,2a,3,3a; text f.19,
p.285.

Remark: This very rare species has not previously been met with outside the Yorkian Series, and, if correctly determined, this is the first record of the plant from the Staffordian Series.

CROSSOTHECA, Zeiller.

(1). Crossotheca pinnatafida, Gut. sp.,

Kidston, 28, pt.4, p.346, pl.90, f.1-5, text f.28.

Remark; A single well preserved pinnule of this species was collected at Parkfield Pit. The plant is very rare, and this is the first record from the Staffordian Series.

(2). Crossotheca crepini, Zeiller.

Zeiller, 38, p.112, pl.13, f.1-3, text f.21, p.33.---
Renier, 32, pl.68.---Kidston, 28, pt.4, p.344, pl.87,
f.1,2, text f.27.

Remarks: This rare species has not been recorded previously from outside the Yorkian Series. D. obliqua has been recorded once only from outside the Yorkian Series.

NEUROPTERIS Brongniart.

(1). Neuropteris obliqua, (Brongt..) Plate II. fig.3.

Zeiller, 38, p.284, pl.48, f.1,2,4-7.---Arber, 7,
p.355, pl.61, f.1-3.

Remarks: Some of the specimens are typical examples of Brongniart's species, while others are of the form N. impar, Weiss, as figured by Kidston (24, p.83, pl.8, f.1-3). These two "species", provisionally kept apart by Kidston, were regarded by Arber (loc. cit.) as representing the upper and lower pinnules respectively of the same plant.

(2). Neuropteris sp., Plate IV. fig.7.

Remarks: The single specimen, collected at Parkfield Colliery, resembles N. crenulata, Brongt., in the flexuous rachis, the articulation of the pinnules, the small terminal pinnule, the crenulated margins, and in the venation. It is possibly a terminal pinna of Brongniart's species.

(3). Neuropteris sp.,

Description: Pinnules 25 mm. long by 12 mm. broad at the base (the broadest part). Veins almost straight, dichotomising 2 or 3 times, leaving the central vein at an angle of about 25 degrees.

Remarks: This plant, collected at Parkfield Pit, does not agree

⁶ Brongniart, 9, I, p.234, pl.64, f.2.---Zeiller, 40, p.98, pl.26, f.1.---Kidston, 18, p.327, pl.1, f.2.

with any known species of Neuropteris, but the preservation is poor. The pinnules are smaller and the veins much further apart than in N. cordata, Brongt., (9. I, p.229, pl.64, f.5).

DICTYOPTERIS, Gutbier.

Dictyopteris obliqua, Bunbury.

Bunbury, 10, p.427, pl.21, f.2.---Kidston, 17, p.76, pl. . f.3. D. sub-brongniarti, Zeiller, 38, p.290, pl.49, f.6, pl.50, f.1,2.

Remarks: Most of the specimens collected consist of isolated pinnules. D. obliqua has been recorded once only from outside the Yorkian Series.

ALETHOPTERIS, Sternberg.

Alethopteris cf costei, Zeiller. Plate III. fig.9.

Zeiller, 40, p.75, pl.15 & 16.---Potonié, 31, IX, No.174.

Remarks: The pinnules are from 10 to 15 mm. in length, leaving the rachis at about 90 degrees. The central vein is strongly-marked and the lateral veins bifurcate once or twice.

If the specimens are correctly identified, this is the first record of the species from Britain.

SEMINA INCERTAE SEDIS.

SAMAROPSIS, Göppert.

(1). Samaropsis sp., Plate VI. fig.6.

Description: Seeds oval, 12 mm. long by 8-9 mm. broad; nucule ovate, 5-6 mm. long by 4-5 mm. broad, with a clearly-marked median line, surface longitudinally striated. Wing distinctly emarginate at base and produced above the nucule for about 3 mm. around the micropyle.

Remarks: These seeds, which were collected at Newbury Pit, differ from S. fluitans, Dawson (11, p.165, pl.12, f.74) in size, in the surface of the nucule being striate instead of pitted, and in the wing being broad at the base. From S. bisectum, Dawson (11, pl.12, f.73), in which the nucule is also striate, they differ in

that the wing is neither "widely notched at the apex" nor "more narrowly notches below". In S. gutbieri, Geinitz (Kidston, 26, p.1059, pl.5, f.6) the surface is smooth and the seed is broader in proportion to its length. Compared with S. emarginata, Göpp. & Berger (Kidston, 26, p.1058, pl.5, f.7) our specimens are more acute as regards the apex of the wing and of the nucule.

(2). Samaropsis sp., Plate VI. fig.4.

Description: Seed broadly cordate, 15 mm. long by 18 mm. broad, base emarginate, apex bluntly rounded. Nucule cordate, central; wing 1 mm. broad laterally, 3 mm. broad at base.

Remarks: This seed was collected at Deep Pit. It differs from any known species of Samaropsis, but the specimen is incomplete.

CARPOLITHUS, Sternberg.

Carpolithus sp.,

Remarks: Two seeds from Deep Pit, though in size and form resembling Carpolithus ovoideus, Göpp. & Berger sp., (Kidston, 16, p.404, pl.23, f.7,8) cannot be referred to that species as the testa bears distinct striations, oblique in one case and longitudinal in the other.

HOLCOSPERMUM, Nathorst.

Holcospermum sp., Plate VI. fig.3.

Description: Seed elongately elliptical, 3.3 cm. long, 1.8 cm. broad in middle. Broadest part occurs about one third along the seed, where it measures 2 cm. across. Base and apex rounded. Seed bears 4 prominent longitudinal ribs which gradually approach each other at base and apex. Between the ridges are several fine grooves, some traversing the whole length of the seed, others discontinuous. Testa also bears fine oblique striae.

Remarks: This seed bears some slight similarity to Radiospermum elongatum, Arber (4, p.101, pl.7, f.42,43), but is broader towards the base and narrower towards the apex. The ribs are more strongly marked than in Arber's species, while the testa is not smooth.

LYCOPODIALES.

LEPIDODENDRON, Sternberg.

(1). Lepidodendron simile, Kidst., M.S. Fide Dr. Kidston. Plate VIII fig.5.

Kidston, 24, p.137; ²⁵3, p.134; 26, pp.1038,1079.---
Vernon, 35, pl.57, f.7.

Remark: Several fossils, from Speedwell, Deep and Mells Pits, which I had identified as L. ophiurus, Brongt. were referred by the late Dr. Kidston to his species, the description of which has not been published. Arber (2, p.151; 8, p.200) rejected L. simile, but the specimens are retained provisionally under that name.

(2). Lepidodendron sp., Plate VIII fig.4.

Description: Leaf-cushions elongate-rhomboidal, 7 mm. long by 3 mm. broad, apex bluntly pointed, lower angle inflected. Leaf-scar 2 mm. broad by 1 mm. high, situated 1½ mm. down the leaf-cushion, rhomboidal, upper and lower margins rounded, lateral angles prominent and sharp. The three cicatricules are placed half-way down the scar, all punctiform. Ligular cicatricule visible. Field beneath scar ornamented by a vertical series of broad transverse lines which open out as the cushion is descended, forming rhomboidal markings which, in some cases, are almost as large as the leaf-scar itself. In addition, the field bears numerous fine transverse lines, visible only under the lens.

Remarks: The specimens, which were collected at Bromley, differ from L. rimosum, Sternb., (Zeiller, 38, p.449, pl.67, f.4,5) in the less elongated and less sharply-pointed apex of the leaf-cushion, and in the absence of lines leaving the lateral angles of the scar, while the ornamentation of the field appears to be peculiar.

LEPIDOSTROBUS, Brongniart.

Lepidostrobus radians, Schimper.

Schimper, 33, II, p.63.---Arber, 8, p.184, pl.9, f.28-31.

Bark of unknown Lycopod.

Remarks: A single specimen of bark was collected which is very similar to the "Bark of an unknown plant" as figured by Vernon (35, p.623, pl.58, f.4) who remarks that, "The specimen appears to be the bark of a Lycopodiaceous plant somewhat similar to but quite distinct from Bothrodendron". In the specimen in hand there are numerous strongly-marked transverse wrinkles in addition to the longitudinal striations on Vernon's specimen, and the leaf-scars are not so distant. The leaf-scars are 2 mm. wide by 1 mm. high, and the three cicatricules are situated half-way down the scar.

EQUISETALES.

ASTEROPHYLLITES, Brongniart.

(1). Asterophyllites longifolius, Sternb. sp.,

L. & H., 30, pl.18.---Zeiller, 38, p.374, pl.59, f.3.---
White, 37, p.153, pl.49, f.2-4.---Renier, 32, pl.49.

(2). Asterophyllites charaeformis, Sternb. sp.,

Kidston, 24, p.119, pl.11, f.2-5.---Kidston, 25, p.121.

PALAEOSTACHYA, Weiss.

Palaeostachya pedunculata, Williamson.

Zeiller, 38, p.382, pl.60, f.1,2.---Kidston, 24, p.126.
---Kidston, 21, pl.34, f.5.

ANNULARIA, Sternberg.

Annularia ? microphylla, Sauveur.

Kidston, 25, p.172, pl.10, f.1-3.

SPHENOPHYLLALES.

SPHENOPHYLLUM, Brongniart.

(1). Sphenophyllum(?Asterophyllites) fasciculatum, (Lesqx.) Plate X fig.3.

White, 37, p.183, pl.50, f.1-4.

Description: Stem up to 1 mm. broad. Whorls of 3-6 leaves at nodes, bifurcated near base, up to 5 mm. long. Leaves linear, spreading with sharply pointed apex, single-veined.

Remarks: This is the first record of S. fasciculatum from Britain.

(2). Sphenophyllum majus, Bronn. Plate X fig.5.

Zeiller, 38, p.420, pl.64, f.1,2.---White, 37, p.180, pl.50, f.5,6a, pl.51, f.a, pl.73, f.3.---Arber, 2, pl.16, f.2.---Kidston, 24, p.221, pl.14, f.1-4, pl.15, f.2,3.

Sphenophyllum longifolium, Schimper, 33, I, p.340, pl.25, f.22.---Potonié, 31, VII, No.136, f.1-3.

Remarks: While Zeiller and others regarded S. longifolium, Germar as distinct from S. majus, Bronn, White (loc. cit.) regarded the former as a more dissected and larger form of S. majus. An examination of the specimens collected tends to confirm White's view.

(3). Sphenophyllum ? oblongifolium, Germar & Kaulfuss sp.,

Zeiller, 40, p.119, pl.35, f.1-6.---Potonié, 31, VII, No.140, f.1-4.

CORDAITALES.

CORDAICARPUS, Geinitz.

Cordaicarpus ovoideus, (Berg.)

Arber, 4, p.100, pl.7, f.30.---Carpolithes ovoideus,
Kidston, 16, p.404, pl.23, f.7,8.---Kidston, 22, p.367, pl.52, f.1.

Description: Seeds oval with a smooth testa, 3-4 mm. long by 2-3 mm. broad.

III. PALAEOBOTANICAL HORIZONS.

Fossil plants were first used in subdividing the Upper Carboniferous Formation of Britain by the late Dr. Kidston (19, p.183) who, in 1894, proposed the following classification:-

- | | |
|----------------|---|
| COAL MEASURES | { Upper Coal Measures Transition Series Middle Coal Measures Lower Coal Measures |
| MILLSTONE GRIT | |

characteristic floras (contd.)

In 1905, Kidston (23, p.308) pointed out that these terms had often been used in a purely local sense and the following change in nomenclature was proposed:-

Upper Coal Measures = Radstockian Series (including Keele Group).
 Transition Series = Staffordian Series.
 Middle Coal Measures = Westphalian Series.
 Lower Coal Measures, including part of Millstone Grit = Lanarkian Series.

Watts (36, p.238) has recently suggested that the term "Yorkian" should be substituted for "Westphalian" Series as applied to the Middle Coal Measures of Britain.

The Staffordian Series of North Staffordshire have been shown by Walcot Gibson (12, p.37-8; 13, p.51) to be composed of three groups:-

- (1). Newcastle-under-Lyme Group.
- (2). Etruria Marl Group.
- (3). Blackband Group.,

and the fossil floras of these divisions were described by Kidston (23, p.301-321), while Arber (5, pp.129-130) recorded 58 species of plants from the Etruria Marl Group of South Staffordshire.

The classification of the Upper Carboniferous Rocks of Britain here adopted is as follows:-

- | | |
|--------------------|-------------------------------|
| RADSTOCKIAN SERIES | { Radstock Group. |
| | { Keele Group. |
| STAFFORDIAN SERIES | { Newcastle-under-Lyme Group. |
| | { Etruria Marl Group. |
| | { Blackband Group. |
| YORKIAN SERIES | |
| LANARKIAN SERIES. | |

The characteristic floras of these divisions are indicated below:

| | Positive evidence. | Negative evidence. |
|-----------------------------|--|---|
| RADSTOCK- IAN SERIES | Flora rich in number of species, and especially of the <u>Cyatheites-Pecopterids</u> . In the basal beds (the Keele Group) a few Yorkian plants also occur (very rarely). | The typical Yorkian and Lanarkian assemblages of plants are absent. |
| STAFFORD- IAN SERIES. | Newcastle-under-Lyme Group: Yorkian plants few and rare, Radstockian plants preponderate. Etruria Marl Group: intermediate. | ditto. |

characteristic floras (contd.)

| | Positive evidence. | Negative evidence. |
|----------------------------|---|--|
| STAFFORD- IAN SERIES | Blackband Group: Radstockian plants few and rare, Yorkian plants preponderate. (The relative abundance of the plants occurring, important in all divisions, is of special importance in the Staffordian Series). | The typical Yorkian and Lanarkian assemblages of plants are absent. |
| YORKIAN SERIES. | Many species (especially of <u>Sigillaria</u> , <u>Neuropteris</u> , and <u>Sphenopteris</u> are confined to this division; other plants, which are rare elsewhere, are here characteristically common. | The <u>Cyatheitites-Pecopterids</u> are absent. |
| LANARK- IAN SERIES. | Some species are confined to this division, though most are rare and some are restricted in horizontal distribution. (2) <u>FARRINGTON SERIES.</u> | ditto. As many Lanarkian plants are found in the Yorkian Series also, the chief criterion is negative, consisting in an admixture of Yorkian and Lanarkian species without a typical Yorkian flora. |

Radstock Area, Kidston (16, p.410) remarked that, "Palaeontologically, the Farrington Series cannot be separated from the Radstock Series, of which, in fact, they seem to form a part."

It should be pointed out that, owing to the rapid progress in palaeobotany, Kidston's* original lists of the vertical distribution of Coal Measure plants now need revising, and this is true of most subsequently published lists (which were mainly or entirely based on Kidston's).

The writer visited several pits which had not been investigated previously from a palaeobotanical point of view and, on the basis of the fossil floras obtained, regards Bishop Sutton New Pit, Marsh Lane Pit and Norton Hill Pit as very probably working certain of the lower Farrington seams.

In view of the present increase in the known flora of the Farrington Series, it is necessary to re-examine the palaeobotanical horizons represented. In Table I are given the floras

* Kidston, R., 25, p.74.

* Kidston, R., 1894, (19, pp.238-257).
"There is no evidence of any true Stephanian flora from British rocks".

* See Arber, 4, p.101, and Greenwell & McMurtrie, 1884 ("The Radstock Portion of the Somerset Coalfield," Newcastle, p.27).

of the Southern and Northern Areas (columns 1 and 2), and the

(1). THE RADSTOCK SERIES.

Kidston (16, pp.405-409) showed that THE RADSTOCK SERIES BELONGS TO THE TRUE UPPER COAL MEASURES OF BRITAIN, which he regarded as "part of the Upper Coal Measures or Stephanian of the Continent"[‡] and in 1894, (20, p.571) observed that, "Although such strata as the Radstock and Farrington Series of the Somerset Coalfield-----are true members of the Upper Coal Measures as developed in Europe, they belong to the lower part of the series; the upper beds, such as occur in certain parts of France, being entirely absent from Britain".[†] Zeiller also held this view (in Kidston, 16, loc. cit.).

All subsequent work has confirmed the above conclusions.

(2) THE FARRINGTON SERIES.

With regard to the Farrington Series of the Southern or Radstock Area, Kidston (16, p.410) remarked that, "Palaeontologically, the Farrington Series cannot be separated from the Radstock Series, of which, in fact, they seem to form a part."

Lillie (29, p.67) investigated the Farrington Series of the Northern or Gloucestershire Area which he also referred to the Upper Coal Measures.

The writer visited several pits which had not been investigated previously from a palaeobotanical point of view and, on the basis of the fossil floras obtained, regards Bishop Sutton New Pit, Marsh Lane Pit and Norton Hill Pit as very probably working certain of the lower Farrington seams.*

In view of the present increase in the known flora of the Farrington Series, it is necessary to re-examine the palaeobotanical horizons represented. In Table I are given the floras

‡ Kidston, R., 25, p.74.

† Arber (6, p.8-11, and 1, p.37-38) regarded all the recorded British Coal Measure floras as Westphalian in affinity, maintaining that, "There is no evidence of any true Stephanian flora from British rocks".

* See Arber, 4, p.101, and Greenwell & M'Murtrie, 1864 ("The Radstock Portion of the Somerset Coalfield," Newcastle, p.27).

of the Southern and Northern Areas (columns 1 and 2), and the zone in which a species is most frequent or characteristic (column 3: R = Radstockian Series, Y = Yorkian Series, L = Lanarkian Series). In columns 4 and 5 are shown those plants which are known elsewhere from the Keele Group and from the Newcastle-under-Lyme Group respectively.†

TABLE I - THE FLORAS OF THE FARRINGTON SERIES.

| | Southern Area. | Northern Area. | Zone | Keele Group | Newcastle Group. |
|--|----------------|----------------|------|-------------|------------------|
| <i>Renaultia chaerophylloides</i> , Brongt. sp., | - | X | Y | - | X* |
| <i>Sphenopteris neuropteroides</i> , Boul. sp., | X | X | R | ?X | X |
| " <i>alata</i> , Brongt., | - | X | R | - | - |
| " <i>pecopteroides</i> , Kidst., | - | X | R | - | - |
| " <i>macilenta</i> , L. & H., | X | - | R | - | X* |
| <i>Radstockia sphenopteroides</i> , Kidst. sp., | - | X | R | - | - |
| <i>Neuropteris macrophylla</i> , Brongt., | X | X | R | X | X |
| " <i>scheuchzeri</i> , Hoffm., | X | X | R | X | X |
| " <i>rarinervis</i> , Bunb., | X | X | R | X | X |
| " <i>flexuosa</i> , Sternb., | X | X | R | X | X |
| " <i>ovata</i> , Hoffm., | X | X | R | X | X |
| " <i>fimbriata</i> , Lesq., | X | X | R | - | X |
| <i>Cyclopteris orbicularis</i> , Brongt., | - | X | ? | - | X |
| <i>Pecopteris unita</i> , Brongt., | X | X | R | X | X |
| " <i>crenulata</i> , Brongt., | X | X | R | - | X* |
| " <i>arborescens</i> , Schl. sp., | X | X | R | X | X |
| " <i>pteroides</i> , Brongt., | - | X | R | - | - |
| " <i>cyathea</i> , Schl. sp., | X | - | R | X | X |
| " <i>miltoni</i> , Art. sp., | X | X | Y | X | X |
| " <i>oreopteridia</i> , Schl. sp., | - | X | R | - | X* |
| " <i>polymorpha</i> , Brongt., | - | X | R | X | X |
| " <i>bucklandii</i> , Brongt., | X | X | R | - | X* |
| <i>Dactylothea plumosa</i> , Art. sp., | X | X | R | - | X |
| <i>Dicksoniites pluckenetii</i> , Schl. sp., | X | X | R | - | - |
| <i>Odontopteris lindleyana</i> , Sternb. sp., | X | X | R | X | X |
| <i>Alethopteris lonchitica</i> , Schl. sp., | X | X | YL | - | X |
| " <i>grandini</i> , Brongt. sp., | X | X | R | X | X |
| " <i>serlii</i> , Brongt., | X | X | R | X | X |
| " <i>davreuxi</i> , Brongt. sp., | X | X | ?Y | X | X |
| " <i>aquilina</i> , Schl. sp., | X | X | R | X | X |
| " <i>pontica</i> , Zeiller, | - | X | - | - | - |
| <i>Dictyopteris oblique</i> , Bun., | X | - | Y | - | - |
| <i>Mariopteris muricata</i> , Schl. sp., | X | X | YL | - | X |
| <i>Crossothea pinnatifida</i> , Gut. sp., | - | X | R | - | - |
| " <i>crepini</i> , Zeiller, | - | X | Y | - | - |
| <i>Aphlebia crispa</i> , Gut. sp., | X | X | - | - | X* |
| <i>Rhacophyllum spinosum</i> , Lesq., | - | X | R | - | - |
| " <i>goldenbergii</i> , Weiss, | - | X | R | - | - |
| " <i>filiciforme</i> , Gut. sp., | - | X | R | - | - |

† Arber, E. A. N., (3, p.233-281). The whole of the productive Coal Measures of the Forest of Dean Coalfield are referred to the Upper Coal Measures, but, while Kidston (28, p.54) refers the First Division (= Woorgreens Coals) to the Radstock Group, the Second Division Coals and the Yorkley Seam are referred to the Newcastle-under-Lyme Group. For floras of Keele and Newcastle-under-Lyme Groups see also Kidston, 23, pp.311-314; 26, pp.1020-1022, 1078-1080; 27, pp.46-49, and Vernon, R. D., 35, p.587.

(TABLE I, contd.)

| | Southern Area. | Northern Area. | Zone | Keele Group | Newcastle Group. |
|--|----------------|----------------|------|-------------|------------------|
| <i>Caulopteris macrodiscus</i> , Brongt., | - | X | R | - | - |
| <i>Schizospermum noeggerathi</i> , Stb. sp., | X | X | R | - | X |
| <i>Radiospermum elongatum</i> , Arber, | X | - | - | - | - |
| <i>Rhabdocarpus lillianus</i> , Arber, | - | X | - | - | - |
| <i>Cordaicarpus ovoideus</i> , Gopp. & Berg., | X | - | - | - | X* |
| <i>Sigillaria elongata</i> , Brongt., | - | X | Y | - | X |
| " <i>voltzii</i> , Brongt., | - | X | Y | - | - |
| " <i>reniformis</i> , Brongt., | - | X | ?Y | - | - |
| " <i>rugosa</i> , Brongt., | - | X | Y | - | X |
| " <i>major</i> , L. & H., | - | X | YL | - | - |
| " <i>tessellata</i> , Stein. sp., | X | X | Y | X | X |
| " <i>mamillaris</i> , Brongt., | - | X | Y | - | - |
| " <i>deutschiana</i> , Brongt., | - | X | Y | - | - |
| " <i>cumulata</i> , Weiss, | X | - | R | - | X* |
| " <i>m'murtriei</i> , Kidst., | X | - | R | - | - |
| " <i>principis</i> , Weiss, | X | - | Y | - | - |
| " <i>nortonensis</i> , n. sp., | X | - | - | - | - |
| " <i>ovata</i> , Sauv., | X | - | Y | - | X* |
| <i>Lepidodendron lanceolatum</i> , Lesqx., | X | X | R | - | X |
| " <i>loricatum</i> , Arber (pars) | X | X | - | - | X |
| " <i>aculeatum</i> , Sternb., | X | X | YL | - | X |
| " <i>rimosum</i> , Sternb., | - | X | Y | - | - |
| " <i>wortheni</i> , Lesqx., | X | X | - | - | X |
| <i>Lepidostrobis triangularis</i> , Zeill., | X | - | Y | - | X* |
| " <i>majus</i> , Brongt., | - | X | R | - | X |
| " <i>hastatus</i> , Lesqx., | - | X | R | - | - |
| " <i>brevifolius</i> , Lesqx., | - | X | R | - | X |
| " <i>minor</i> , Goode, | X | X | Y | - | X* |
| " <i>lanceolatus</i> , L. & H. sp., | X | X | YL | X | X |
| <i>Asolanus camptotaenia</i> , Wood, | X | X | - | - | X |
| <i>Sigillariophyllum bicarinatum</i> , L & H. sp., | X | X | - | X | X* |
| <i>Lepidophloios laricinus</i> , Sternb., | X | X | Y | - | ?X |
| <i>Stigmaria ficoides</i> , Sternb. sp., | X | X | - | X | X |
| <i>Calamites carinatus</i> , Sternb., | X | X | YL | - | X |
| " <i>suckowii</i> , Brongt., | X | X | YL | X | X |
| " <i>cistii</i> , Brongt., | - | X | - | ?X | ?X |
| <i>Annularia stellata</i> , Schl. sp., | X | X | R | X | X |
| " <i>sphenophylloides</i> , Zenk. sp., | X | X | R | X | X |
| " <i>radiata</i> , Brongt., | - | X | YL | X | ?X |
| <i>Asterophyllites equisetiformis</i> , Schl. sp. | X | X | - | X | X |
| " <i>longifolius</i> , Sternb. sp., | - | X | Y | - | - |
| <i>Pinnularia capillacea</i> , L. & H., | X | X | - | - | ?X |
| <i>Macrostachya ?infundibuliformis</i> , Bgt. sp. | - | X | R | - | X |
| <i>Sphenophyllum emarginatum</i> , Brongt., | X | X | R | X | X |
| " <i>majus</i> , Bronn, | ?X | X | Y | - | X* |
| " <i>cuneifolium</i> , Sternb., | - | X | YL | - | X |
| <i>Cordaites angulosostriatus</i> , Kidst., | X | X | R | X | X |

(A) The flora of the Farrington Series of the Southern Area consists of 27 Radstockian and 14 Yorkian (and Lanarkian) species, in addition to 13 plants which are of doubtful or of no zonal value. All the common and fairly common plants recorded are Radstockian, while the Yorkian species are invariably of rare occurrence.

* Recorded from the Newcastle-under-Lyme Group (for the first time) in the present work. (see Flora of Central Area of Coalfield, page 18.).

TABLE II - FLORA OF THE CENTRAL AREA.

Though the Cyatheites-Pecopterids are comparatively well-represented, they are less frequent than in the Radstock Group of the Radstockian Series, and some of the rarer Radstockian plants are unknown from these rocks. The proportion of Yorkian plants present is higher than in the Radstock Group. On this evidence, THE FARRINGTON SERIES OF THE SOUTHERN AREA IS REFERRED TO THE LOWEST GROUP OF THE RADSTOCKIAN SERIES, NAMELY, THE KEELE GROUP.

(B) The flora of the Farrington Series of the Northern Area contains 38 Radstockian, 23 Yorkian (and Lanarkian) and 14 doubtful or non-zonal species. Although the Radstockian species again preponderate, they are usually rarer than in the Southern Area, while the proportion of Yorkian species is greater. The flora includes several species which are unknown from the Radstock Group or from the Farrington Series of the Southern Area. The rare occurrence of a number of Radstockian plants and the apparent absence of others, combined with the presence of a fairly high proportion of Yorkian species, indicate that these beds belong to the Transition or Staffordian Series, and THE FARRINGTON SERIES OF THE NORTHERN AREA IS REFERRED TO THE UPPERMOST OR NEWCASTLE-UNDER-LYME GROUP OF THE STAFFORDIAN SERIES. Reference to columns 4 and 5 of Table I, in which these floras are compared with those of the Keele and Newcastle-under-Lyme Groups as developed elsewhere, lends support to the above determinations.

(3) THE CENTRAL AREA OF THE COALFIELD.

In Table II, here given, are shown the floras of the Broad Oak Colliery, Pensford, and the Bromley Colliery, near Pensford. The fourth and fifth columns show which of the plants have been recorded elsewhere from the Staffordian Series and from the Newcastle-under-Lyme Group of that Series respectively.

TABLE II - FLORA OF THE CENTRAL AREA.

| | Pensford | Bromley | Zone | Staffordian Series. | Newcastle Group. |
|---|----------|---------|------|---------------------|------------------|
| <i>Pecopteris oreopteridia</i> , Schl. sp., | X | ?X | R | X | X* |
| " <i>polymorpha</i> , Brongt., | X | - | R | X | X |
| " <i>miltoni</i> , Art. sp., | X | X | Y | X | X |
| " <i>crenulata</i> , Brongt., | X | X | R | X | X* |
| " <i>arborescens</i> , Schl. sp., | X | - | R | X | X |
| " <i>candolliana</i> , Brongt., | X | X | R | - | - |
| " <i>bucklandii</i> , Brongt., | X | - | R | X | X* |
| " <i>unita</i> , Brongt., | - | X | R | X | X |
| <i>Dactylothea plumosa</i> , Art. sp., | X | X | R | X | X |
| <i>Eupecopteris camertonensis</i> , Kidst., | - | X | R | - | - |
| <i>Corynepteris sternbergii</i> , Ett. sp., | X | - | Y | - | - |
| <i>Sphenopteris neuropteroides</i> , Boul. sp., | X | X | R | X | X |
| " <i>macilentata</i> , L & H., | X | X | R | - | - |
| " <i>laurenti</i> , Andrae, | - | X | Y | X | - |
| <i>Renaultia chaerophylloides</i> , Bgt. sp., | X | - | Y | X | X* |
| <i>Mariopteris muricata</i> , Schl. sp., | X | X | YL | X | X |
| <i>Alethopteris serlii</i> , Brongt. sp., | X | X | R | X | X |
| " <i>davrenxi</i> , Brongt. sp., | X | - | ?Y | X | X |
| " <i>aquilina</i> , Schl. sp., | X | X | R | X | X |
| <i>Neuropteris flexuosa</i> , Sternb., | X | X | R | X | X |
| " <i>scheuchzeri</i> , Hoffm., | X | X | R | X | X |
| " <i>fimbriata</i> , Lesqx., | X | X | R | X | X |
| " <i>ovata</i> , Hoffm., | X | X | R | X | X |
| " <i>schlehani</i> , Stur., | X | - | Y | - | - |
| " <i>rarinervis</i> , Bunb., | X | X | R | X | X |
| " <i>macrophylla</i> , Brongt., | X | X | R | X | X |
| " <i>heterophylla</i> , Brongt., | - | X | YL | X | - |
| <i>Aphlebia crispa</i> , Gutb., | X | - | - | X | X* |
| <i>Odontopteris lindleyana</i> , Sternb., | X | X | R | X | X |
| " <i>alpina</i> , (Stb). Gein., | X | - | Y | - | - |
| <i>Cyclopteris orbicularis</i> , Brongt., | - | X | ?Y | X | X |
| <i>Trigonocarpus parkinsoni</i> , Brongt., | X | X | YL | X | - |
| <i>Radiospermum perpusillum</i> , Lx. sp., | X | - | YL | - | - |
| <i>Holcospermum mamillatum</i> , Lx. sp., | X | - | - | X | - |
| <i>Cordaicarpus ovoideus</i> , Gopp. & Berg., | X | - | - | - | - |
| <i>Sigillaria ovata</i> , Sauv., | X | - | Y | X | - |
| " <i>tessellata</i> , Stein. sp., | X | X | Y | X | X |
| " <i>cumulata</i> , Weiss, var. | - | - | - | - | - |
| " <i>nodosa</i> , L & H., | X | - | R | - | - |
| " <i>mauricii</i> , Grand 'Eury., | X | - | - | - | - |
| " <i>transversalis</i> , Bgt. var., | - | - | - | - | - |
| " <i>sparsifolia</i> , Boul., | X | - | Y | - | - |
| " <i>kidstoni</i> , n. sp., | X | - | - | - | - |
| <i>Sigillariophyllum bicarinatum</i> , L & H. | X | X | - | - | X* |
| <i>Lepidodendron aculeatum</i> , Sternb., | X | X | YL | X | X |
| " <i>wortheni</i> , Lesqx., | X | X | - | X | X |
| " <i>lanceolatum</i> , Lesqx., | X | X | R | X | X |
| " <i>distans</i> , Lesqx., | X | - | L | - | - |
| " <i>obovatum</i> , Sternb., | - | X | YL | X | - |
| <i>Lepidostrobos brevifolius</i> , Lesqx., | X | - | R | X | X |
| " <i>lanceolatus</i> , L & H sp., | X | X | YL | X | X |
| " <i>minor</i> , Goode, | X | X | Y | X | X* |
| " <i>triangularis</i> , Zeill., | X | - | Y | X | - |
| " <i>majus</i> , Brongt., sp., | X | - | R | X | X |
| <i>Stigmaria ficoides</i> , Sternb., sp., | X | X | - | X | X |
| <i>Calamites carinatus</i> , Sternb., | X | X | YL | X | X |
| " <i>suckowii</i> , Brongt., | - | X | YL | X | X |
| <i>Asterophyllites equisetiformis</i> , Schl., sp., | X | - | - | X | X |
| <i>Annularia sphenophylloides</i> , Zenk. sp., | X | X | R | X | X |

* Recorded from the Newcastle-order-Lyne Group (for the first time) in the present work. (See Flora of Farrington Series of Northern Area, p. 15.)

Table II. (contd.)

| | Pensford | Bromley | Zone | Staffordian Series. | Newcastle Group. |
|--|----------|---------|------|---------------------|------------------|
| <i>Annularia stellata</i> , Schl. sp., | X | X | R | X | X |
| " <i>radiata</i> , Brongt., | - | X | YL | X | X |
| <i>Pinnularia capillacea</i> , L. & H., | X | X | - | X | ?X |
| <i>Stachannularia tuberculata</i> , Sternb., | X | - | R | X | X |
| <i>Sphenophyllum majus</i> , Bronn., | ?X | X | Y | - | X * |
| " <i>emarginatum</i> , Brongt., | X | X | R | X | X |
| " <i>cuneifolium</i> , Sternb., | X | X | YL | X | X |
| " <i>fasciculatum</i> , Lesqx., | - | X | - | - | - |
| <i>Cordaites angulosostriatus</i> , Kidst., | X | - | R | X | X |
| " <i>borassifolius</i> , Sternb.sp., | - | X | ?Y | X | - |
| <i>Poacordaites microstachys</i> , Gold.sp., | X | - | R | - | - |

(4) THE NEW ROCK AND VORSTER SERIES.

The Pensford flora includes 28 Radstockian and 18 Yorkian (and Lanarkian) species, while the Bromley flora contains 20 Radstockian and 15 Yorkian (and Lanarkian) plants. Although, at both pits, all the common species present are Radstockian, the characteristic assemblage of that division is, as a whole, absent. (Only 8 species of *Pecopteris* occur at Pensford, and 6 at Bromley, and all are infrequent or rare, whereas in the Radstockian Series the genus is richly represented and several species are characteristically common. Many other typical Radstockian plants are absent from the Pensford and Bromley floras.)

Though the Yorkian species present are comparatively few and of rare occurrence, the majority of these plants have never been recorded from the Radstockian Series. Thus, at Pensford and Bromley the floras are predominantly, though not characteristically, Radstockian, and these Coal Measures must be classed with the Staffordian Series.

The next consideration is to which Group of the Staffordian Series the beds belong. As the proportion of Yorkian plants is small, while all the common species are Radstockian, the uppermost Group is indicated, and THE COAL MEASURES WORKED IN THE CENTRAL AREA OF THE COALFIELD AT PENSFORD AND BROMLEY ARE REFERRED TO THE NEWCASTLE-UNDER-LYME GROUP OF THE STAFFORDIAN SERIES. Reference to columns 4 and 5 of Table II (above) shows that almost the

* Recorded from the Newcastle-under-Lyme Group (for the first time) in the present work. (See Flora of Farrington Series of Northern Area, p. 15.)

Table III (contd.)

entire flora of the Central Area has been recognised previously from the Staffordian Series, and the bulk of it from the Newcastle-under-Lyme Group, thus justifying our determination.

On the floral evidence it is probable that certain of the lower Farrington seams are worked at Pensford and Bromley.

(4) THE NEW ROCK AND VOBSTER SERIES.

The New Rock and Vobster Series were referred by Kidston[†] to the Transition (= Staffordian) Series.

Table III, below, gives the known flora of these rocks, which has been considerably increased in the present work. In the second and third columns are shown those plants which are also found elsewhere in the Staffordian Series and in the Blackband Group of that Series respectively.[‡]

TABLE III - THE FLORA OF THE NEW ROCK AND VOBSTER SERIES.

| | Zone | Staffordian Series. | Blackband Group. |
|--|------|---------------------|------------------|
| <i>Pecopteris oreopteridia</i> , Schl. sp., | R | X | - |
| " <i>arborescens</i> , Schl. sp., | R | X | - |
| " <i>volkmanni</i> , Sauv., | Y | - | - |
| " <i>miltoni</i> , Art. sp., | Y | X | X |
| <i>Dactylothea plumosa</i> , Art. sp., | R | X | X |
| <i>Mariopteris muricata</i> , Schl., sp., | YL | X | X |
| <i>Neuropteris pseudogigantea</i> , Pot., | YL | X | X |
| " <i>scheuchzeri</i> , Hoffm., | R | X | X |
| " <i>heterophylla</i> , Brongt., | YL | X | X |
| " <i>macrophylla</i> , Brongt., | R | X | X |
| " <i>obliqua</i> , Brongt., | Y | X | X |
| " <i>rarinervis</i> , Bunb., | R | X | X |
| <i>Cyclopteris orbicularis</i> , Brongt., | ? | X | - |
| <i>Dictyopteris munsteri</i> , Eich., sp., | Y | X | X |
| <i>Sphenopteris tenuissima</i> , Presl., | Y | - | - |
| " <i>laurenti</i> , Andrae, | Y | X | - |
| " <i>dilatata</i> , L & H., | Y | X | X |
| " <i>neuropteroides</i> , Boul., sp., | R | X | - |
| " <i>trifoliolata</i> , Art., sp., | Y | - | - |
| <i>Corynepteris sternbergii</i> , Ett., sp., | Y | X* | - |
| " <i>coralloides</i> , Gut., sp., | Y | X | - |
| <i>Diploptema furcatum</i> , Brongt., sp., | Y | X | - |
| <i>Alethopteris lonchitica</i> , Schl., sp., | YL | X | X |
| " <i>decurrens</i> , Art., sp., | YL | X | - |

[†] Kidston, R., 20, pp.557-8.

[‡] Kidston, R., 23, pp.311, 321; 27, pp.46-9; 28, pp.316, 355.

Table III (contd.)

| | Zone | Staffordian Series. | Blackband Group. |
|---|------|---------------------|------------------|
| <i>Desmopteris elongata</i> , Presl. | R | - | - |
| <i>Megalospermum inflatum</i> , Lesqx. sp., | Y | - | - |
| <i>Sigillaria elongata</i> , Brongt., | Y | X | - |
| " <i>cordigera</i> , Zeill., | Y | - | - |
| " <i>tessellata</i> , Stein. sp., | Y | X | - |
| " <i>major</i> , L. & H., | YL | X | X |
| " <i>cumulata</i> , Weiss, † ^o | R | X* | - |
| " <i>mamillaris</i> , Brongt., | Y | X | - |
| " <i>scutellata</i> , Brongt., | YL | X | - |
| " <i>rugosa</i> , Brongt. † ^o | Y | X | - |
| " <i>tenuis</i> , Acheb. † ^o | Y | - | - |
| " <i>saulii</i> , Brongt., | Y | - | - |
| " <i>ovata</i> , Sauv., | Y | X | X |
| <i>Asolanus camptotaenia</i> , Wood, | - | X | - |
| <i>Stigmaria ficoides</i> , Sternb. sp., | - | X | X |
| " <i>minuta</i> , Göpp., | Y | - | - |
| <i>Lepidodendron aculeatum</i> , Sternb., | YL | X | - |
| " <i>rimosum</i> , Sternb., | Y | X | X |
| " <i>obovatum</i> , Sternb., | YL | X | - |
| " <i>ophiurus</i> , Brongt., | YL | X | - |
| " <i>wortheni</i> , Lesqx., | - | X | X |
| " <i>lanceolatum</i> , Lesqx., | R | X | - |
| " <i>simile</i> , Kidst., | YL | ?X | - |
| <i>Lepidostrobus minor</i> , Goode, | Y | X | - |
| " <i>triangularis</i> , Zeill., | Y | X | - |
| " <i>morissianum</i> , Lesqx., | - | - | - |
| " <i>majus</i> , Brongt. sp., | R | X | - |
| " <i>incertus</i> , Lesqx., | - | - | - |
| " <i>radians</i> , Schimp., | Y | - | - |
| " <i>lanceolatus</i> , L. & H. sp., | YL | X | X |
| <i>Sigillariophyllum bicarinatum</i> , L & H sp. | - | X* | - |
| <i>Calamites suckowii</i> , Brongt., | YL | X | X |
| " <i>carinatus</i> , Sternb., | YL | X | X |
| " <i>undulatus</i> , Sternb., | YL | X | X |
| <i>Annularia radiata</i> , Brongt., | YL | X | X |
| " <i>sphenophylloides</i> , Zenk. sp., | R | X | X |
| <i>Asterophyllites equisetiformis</i> , Schl. sp. | - | X | X |
| " <i>grandis</i> , Sternb. sp., | Y | X | X |
| " <i>charaeiformis</i> , Sternb. sp., | Y | X | X |
| <i>Palaeostachya pedunculata</i> , Will., | Y | X | - |
| <i>Pinnularia capillacea</i> , L. & H., | - | X | - |
| <i>Sphenophyllum cuneifolium</i> , Sternb., | YL | X | X |
| " <i>myriophyllum</i> , Crépin, | Y | X | - |
| " <i>trichomatosum</i> , Stur, | Y | - | - |
| " <i>emarginatum</i> , Brongt., | R | X | X |
| <i>Dorycordaites palmaeformis</i> , Gut., | Y | X | - |
| <i>Cordaites principalis</i> , Germ. sp., | Y | X | - |
| " <i>borassifolius</i> , Sternb. sp., | ?Y | X | X |
| " <i>angulosostriatus</i> , Kidst., | R | X | - |
| <i>Artisia approximata</i> , Brongt. sp., | - | X | - |
| " <i>transversa</i> , Art. sp., | - | X | X |
| <i>Cordaicarpus cordai</i> , Gein. sp., | Y | X | - |
| " <i>areolatus</i> , Boul. sp., | Y | - | - |
| " <i>ovoideus</i> , Göpp. & Berg. | - | X* | - |

* Recorded from the Staffordian Series (for the first time) in the present work. See floras of Northern and Central Areas, pp. 15, 18.)

†^o Recorded (Kidst., 16, p. 413) as *S. tessellata*, see Kidst. 23, p. 317.

†^e Recorded (Kidst., 16, p. 415) as *S. sillimani*, see Kidst., 20, p. 577.

†^c Recorded (Kidst., 16, p. 415) as *S. schlotheimii*, see Kidst., 20, p. 576.

The flora of the New Rock and Vobster Series is seen to contain 14 Radstockian in association with 51 Yorkian (and Black-Lanarkian) species.

(c) The Radstockian species present are not only comparatively few, but are invariably of rare occurrence, many of the records being represented by a single specimen only.

Of the 51 Yorkian species recorded, most are unknown from the Radstockian Series, the remainder being extremely rare in those rocks.

In spite, however, of the preponderance of Yorkian plants in the New Rock and Vobster Series, the typical Yorkian assemblage cannot be recognised in the flora. Thus, (a) At least 37 species of Sigillaria are known which occur only in and below the Yorkian Series, and none of which are found in the New Rock and Vobster Series.

Further, the 11 Yorkian Sigillarias recorded above from the New Rock and Vobster Series are all rare or fairly rare in these rocks, whereas several are characteristically common in the Yorkian Series.

(b) With regard to the Sphenopterideae, constituting one of the main features of the Yorkian flora, and of which over 100 species are known only from or below that Series, 8 species only have been found in the New Rock and Vobster Series, and 6 of these are represented by a single specimen in our collection.

(c) The Yorkian Neuropterids here recorded are also rare, (whereas they are mostly common in that Series), and many other species of Neuropteris characteristic of the Yorkian Series are absent. It will be seen that these rocks contain a transition flora in which, though the proportion of Yorkian plants is large, a typical assemblage of that division cannot be recognised, and it is evident that THE NEW ROCK AND VOBSTER SERIES MUST BE REFERRED TO THE LOWEST GROUP OF THE STAFFORDIAN SERIES, NAMELY THE BLACKBAND GROUP.

This determination receives support by a comparison of the flora of the New Rock and Vobster Series with that of the Black-band Group of the Staffordian Series of other British coalfields, (columns 2 and 3 of Table III, above).

(5) THE PENNANT ROCK.

With regard to the horizon of these beds, Kidston (20, p.578) remarked that, "The few fossils I have been able to identify from the Pennant Rocks represent so few species that there is no palaeontological evidence available for deciding this point. If, however, we examine the fossil plants of the Upper Coal Measures which overlie the Pennant, and compare them with those of the New Rock Series on which the Pennant rests, and which is clearly transitional between the Upper and Middle Coal Measures, the Pennant Rock of Somerset must obviously be either the basement beds of the Upper Coal Measures or the upper portion of the Transition Series!"*

We have few additions to make to the flora of the Pennant Rock, but, as the Farrington Series (in the Northern Area) has been referred (above) to the Staffordian Series, it is evident that THE PENNANT ROCK OF THE NORTHERN AREA BELONGS TO THE STAFFORDIAN SERIES.

(6) THE UPPER BEDS OF THE "MILLSTONE GRIT".

Although comparatively few species of plants were collected from the upper beds of the "Millstone Grit", some are of very frequent occurrence.

Sphenophyllum trichomatosum, Stur., is extremely common, and hitherto has not been found outside the Yorkian Series.

Odontopteris conwayi, L. & H. sp., which is equally abundant,

* Stamp, (34, p.158) observes, "---In the Bristol and Somerset Coalfield the Pennant Grit occurs high up in the Staffordian", but cites no authority.

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is known from the Yorkian Series only.

Lepidodendron distans, Lesqx., is a characteristic Yorkian and Lanarkian plant, and has not hitherto been found above the Yorkian Series.

Lepidophloios laricinus, Sternb., occurs chiefly in the Yorkian Series, though it is found, very rarely, in the higher divisions.

Calamites undulatus, Sternb., is much more common in the Yorkian and Lanarkian Series than elsewhere.

Lepidostrobus lanceolatus, L. & H. sp., is frequent both in the Yorkian and the Lanarkian Series, and becomes rarer in the Staffordian Series.

Stigmaria ficoides, Sternb., sp., and Sigillariophyllum bicarinatum, L. & H. sp., are of no zonal value, as they occur more or less abundantly throughout the Coal Measures.

Observing the entire absence of Radstockian species in the above flora, together with the very common occurrence of certain typical Yorkian plants, although a rich variety of Yorkian species has not been found, THE UPPER BEDS OF THE "MILLSTONE GRIT" OF THIS DISTRICT IS PROVISIONALLY REFERRED TO THE YORKIAN SERIES.

Thus, although lithologically the upper beds of the "Millstone Grit" of the Bristol and Somerset Coalfield resembles that of the North Midlands Coalfields, it appears to be palaeontologically referable to the Yorkian Series, as was shown by Goode (14, p. 275) to be true of the "Millstone Grit" of Pembrokehire.*

* Kidston, (28, p.10) has remarked that, "The term "Millstone Grit" as frequently used in geological writings, has been applied very loosely to coarse sandstone beds belonging to the lower Carboniferous as well as to the Upper Carboniferous, and their true geological position can only be determined by their fossil contents, frequently difficult to obtain". See also Arber, (3, p.269) and Kidston, (26, p.1065)

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4. Sphenopteridae. While several species of Sphenopteris have been recorded from the Radstock and Farrington Series, nearly all are of the PTERIDOSPERMAE and FILICALES.

1. Pecopteridae. The Radstock Series is chiefly characterised by the presence of 16 species of Pecopteris, the most frequent of which are P. miltoni, P. arborescens, P. oreopteridia, and P. unita. Many of the Radstockian Pecopterids are found in the Farrington Series of the Southern Area, where, however, they are generally less frequent. In the Central Area, and in the Farrington Series of the Northern Area they are still less frequent. From the New Rock and Vobster Series only two Radstockian species of Pecopteris have been recorded, both being extremely rare, while the Yorkian plant, P. volkmanni, is found here.

Dactylothea plumosa occurs throughout the coalfield, though it is more abundant in the Radstock Series than elsewhere. Dicksoniites pluckenettii is nowhere common, and is confined to the Radstock and Farrington Series.

Mariopteris muricata, widely distributed throughout the coalfield, is rare in the Radstock Series and becomes more frequent in the lower rocks.

2. Alethopteridae. Of the six species of Alethopteris known from the Radstock Series, only one, A. serlii, is common, and this is extremely abundant. It is less frequent in the Farrington Series, and especially in the Northern Area. In the New Rock and Vobster Series this typical Radstockian species is unknown, and the Yorkian plants A. lonchitica and A. decurrens are found. Desmopteris elongata is extremely rare.

3. Odontopteridae. Odontopteris lindleyana, found in the Radstock and Farrington Series at several localities, is rare, while O. alpina is known from one locality only. O. conwayi is very abundant in the upper beds of the "Millstone Grit" but has not been found elsewhere in the coalfield.

4. Sphenopterideae. While several species of Sphenopteris have been recorded from the Radstock and Farrington Series, nearly all are rare, the most frequent being S. neuropteroides.
- (2) In the New Rock and Vobster Series the Radstockian Sphenopterids are absent and are replaced by 7 rare or fairly rare species which are unknown from the Radstock Series.
- (3) The genera Radstockia, Renaultia, Crossotheca and Unatheca are rare.
5. Neuropterideae. In the Radstock and Farrington Series the genus Neuropteris is represented by six species, the most common forms being N. macrophylla, N. scheuchzeri, N. ovata and N. flexuosa. These plants are absent from or very rare in the New Rock and Vobster Series, where N. pseudogigantea and N. heterophylla appear.
- None of the species of Dictyopteris or Rhacophyllum is common or widely distributed.
6. Fern Stems. The genera Megaphyton and Caulopteris are restricted to the Radstock and Farrington Series, where they are of rare occurrence.

SEMINA INCERTAE SEDIS.

Schizospermum noeggerathi is confined to the Radstock and Farrington Series, Holcospermum mamillatum to the Central Area, Radiospermum elongatum and Rhabdocarpus lillianus to the Farrington Series, and Megalospermum inflatum to the New Rock Series. All the species of seeds found in the coalfield are more or less rare, and are restricted in horizontal distribution.

LYCOPODIALES.

- (1) With regard to the Lepidodendrae, L. wortheni, known from the Middle to the Upper Coal Measures, is the most common species throughout the coalfield. L. aculeatum and L. lanceolatum are also frequent in the Radstock and Farrington Series. L. loricatum, a typical plant of the Transition Coal Measures,

appears in the Farrington Series.

L. simile, L. ophiurus, and L. obovatum are found in the New Rock and Vobster Series, where they are rare.

- (2) The genus Lepidophloios is extremely rare, and is recorded from two or three localities only.
- (3) The commonest Sigillaria of the Radstock and Farrington Series is S. cumulata. Several species of Sigillaria are confined to the New Rock and Vobster Series, but none is frequent.
- (4) Asolanus occurs at several localities but is very rare.
- (5) While Sigillariostrobus has been found in the Radstock Series only, certain species of Lepidostrobus (L. minor and L. lanceolatum) occur throughout the coalfield, while others (L. morissianum and L. incertus) are restricted to the lower rocks, where they are rare.

EQUISETALES.

The genus Calamites is fairly rare, though certain species (C. suckowii and C. carinatus) are found in each Series. C. undulatus, extremely rare in the Radstock Series, is more frequent in the New Rock Series.

Asterophyllites equisetiformis occurs, though rarely, throughout the coalfield, while A. grandis and A. charaeformis are restricted to the New Rock Series.

Annularia stellata and A. sphenophylloides, common and characteristic plants of the Radstock Series, are less frequent in the Farrington Series, and the former is unknown while the latter is extremely rare in the New Rock and Vobster Series. A. radiata appears in the Farrington Series of the Northern Area and becomes more frequent in the New Rock Series. The fructifications of Calamites are rarely found.

SPHENOPHYLLALES

The genus Sphenophyllum is represented in the Radstock Series by S. emarginatum, a common and characteristic plant. This

V. SUMMARY AND CONCLUSIONS.

species is rarer in the Farrington Series, extremely rare in the New Rock Series and absent from the Vobster Series. S. majus and S. cuneifolium appear in the Farrington Series, and the latter becomes much more frequent in the New Rock and Vobster Series, where it is joined by S. myriophyllum and S. trichomatosum. The last, which is rare in the New Rock Series, is found, in great abundance, in the upper beds of the "Millstone Grit".

CORDAITALES.

Cordaites angulosostratus, a common and characteristic plant of the Radstock Series, is rarer in the lower rocks, where C. borassifolius and C. principalis occur.

Poacordaites microstachys is confined to the Radstock and Farrington Series.

Cordaicarpus areolatus and C. cordai are known only from the New Rock Series, where they are rare.

It will be seen that each Series in the Bristol and Somerset Coalfield contains a distinctive flora by which it can be readily identified.

The writer endeavoured to test the value of the flora accompanying the individual coal-seams as a means of identifying them from place to place. The results, however, though not conclusive, were so variable that the flora appears to be of little value for this purpose in the Bristol and Somerset Coalfield.*

* This conclusion was also arrived at with regard to the Radstock Series by Greenwell and M'Murtrie ("On the Radstock Portion of the Somerset Coalfield", 1864, Newcastle-upon-Tyne, p.20).

V. SUMMARY AND CONCLUSIONS.

The late Dr. Kidston expressed entire agreement with

(1). With the additional species recorded in Part II of this work, the known flora of the Bristol and Somerset Coalfield has been increased as follows:-

- New records from various localities.....444.
- New records from the Coalfield.....79.
- New records from Great Britain.....8.
- New species (described and figured).....2.

In addition, many species which are already known from particular localities in the Coalfield are recorded for the first time from definite horizons.

(2). The known vertical distribution of 45 species has been extended to the Staffordian Series.

(3). Palaeobotanical horizons have been determined as follows:-

| | Previous determination. | Present determination. |
|-----------------------------------|---|---|
| RADSTOCK SERIES. | Upper Coal Measures (=Radstockian Series). (Kidston, 1887) | Radstock Group of the Radstockian Series. |
| Southern Area | ditto. | Keele Group of the Radstockian Series. |
| FARRINGTON SERIES. ? Central Area | unknown. | Newcastle-under-Lyme Group of the Staffordian Series. |
| Northern Area. | Upper Coal Measures. (Lillie, 1910). | Newcastle-under-Lyme Group of the Staffordian Series. |
| PENNANT ROCK. | Either basement beds of Upper Coal Measures, or upper portion of Transition (=Staffordian) Series. (Kidston, 1894). | (In Northern Area) Staffordian Series. |
| NEW ROCK AND VOBSTER SERIES. | Transition (=Staffordian) Series. (Kidston, 1894). | Blackband Group of Staffordian Series. |
| UPPER BEDS OF "MILLSTONE GRIT". | unknown. | (probably) Yorkian Series. |

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The late Dr. Kidston expressed entire agreement with the above results, and I gladly record my indebtedness to Dr. Kidston for his assistance and encouragement in the work.

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- Fig.1.- *Alathopteria grandini*, Brongt. sp., from Radstock. x 7 (No. 361).
- Fig.2.- Horizontal Section from Leyhill Quarry, near Cromhall.
- Fig.3.- *Alathopteria grandini*, Brongt. sp., in photographing from Cheston Colliery.
- Fig.4.- *Alathopteria conica*, Zeiller, from Parkfield Pit.
- Fig.5.- *Alathopteria conica*, Zeiller, from Parkfield Pit.
- Fig.6.- *Alathopteria conica*, Zeiller, from Parkfield Pit.
- Fig.7(a) and (b).- *Alathopteria acullina*, Schl. sp., from Bishop Sutton New Pit. x 1. (Nos. 371, 366).
- Fig.8.- *Alathopteria davreuxi*, Brongt. sp., from Broad Oak Colliery, Pensford. x 1. (No. 405).
- Fig.9.- *Alathopteria decurrens*, Artis sp., from Hanham Pit. x 1. (No. 398).
- Fig.10. *Alathopteria cf. costei*, Zeiller, from Parkfield Pit. Pucklechurch. x 1. (No. 392).

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- Fig.1.- *Neuropteris limbata*, Lesq., from Broad Oak Colliery, Pensford. x 1. (No. 177).
- Fig.2.- *Neuropteris oxata*, Hoffm., from Broad Oak Colliery, Pensford. x 1. (No. 137).
- Fig.3.- *Neuropteris obliqua*, Brongt. sp., from Deep Pit, Kingswood, Bristol. x 1. (No. 336).
- Fig.4.- *Neuropteris flexuosa*, Sterob., from Broad Oak Colliery, Pensford. x 1. (specimen given to Bidston collection).
- Fig.5.- *Neuropteris flexuosa*, Sterob., from Radstock, x 1. (No. 73).

EXPLANATION OF PLATES.

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- Plate II.
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drawing.
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to Soho Quarry, near Leigh on Mendip.
Reduced ($\times \frac{1}{3}$) in photographing from drawing.
- Plate III.
- Fig. 1.- *Alethopteris grandini*, Brongt. sp., from Radstock. $\times \frac{2}{7}$
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- Fig. 2.- *Alethopteris serlii*, Brongt. sp., from Radstock. x 1.
- Fig. 3.- *Alethopteris aquilina*, Schl. sp., from Bishop Sutton
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- Fig. 5.- *Alethopteris valida*, Boulay, from Broad Oak Colliery,
Pensford. x 1. (No. 385).
- Fig. 6.- *Alethopteris davreuxi*, Brongt. sp., from Parkfield Pit,
Pucklechurch. x 1. (No. 415).
- Fig. 7(a) and (b).- *Alethopteris aquilina*, Schl. sp., from Bishop
Sutton New Pit. x 1. (Nos. 371, 368).
- Fig. 8.- *Alethopteris davreuxi*, Brongt. sp., from Broad Oak
Colliery, Pensford. x 1. (No. 405).
- Fig. 9.- *Alethopteris decurrens*, Artis sp., from Hanham Pit.
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- Fig.1.- Pecopteris polymorpha, Brongt., from Coalpit Heath Colliery. x 1. (No. 1393).
- Fig.2.- Pecopteris miltoni, Artis sp., from Broad Oak Colliery, Pensford. x $\frac{4}{5}$. (No. 1175).
- Fig.3.- Dicksoniites pluckenetii, Schl. sp., from Parkfield Pit, Pucklechurch. x 1. (No. 1328).
- Fig.4.- Pecopteris arborescens, Schl. sp., from Parkfield Pit, Pucklechurch. x 1. (No. 1233).
- Fig.5.- Dactylotheca plumosa, Artis sp., from Radstock. (specimen lent).
- Fig.6.- Pecopteris cyathea, Schl. sp., from Norton Hill Pit, Midsomer Norton. x 1. (No. 1344).
- Fig.7.- Dicksoniites pluckenetii, Schl. sp., from Marsh Lane Pit, Farrington Gurney. x 1. (No. 1339).
- Fig.8.- Eupecopteris sp., from Parkfield Pit, Pucklechurch. x 1. (No. 1353).
- Fig.5.- Cordalocarpus areolatus, Boulay sp., from Deep Pit, Kingswood, Bristol. Plate VI. (No. 554).
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- Fig.2.- Sphenopteris sp., from Norton Hill Pit, Midsomer Norton. x $\frac{1}{2}$. (specimen given to Kidston collection).
- Fig.3.- Radstockia sphenopteroides, Kidst. sp., from Parkfield Pit, Pucklechurch. x 1. (No. 914).
- Fig.4.- Sphenopteris dilatata, L. & H., from Deep Pit, Kingswood, Bristol. x 1. (No. 704).
- Fig.5.- Rhodea sp., from Deep Pit, Kingswood, Bristol. x 1. (No. 906).
- Fig.6.- Sphenopteris sp., from Bishop Sutton New Pit. x 1. (No. 861).
- Fig.7.- Neuropteris sp., from Parkfield Pit, Pucklechurch. x 1. (No. 235).
- Fig.8.- Sphenopteris ? sauveuri, Crépin, from Bromley Colliery, near Pensford. x 1. (No. 863).
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Plate VII.

- Fig.1.- Mariopteris muricata, Schl. sp., from Old Mills Pit, Farrington Gurney. x 1. (No. 932).
- Fig.2.- Dolerophyllum sp., from Broad Oak Colliery, Pensford. x 1. (No. 271).
- Fig.3.- Dictyopteris münsteri, Eichw. sp., from Newbury Pit. x 1. (No. 459).
- Fig.4.- Rhacophyllum spinosum, Lesqx., from Parkfield Pit. Pucklechurch. x 1. (No. 320).
- Fig.5.- Cyclopteris orbicularis, Brongt., from Bromley Colliery, near Pensford. x 1. (No. 282).
- Fig.6a and b.- Odontopteris conwayi, L. & H. sp., from Strontium Quarry, Yate. x 1. (Nos. 486, 490).
- Fig.7.- Odontopteris lindleyana, Sternb., from Bishop Sutton New Pit. x 1. (No. 451).

Plate VIII.

- Fig.1.- Caulopteris anglica, Kidst., from Radstock. x $\frac{7}{8}$. (specimen lent).
- Fig.2.- Megalospermum inflatum, Lesqx. sp., from Deep Pit, Kingswood, Bristol. x 1. (No 496).
- Fig.3.- Holcospermum sp., from Deep Pit, Kingswood, Bristol. x 1. (No. 520).
- Fig.4.- Samaropsis sp., from Deep Pit, Kingswood, Bristol. x 1. (No. 523).
- Fig.5.- Cordaicarpus areolatus, Boulay sp., from Deep Pit, Kingswood, Bristol. x 1. (No. 554).
- Fig.6.- Samaropsis sp., from Newbury Pit. x 1. (No. 521).
- Fig.7.- Cyclopteris sp., from Broad Oak Colliery, Pensford. x 1. (No. 286).

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- Fig.1.- Sigillaria m'murtriei, Kidst., from Radstock. x $\frac{7}{8}$. (specimen lent by Mr. Tutchter of Bristol, who afterwards gave it to Dr. Kidston).
- Fig.2.- Sigillaria cumulata, Weiss, var. nodosa, L. & H., from Broad Oak Colliery, Pensford. x 1. (No. 1673).
- Fig.3.- Sigillaria saulii, Brongt., from Newbury Pit. x 1. (No. 1662).
- Fig.4.- Sigillaria rugosa, Brongt., from Parkfield Colliery, Pucklechurch. x 1. (No. 1695).
- Fig.5.- Sigillaria tessellata, Stein. sp., from Bishop Sutton New Pit. x $\frac{5}{8}$. (No. 1621).

- Fig.6.- Sigillaria mamillaris, Brongt., from Parkfield Colliery, Pucklechurch. x 1. (No. 1661).
Fig. 7. Sigillaria scutellata, Brongt., from Deep Pit, Kingswood, Bristol. x 1. (No. 1703).
Fig.8.- Sigillaria elongata, Brongt., from Deep Pit, Kingswood, Bristol. x 1. (No. 1657).

Plate X.

- Fig.1.- Lepidodendron ophiurus, Brongt., from Deep Pit, Kingswood, Bristol. x $\frac{5}{4}$. (No. 1533).
Fig.2.- Lepidodendron aculeatum, Sternb., from No.4 Seam, Bromley Colliery, near Pensford. x $\frac{5}{8}$. (No. 1559).
Fig.3.- Lepidodendron lanceolatum, Lesqx., from Norton Hill Pit, Midsomer Norton. x 1. (No. 1463).
Fig.4.- Lepidodendron sp., from Bromley Colliery, near Pensford. x 1. (No. 1529).
Fig.5.- Lepidodendron simile, Kidst., M.S., from Deep Pit, Kingswood, Bristol. x 1. (No. 1519).
Fig.6.- Asolanus camptotaenia, Wood, from Coalpit Heath Colliery, x 1. (No. 1665).

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- Fig.1.- Annularia stellata, Schl. sp., from Deep Middle Vein, Kilmersdon Pit. x $\frac{3}{4}$. (No. 985).
Fig.2.- Annularia radiata, Brongt., from Deep Pit, Kingswood, Bristol. x 1. (No. 1006).
Fig.3.- Annularia stellata, Schl. sp., from Broad Oak Colliery, Pensford. x 1. (No. 995).
Fig.4.- Calamites undulatus, Sternb., from Deep Pit, Kingswood, Bristol. x 1. (No. 966).
Fig.5.- Asterophyllites equisetiformis, Schl. sp., from Broad Oak Colliery, Pensford.
Fig.6.- Macrostachya ? infundibuliformis, Brongt. sp., from Coalpit Heath. x 1. (No. 1064).
Fig.7.- Calamites sp., from Coalpit Heath. x $\frac{1}{2}$. (No. 984).
Fig.8.- Annularia sphenophylloides, Zenk. sp., from Norton Hill Pit, Midsomer Norton. x 1. (No. 1033).
Fig.9.- Sphenophyllum ? myriophyllum, Crépin, from Deep Pit, Kingswood, Bristol. x 1. (No. 595).

Plate XII.

- Fig.1.- Sphenophyllum emarginatum, Brongt., from Coalpit Heath, Colliery, x 1. (No. 632).

- Fig.2.- Sphenophyllum cuneifolium, Sternb. sp., from Deep Pit, Kingswood, Bristol. x 1. (No. 683).
- Fig.3.- Sphenophyllum fasciculatum, Lesqx., from Bromley Colliery, near Pensford. x 1. (No. 652).
- Fig.4.- Poacordaites microstachys, Gold. sp., from Broad Oak Colliery, Pensford. x 1. (No. 1432).
- Fig.5.- Sphenophyllum majus, Bronn, from Broad Oak Colliery, Pensford. x 1. (No. 653).
- Fig.6.- Sphenophyllum longifolium, Germar, from Broad Oak Colliery, Pensford. (No. 630).
- Fig.7.- Cordaites angulosostriatus, Kidst. (?Grand 'Eury), from Broad Oak Colliery, Pensford. x $\frac{4}{5}$. (No. 1433)
- Fig.8.- Cordaites principalis, Germar sp., from Deep Pit, Kingswood, Bristol. x 1. (No. 1435).

Fig.3.- Pecopteris polymorpha, Brongt., from Redstock.
x 1.

PLATE XIII.

- Fig.1.- Sigillaria rugosa, Brongt., from Coalpit Heath Colliery, x 1. (No. 1698).
- Fig.2.- Sigillaria cf germanica, Weiss, from Broad Oak Colliery, Pensford. x 1. (No. 1644).
- Fig.3.- Neuropteris macrophylla, Brongt., from Broad Oak Colliery, Pensford. x 1. (No. 111).
- Fig.4.- Diplothemema furcatum, Brongt. sp., from Deep Pit, Kingswood, Bristol. x 1. (No. 816).
- Fig.5.- Sphenophyllum majus, Bronn, from Marsh Lane Pit, Farrington Gurney. x 1. (No. 664).
- Fig.6.- Sphenopteris pecopteroides, Kidst., from Parkfield Colliery, Pucklechurch. x 1. (No. 719).

PLATE XIV.

- Fig.1.- Sigillaria cordigera, Zeiller, from Deep Pit, Kingswood, Bristol. x 1. (No. 1646).
- Fig.2.- Pecopteris bucklandii, Brongt., from Coalpit Heath Colliery. x 1. (No. 1412).
- Fig.3.- Asolanus camptotaenia, Wood, from Bishop Sutton New Pit. x 1. (No. 1666).
- Fig.4.- Neuropteris cf raymondi, Zeiller, from Deep Pit, Kingswood, Bristol. x 1. (No. 6).
- Fig.5.- Sphenopteris macilenta, L. & H., from Marsh Lane Pit, Farrington Gurney (21" seam). x 1. (No. 771).
- Fig.6.- Neuropteris heterophylla, Brongt., from Hanham Pit. x 1. (No. 72).

- Fig.6.- *Sphenophyllum cuneifolium*, Sturab., var. *saxifragaeifolium*.
 Fig.7.- *Lepidodendron loricatum*, Arber.(pars), from Coalpit Heath Colliery. x 1. (No. 1588).
 Fig.8.- *Neuropteris* sp., from Parkfield Colliery, Pucklechurch. x 1. (No. 232).
 Fig.9.- *Stigmaria minuta*, Göpp. from Speedwell Pit, Kingswood, Bristol. x 1. (No. 1448).
 Fig.10. *Pecopteris oreopteridia*, Schl. sp., from Broad Oak Colliery, Pensford. x 1. (No. 2281).

(All figures reduced, x $\frac{2}{3}$, in photographing from drawing.)

PLATE XV.

- Fig.1.- *Pecopteris* sp., from Broad Oak Colliery, Pensford. x 1. (No. 1301).
 Fig.2.- *Mariopteris muricata*, Schl. sp., from Radstock. x 1. (No. 920).
 Fig.3.- *Pecopteris polymorpha*, Brongt., from Radstock. x 1. (No. 1370).
 Fig.4.- *Lepidodendron lanceolatum*, Lesqx., from Broad Oak Colliery, Pensford. x 1. (No. 1458).
 Fig.5.- *Lepidodendron wortheni*, Lesqx., from Deep Pit, Kingswood, Bristol. x 1. (No. 1491).
 Fig.6 a and b.- *Sphenophyllum trichomatosum*, Stur., from Deep Pit, Kingswood, Bristol. x 1: (Nos. 601, 598).
 Fig.7.- ? *Oligocarpia brongniarti*, Stur., from Parkfield Colliery, Pucklechurch. x 1. (No. 696).
 Fig.8.- *Sphenophyllum ? oblongifolium*, (Germar), from Bromley Colliery, near Pensford. x 1. (No. 668).
 Fig.9.- *Palaeostachya ? pedunculata*, Will., from Deep Pit, Kingswood, Bristol. x 1. (No. 1075).

PLATE XVI.

(All figures reduced, x $\frac{12}{19}$, in photographing from drawing.)

- Fig.1.- *Lepidostrobus minor*, Goode, from Norton Hill Pit, Midsomer Norton. x $\frac{12}{19}$ (No.1819).
 Fig.2.- *Sphenophyllum fasciculatum*, Lesqx., from Bromley Colliery. x $\frac{12}{19}$ (No. 652).
 Fig.3.- *Holcospermum mamillatum*, Lesqx. sp., from Broad Oak Colliery, Pensford. x $\frac{12}{19}$ (Nos. 511, 516).
 Fig.4.- *Trigonocarpus parkinsoni*, Brongt., from Broad Oak Colliery, Pensford. x $\frac{12}{19}$ (Nos. 525, 526).
 Fig.5.- *Cyclopteris* sp., from Broad Oak Colliery, Pensford. x $\frac{12}{19}$ (No. 300).

- Fig.6.- Sphenophyllum cuneifolium, Sternb., var. saxifragaefolium,
from Broad Oak Colliery, Pensford. (Specimen given to
Kidston Collection). $\times \frac{12}{19}$
- Fig.7.- Lepidostrobos lanceolatus, L. & H. sp., from Broad Oak
Colliery, Pensford. $\times \frac{12}{19}$ (No. 1717).
- Fig.8.- Neuropteris schlehani, Stur., from Broad Oak Colliery,
Pensford. $\times \frac{12}{19}$ (No. 74).

PLATE XVII.

(All figures reduced, $\times \frac{12}{19}$, in photographing from drawing.)

- Fig.1.- Stigmara minuta, Göpp. from Speedwell Pit, Kingswood,
Bristol. $\times \frac{12}{19}$ (No. 1448).
- Fig.2.- Sphenophyllum majus, Bronn, from Broad Oak Colliery,
Pensford. $\times \frac{12}{19}$ (No. 653).
- Fig.3.- Lepidostrobos minor, Goode, from Deep Pit, Kingswood.
Bristol. $\times \frac{12}{19}$ (No. 1810).
- Fig.4.- Sphenopteris (Corynepteris) sternbergii, Ett., from Broad
Oak Colliery, Pensford. $\times \frac{12}{19}$ (No. 731).
- Fig.5.- Lepidostrobos triangularis, Zeiller, from Broad Oak
Colliery, Pensford. $\times \frac{12}{19}$ (No. 1746).
- Fig.6.- Pecopteris crenulata, Brongt., from Broad Oak Colliery,
Pensford. $\times \frac{12}{19}$ (No. 2250).

PLATE XVIII.

(All figures reduced, $\times \frac{12}{19}$, in photographing from drawing.)

- Fig.1.- Diplotmema sp., from Norton Hill Pit, Midsomer Norton.
 $\times \frac{12}{19}$ (No. 857).
- Fig.2.- Sphenopteris sp., from Norton Hill Pit, Midsomer Norton.
 $\times \frac{12}{19}$ (Specimen given to Kidston Collection).
- Fig.3.- Lepidostrobos majus, Brongt. sp., from Newbury Pit.
 $\times \frac{12}{19}$ (No. 1799).
- Fig.4.- Lepidostrobos incertus, Lesqx., from Deep Pit, Kingswood,
Bristol. $\times \frac{12}{19}$ (No. 1807).
- Fig.5.- Lepidostrobos morissianum, Lesqx., from Deep Pit, Kingswood,
Bristol. $\times \frac{12}{19}$ (No. 1734).

- Alethopteris aquilina, Schl.sp., Pt.I,p.149,151,153, Pt.II,p.2.
 " serlII, Brongt.sp., Pt.I,p.149,151,153, Pt.II,p.1,25.
 " davreuxi, Brongt.sp., Pt.I,p.149,151,153.
 " lonchitica, Schl.sp., Pt.I,p.149,154, Pt.II,p.25.
 " pontica, Zeiller, Pt.I,p.151,159.
 " grandini, Brongt.sp., Pt.I,p.151,159. Pt.II,p.2.
 " cf integra, Gothan sp., Pt.I,p.151,159.
 " cf valida, Boul.sp., Pt.I,p.153,158.
 " decurrens, Art.sp., Pt.I,p.156, Pt.II,p.25.
 " cf costei, Zeiller, Pt.II,p.2,7.
- Alloiopteris sp., Pt.II,p.1.
- Aphlebia sp., Pt.I,p.149,151,153.
 " crispa, Gut., Pt.I,p.153. Pt.II,p.2.
- Annularia stellata, Schl.sp., Pt.I,p.150,152,154.Pt.II,p.3,27.
 " sphenophylloides, Zenk.sp.,Pt.I,p.150,154,155.Pt.II,p.3,27.
 " radiata, Brongt., Pt.I,p.152,154,155. Pt.II,p.27.
 " sp., Pt.I,p.155,156.
 " ? microphylla, Sauv., Pt.II,p.3.
- Asterophyllites equisetiformis, Schl.sp.,Pt.I,p.150-152,154,155.Pt.II,p.2
 " grandis, Sternb.sp., Pt.I,p.155,173, Pt.II,p.27. . 7
 " charaeiformis, Sternb.sp.,Pt.II,p.3,10,27.
 " longifolius, Sternb.sp., Pt.II,p.3,10.
- Asolanus camptotaenia, Wood, Pt.I,p.150,152.
- Artisia approximata, Brongt.sp., Pt.I,p.156.
 " transversa, Art.sp., Pt.I,p.156.
- Bark of unknown Lycopod. Pt.II,p.³2,10.
- Calamites undulatus ,Sternb., Pt.I,p.150,~~154~~,155,156,157,Pt.II,
 p.24,27.
 " sp., Pt.I,p.150,154,155,157.Pt.II,p.3.
 " suckowii, Brongt., Pt.I,p.150,152,154,155,156,
 Pt.II,p.3,27.
 " carinatus, Sternb., Pt.I,p.154. Pt.II,p.27.
- Calamite cones Pt.I,p.154.
- Carpolithus sp., Pt.I,p.150,153. Pt.II,p.2,8.
- Caulopteris peltigera, Brongt., Pt.I,p.151.
 " anglica, Kidst., Pt.II,p.2.
- Corynepteris sternbergii, Ett.sp., Pt.I,p.153,154,161. Pt.II,p.1.
 " coralloides, Gut.sp., Pt.I,p.154,161.
- Cordaites sp., Pt.I,p.151,152,154,156. Pt.II,p.3.
 " principalis, Germar, Pt.I,p.151,156,175. Pt.II,p.28.
 " angulosostriatus, Kidst. Pt.I,p.154,175. Pt.II,p.28.
 " ? borassifolius, Sternb., Pt.I,p.154,156,175. Pt.II,p.28.
- Cordaicarpus sp., Pt.I,p.152.
 " cordai, Gein.sp., Pt.I,p.156,176. Pt.II,p.28.
 " areolatus, Boul.sp., Pt.I,p.156,176. Pt.II,p.28.
 " ovoideus , (Berg) Pt.II,p.3,11.
- Crossotheca sp., Pt.I,p.150,154.
 " pinnatafida, Gut.sp., Pt.II,p.1,5.
 " crepini, Zeille r, Pt.II,p.1,6.
- Cyclopteris sp., Pt.I,p.149,151,153. Pt.II,p.2.
 " orbicularis, Brongt., Pt.I,p.153. Pt.II,p.2.

Dactylothea plumosa, Artk.sp., Pt.I,p.149,151,153,154.Pt.II,p.2,25.

Dicksonites pluckenetii, Schl.sp.,Pt.I,p.149,151,Pt.^{II}~~III~~,p.2,25.

Desmopteris elongata, Presl, Pt.I,p.154,164.

Diplotmema furcatum, Brongt.sp., Pt.I,p.154,162.
" sp., Pt.I,p.150,161.

Dictyopteris munsteri, Eich.sp., Pt.I,p.155, Pt.II,p.2.
" obliqua, Bunb., Pt.II,p.2,7.

Dolerophyllum sp., Pt.I,p.150,153,154,156.

Dorycordaites palmaeformis, Gut., Pt.I,p.156,175.

sis

Eupecopteris camertonensis~~is~~, Kidst.MS.Pt.I,p.152,157,
" sp., Pt.I,p.151.

Excipulites callipteridis, Schimp.sp., Pt.I.,p.152,154,176.

Holcospermum mamillatum, Lesqx.^{sp.}, Pt.I.p.153,164. Pt.II,p.26.
" sp., Pt.II,p.2,8.

Lepidodendron aculeatum, Sternb.,Pt.I,p.150,152,153,155. Pt.II,p.3,26.
" wottheni, Lesqx., Pt.I,p.150,152,153,155. Pt.II,p.3,26.
" lanceolatum, Lesqx., Pt.I,p.150,152, 153,155.Pt.II,p.3,26.
" loricatum, Arb.(pars) Pt.I,p.152,170. Pt.II,p.3,26.
" cf jaracewskii, Zeiller, Pt.I,p.152,169.
" rimosum, Sternb., Pt.I,p.152,156,169.
" obovatum, Sternb., Pt.I,p.152,153,155,156,170.Pt.II,p.27.
" distans, Lesqx., Pt.I,p.153,157,170. Pt.II,p.24.
" ophiurus, Brongt., Pt.I,p.155,171, Pt.II,p.27.
" simile, Kidst., Pt.II,p.3, 9,27.
" sp., Pt.II,p.3.Pt.^{III}, p.150,155,156.

Lepidostrobus minor, Goode, Pt.I,p.150,152,154,155,171,Pt.II,p.3,27.
" lanceolatus, L & H .,Pt.I.p.150,152,153,155,157.Pt.II,p.3,
" g 27, 24.
" trianularis, Zeiller,Pt.I,p.150,154,155,171.
" brevifolius, Lesqx.,Pt.I,p.152,153,171.
" majus, Brongt., Pt.I,p.152,172. Pt.II,p.3.
" sp., Pt.I.p.154,157. Pt.II.p.3.
" morissianum, Lesqx.,Pt.I.p.155,172. Pt.II,p.27.
" incertus, Lesqx., Pt.I.p.155,172. Pt.II,p.27.
" radians, Schimp., Pt.II.p.3, 9.

Lepidophyllum sp., Pt.I,p.150,155,157.

Lycopod megaspores Pt.I.p.150,155,156,173.

Lepidophloios laricinus, Sternb.,Pt.I.p.150,152,157,173. Pt.II,p.3,24.

Mariopteris muricata, Schl.sp., Pt.I.p.149,151,153,154,156.Pt.II.p.2,25.
" " forma nervosa, Brongt.,Pt.I.p.153,154.Pt.II.p.2.
" sp., Pt.II.p.2.

Megaphyton sp., Pt.I.p.151.

Macrostachya ? infundibuliformis, Brongt., Pt.I.p.152,173.

Megalospermum inflatum, Lesqx.sp., Pt.I.p.155.Pt.II.p.26.

Neuropteris flexuosa, Sternb., Pt.I.p.149,151,153.Pt.II,p.2,26.
" scheuchzeri, Hoffm.,Pt.I.p.149,151,153,155.Pt.II.p.2,26.
" rarinervis, Bunb., Pt.I.p.149,151,153,155. Pt.II.p.2.
" ovata, Hoffm., Pt.I.p.149,151,153.Pt.II,p.2,26.

| | |
|--|---|
| <u>Neuropteris macrophylla</u> , Brongt., | Pt.I p.149,151,153,155.Pt.II. p.2,26. |
| " <u>fimbriata</u> , Lesqx., | Pt.I p.149,151,153 ³ ,Pt.II,p.2. |
| " <u>schlehani</u> , Stur, | Pt.I p.153,162. |
| " <u>spiropteris</u> | Pt.I p.153. |
| " cf <u>raymondi</u> , Zeill., | Pt.I p.155,163. |
| " <u>pseudogigantea</u> , Pot., | Pt.I p.155,156,163. Pt.II p.2,26. |
| " <u>heterophylla</u> , Brongt., | Pt.I p.155,156.Pt.II p.2,26. |
| " <u>sp.</u> , | Pt.I p.155,156.Pt.II p.2,6. |
| " <u>obliqua</u> , Brongt., | Pt.II p.2,6. |
| <u>Odontopteris lindleyana</u> , Sternb., | Pt.I p.149,153 Pt.II p.2,25. |
| " <u>alpina</u> ,(Sternb) Gein. | Pt.I p.153,164.Pt.II,p.25. |
| " <u>sp.</u> , | Pt.I,p.153. |
| " <u>conwayi</u> , L & H sp , | Pt.I p.157,163.Pt.II p.23,25. |
| <u>?Oligocarpia brongniarti</u> , Stur, | Pt.II p.1,5. |
| <u>Palaeostachya pedunculata</u> ,Will., | Pt.II,p.3,10. |
| <u>Pecopteris polymorpha</u> , Brongt., | Pt.I p.149,151,152.Pt.II,p.2. |
| " <u>arborescens</u> , Schl.sp., | Pt.I p.149,151,152.Pt.II p.2,25. |
| " <u>miltoni</u> , Art.sp., | Pt.I p.149,151,152.Pt.II,p.2,25. |
| " " <u>forma abbreviata</u> , | Brongt.pro sp.Pt.I,p.149. |
| " <u>unata</u> , Brongt., | Pt.I p.149,151,152.Pt.II p.2,25. |
| " <u>eyathea</u> , Schl.sp., | Pt.I p.149,157.Pt.II p.2. |
| " <u>crenulata</u> , Brongt., | Pt.I p.149,152,158.Pt.II p.2. |
| " <u>sp.</u> , | Pt.I p.149. |
| " <u>oreopteridia</u> , Schl.sp., | Pt.I p.151,152.Pt.II p.25. |
| " <u>bucklandii</u> , Brongt., | Pt.I p.151,152,158.Pt.II,p.2. |
| " <u>candolliana</u> , Brongt., | Pt.I p.152,158. |
| " <u>volkmanni</u> , Sauv., | Pt.I p.154,158.Pt.II p.25. |
| <u>Poacordaites microstachys</u> , Gold.sp., | Pt.I p.154,175.Pt.II p.28. |
| <u>Pinnularia capillacea</u> , L & H ., | Pt.I p.150,152,154,155,156,173, |
| " <u>columnaris</u> , Art.sp., | Pt.II p.28. ³ Pt.I p.150,155. |
| <u>Radiospermum ?grande</u> , Arber, | Pt.II p.2. |
| " <u>sp.</u> , | Pt.II p.2. |
| " <u>perpusillum</u> , Lesqx.sp., | Pt.II p.2. |
| " <u>elongatum</u> , Arber. | Pt.II p.26. |
| <u>Rhabdocarpus lillianus</u> , Arber, | Pt.II p.26. |
| <u>Radstockia sp.</u> , | Pt.I p.150,151. |
| " <u>sphenopteroides</u> , Kidst.sp., | Pt.II p.2,5. |
| <u>Renaultia chaerophylloides</u> , Brongt.sp., | Pt.I p.151,153,160. |
| " <u>sp.</u> , | Pt.II p.1,5. |
| <u>Rhacophyllum spinosum</u> , Lesqx., | Pt.II p.2. |
| " <u>goldenbergii</u> , Weiss, | Pt.II p.2. |
| " <u>filiciforme</u> , Gut.sp., | Pt.I p.150. |
| <u>Rhodea sp.</u> , | Pt.I p.154,Pt.II p.1,4. |
| <u>Samaropsis sp.</u> , | Pt.I p.153,155,Pt.II p.2,7. |
| <u>Schizospermum noeggerathi</u> , Sternb.sp., | Pt.I p.150,Pt.II p.26. |
| <u>Sigillaria tessellata</u> , Stein.sp., | Pt.I p.150,151,153,155,167.Pt.II p. |
| " <u>M'Murtriei</u> , Kidst., | Pt.I p.150. |
| " <u>nortomensis</u> , n.sp., | Pt.I p.150,166. |
| " <u>ovata</u> , Sauv., | Pt.I p.150,153,155,168.Pt.II p.2. |
| " <u>Kkumulata</u> , Weiss,var. <u>nodosa</u> L & H ., | Pt.I p.150,153,Pt.II p.2,27. |
| " <u>major</u> , L & H ., | Pt.I p.151,155. |

Sigillaria deutschiana, Brongt., Pt.I.p.151,165.
 " rugosa, Brongt., Pt.I.p.151,155,165.Pt.II,p.2.
 " mamillaris, Brongt., Pt.I.p.151,155.
 " elongata, Brongt., Pt.I.p.151,155.
 " cf germanica, Weiss, Pt.I.p.153,168.
 " mauricii, Grand 'Eury, Pt.I.p.153,168.
 " transversalis, Bgt. var. sparsifolia, Boul., Pt.I.p.153,166
 " kidstoni, n.sp., Pt.I.p.153,165.
 " scutellata, Brongt., Pt.I.p.155.
 " cordigera, Zeiller, Pt.I.p.155,167.
 " saulii, Brongt., Pt.I.p.155,169.
 " sp., Pt.I.p.148..150,156.

Sigillariostrobus sp., Pt.I.p.150.

Sigillariophyllum bicarinatum, L & H sp.,Pt.I.p.150,152,153,155,157.Pt.II, p.3,24.

Spiropteris sp., Pt.I.p.153,155,156.Pt.II.p.2.

Sphenophyllum emarginatum, Brongt., Pt.I.p.151,152,154,156.Pt.II.p.3,28
 " sp., Pt.I.p.151,152,154,157.
 " longifolium, Germar, Pt.I.p.151,152,154,174.Pt.II.p.28.
 " cuneifolium, Sternb., Pt.I.p.156,174.Pt.II.p.3,28.
 " " forma saxifragaeifolium, Stb.sp.,Pt.I.p.154,156.
 " myriophyllum, Crépin, Pt.I.p.156,174,Pt.II.p.28.
 " trichomatosum, Stur, Pt.I.p.156,157,174.Pt.II.p.23,27.
 " fasciculatum, Lesqx., Pt.II.p.3,10.
 " majus, Bronn, Pt.II.p.3,11,28.
 " ? oblongifolium, Germar, Pt.II.p.3,11.

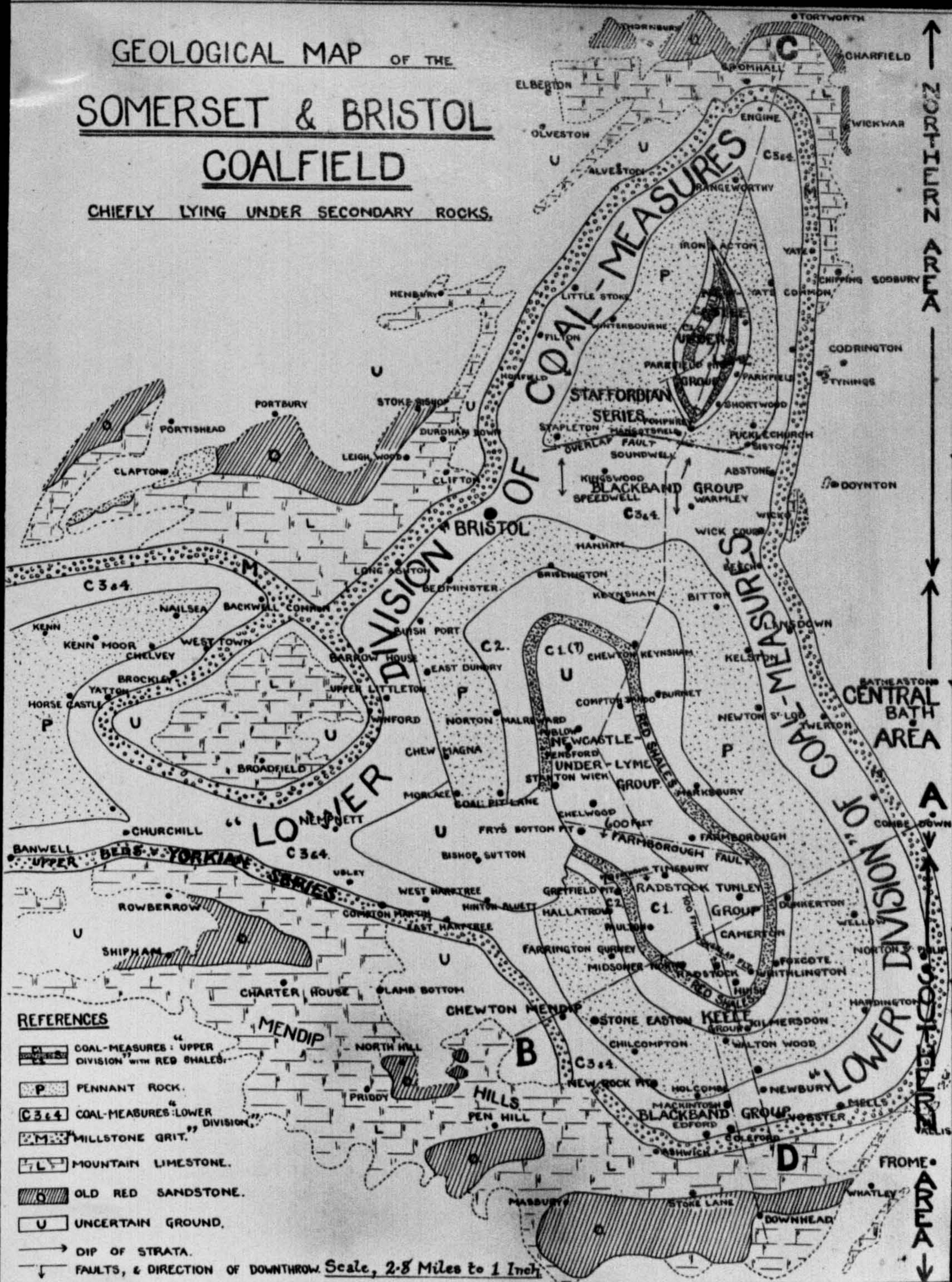
Stachannularia tuberculata, Sternb.sp.,Pt.I.p.154.

Trigonocarpus parkinsoni, Brongt., Pt.I.p.153,164. Pt.II.p.2.
 " sp., Pt.I.p.155.

? Whittleseya sp., Pt.II.p.2.

PLATE I

GEOLOGICAL MAP OF THE SOMERSET & BRISTOL COALFIELD CHIEFLY LYING UNDER SECONDARY ROCKS.



REFERENCES

- COAL-MEASURES: UPPER DIVISION WITH RED SHALES.
- PENNANT ROCK.
- COAL-MEASURES: LOWER DIVISION.
- MILLSTONE GRIT.
- MOUNTAIN LIMESTONE.
- OLD RED SANDSTONE.
- UNCERTAIN GROUND.

→ DIP OF STRATA.
 ↓ FAULTS, & DIRECTION OF DOWNTHROW. Scale, 2.5 Miles to 1 Inch.

FROM
 (MAP PREPARED AND PUBLISHED BY J.M. MURTRIE, ESQ. F.G.S.
 TRANSACTIONS OF THE INSTITUTE OF MINING ENGINEERS, 1901.)

(ADAPTED)

PLATE III

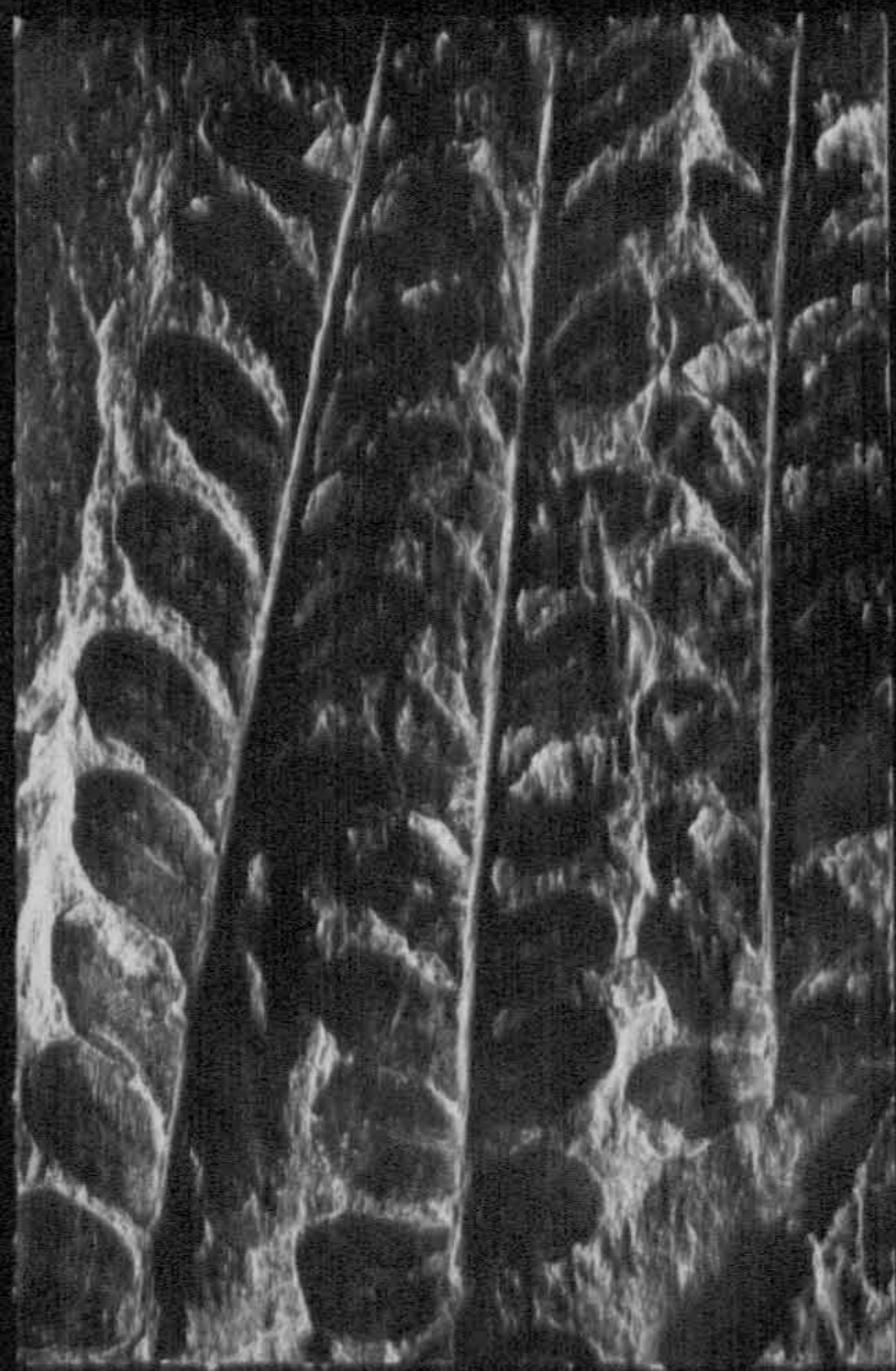


FIG. 1. ALETHOP. GRANDINI, BGT. SP.



FIG. 2. ALETHOP. SERLI, BGT. SP.

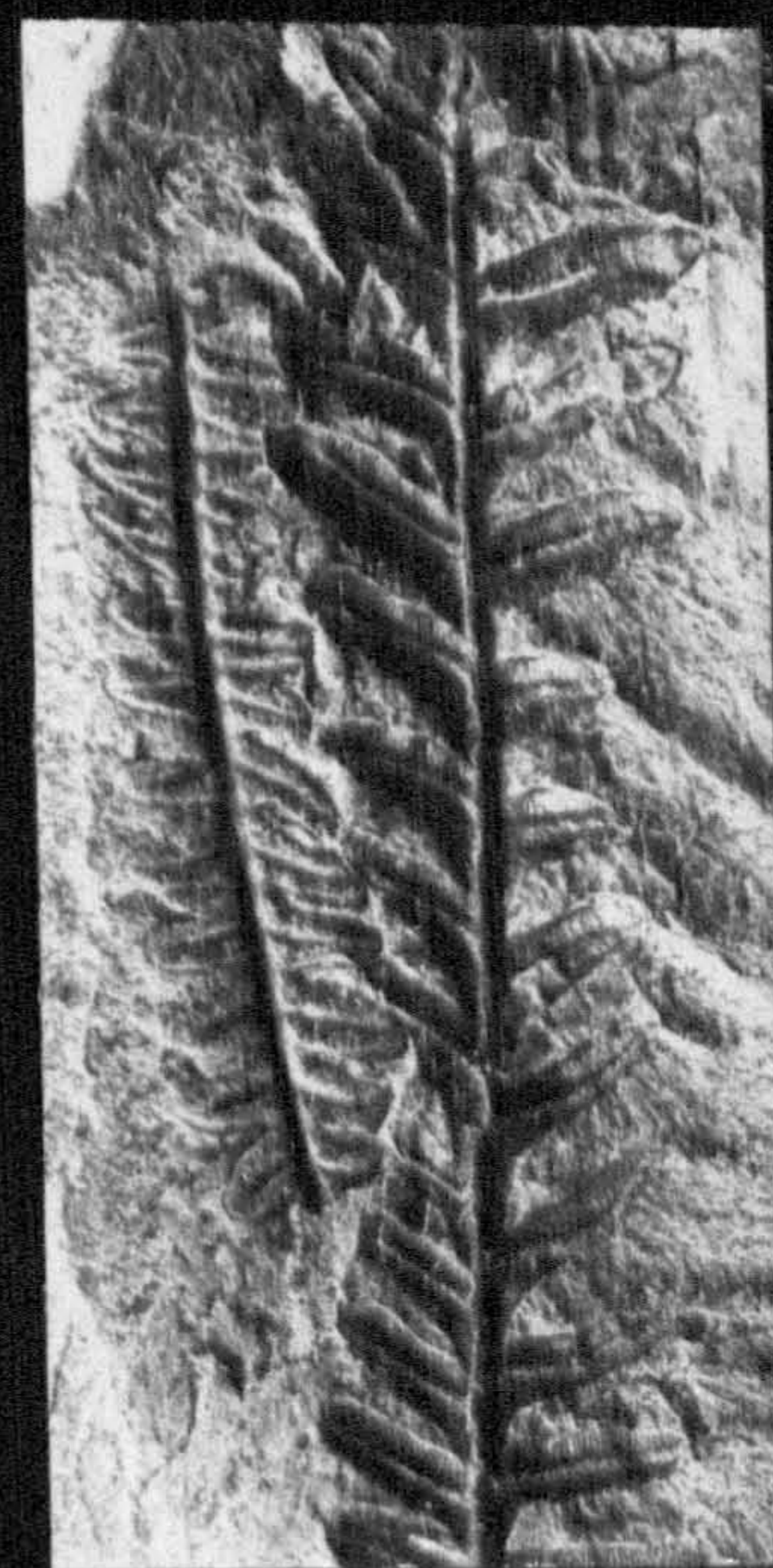


FIG. 3. ALETHOP. AQUILINA, SCHL. SP.



FIG. 4. ALETHOP. PONTICA, ZEILL.

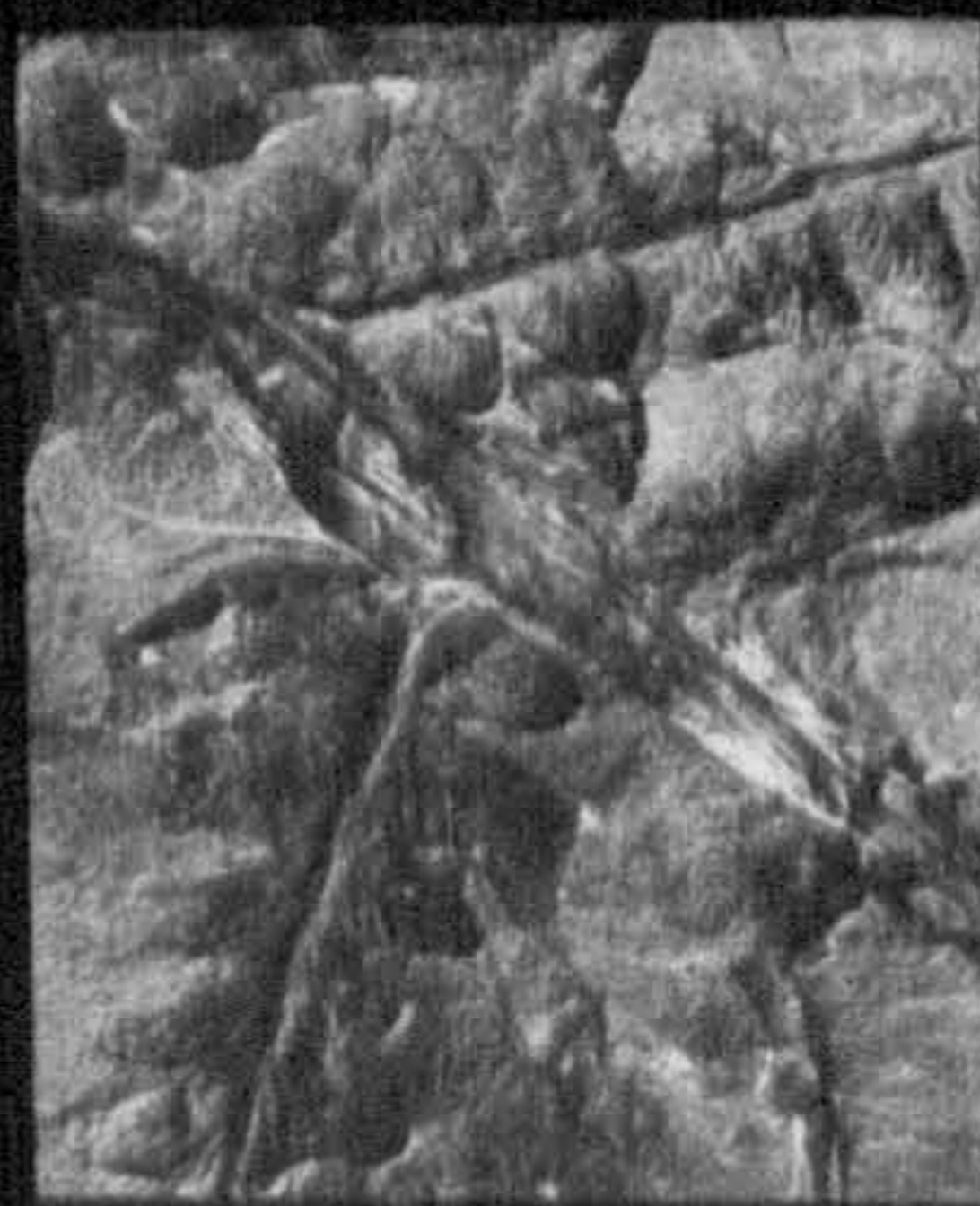


FIG. 5. A. VALIDA, BOUL.

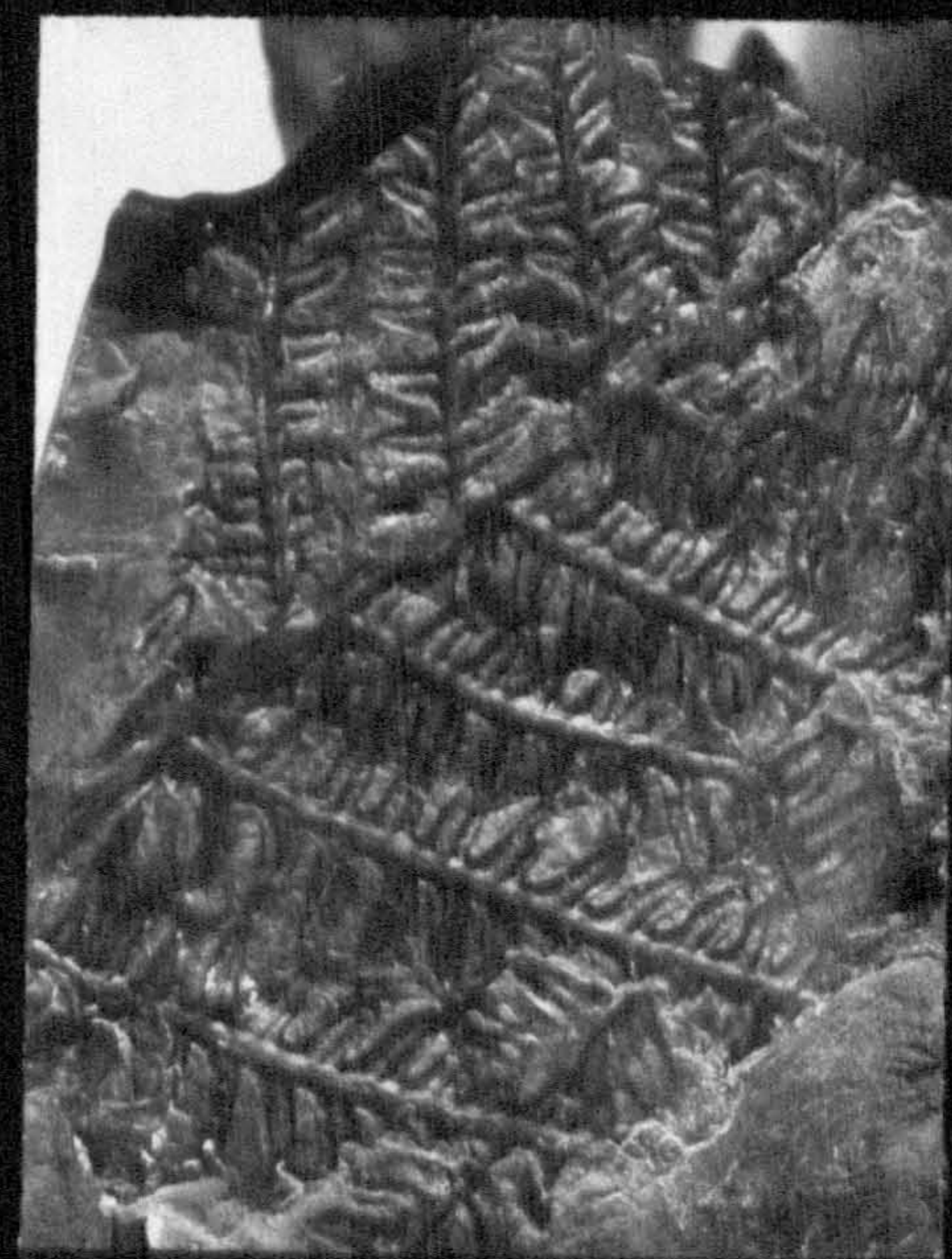


FIG. 6. ALETHOP. DAVREUXI, BGT. SP.

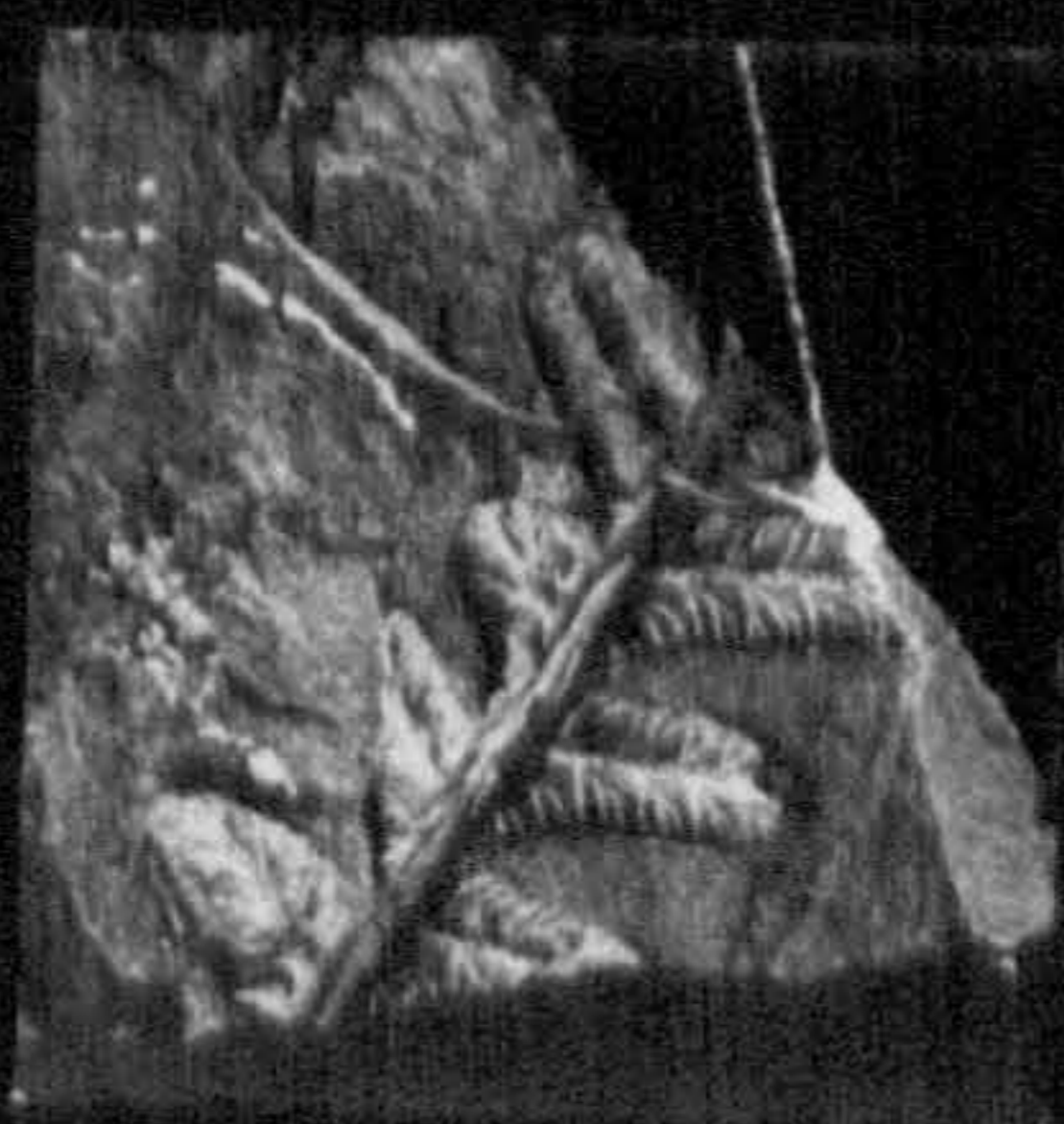


FIG. 7A & B. ALETHOP. AQUILINA, SCHL. SP.



FIG. 8. A. DAVREUXI, BGT. SP.



FIG. 9. A. DECURRENS, ART. SP.



FIG. 10. A. ? COSTEI, ZEILL.

PLATE IV

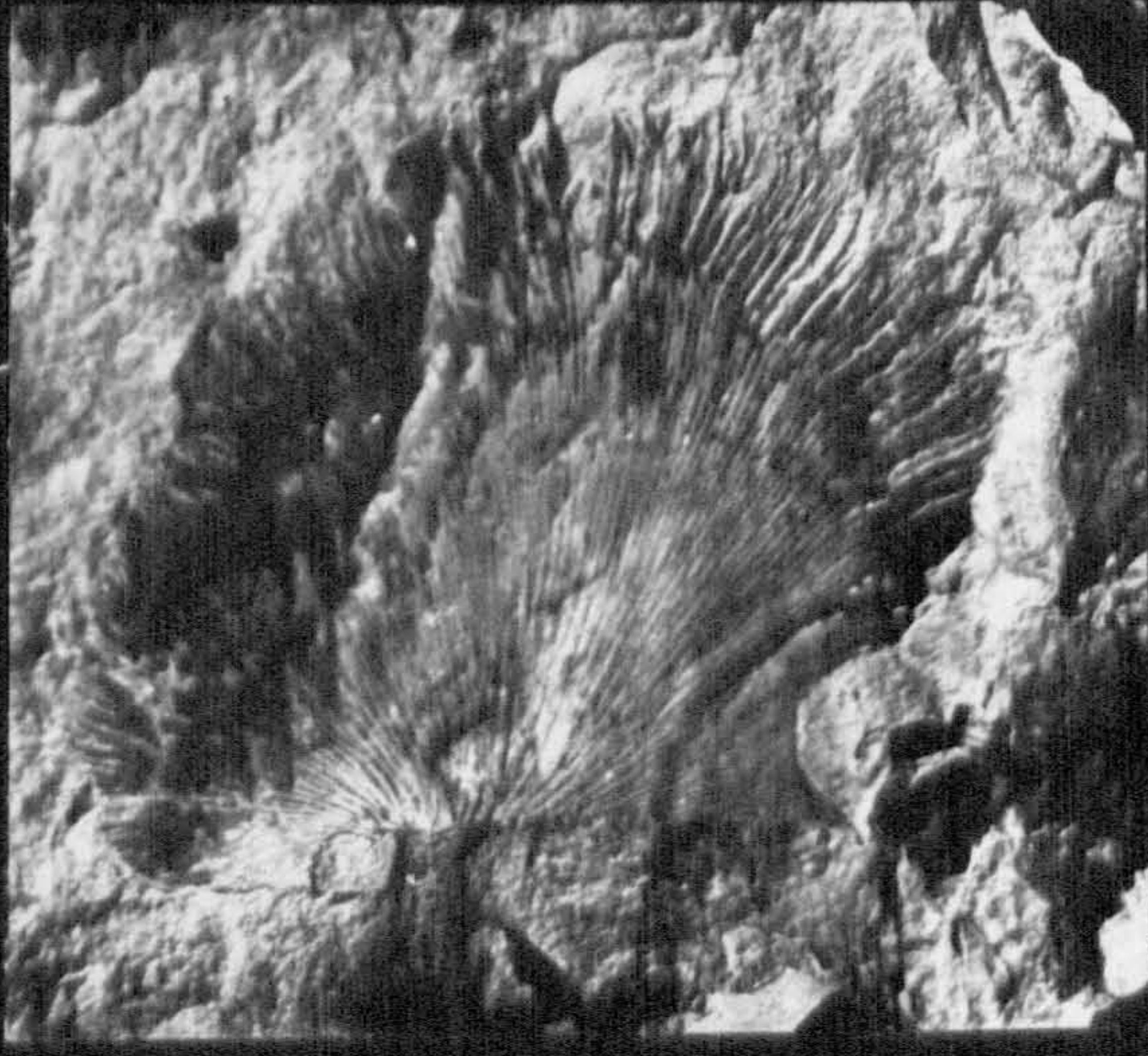


FIG. 1. NEUROPT. FIMBRIATA, LESQX.

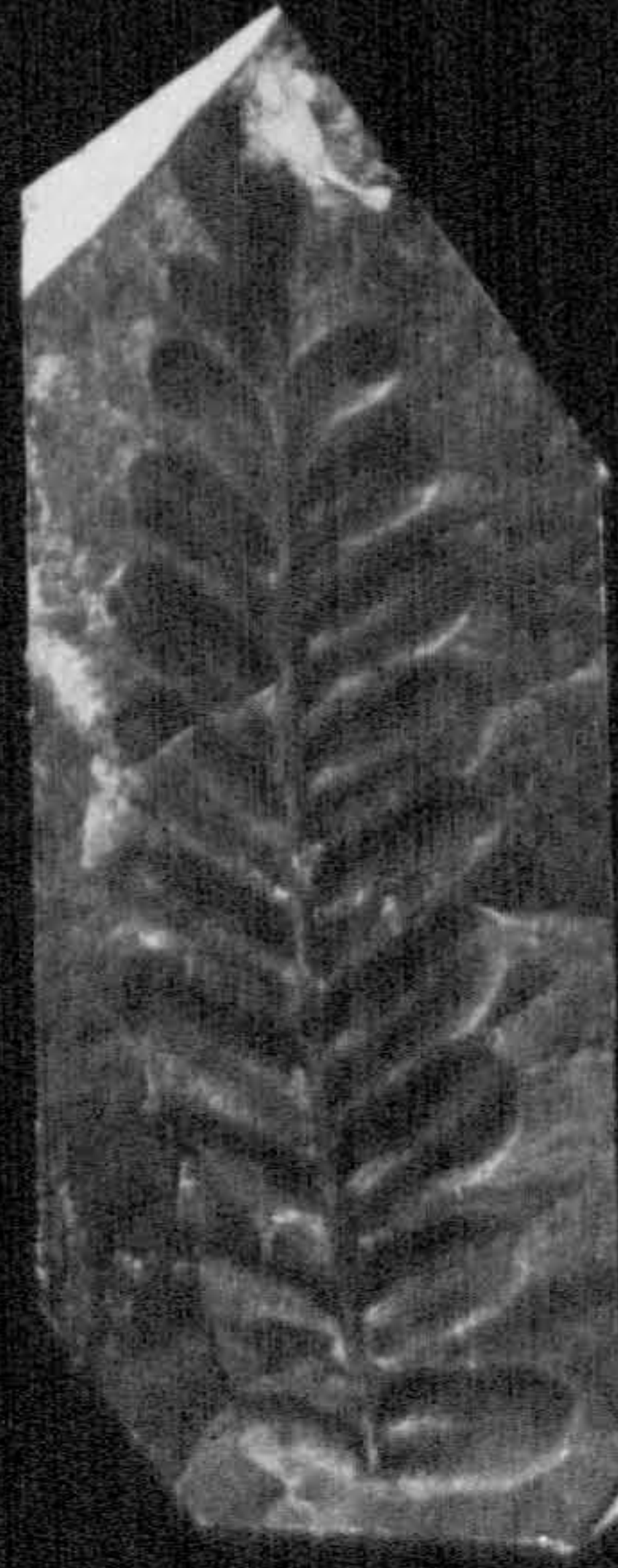


FIG. 2. N. OVATA, HOFF.



FIG. 3. N. OBLIQUA, BGT. SP.



FIG. 4. N. FLEXUOSA, STB.

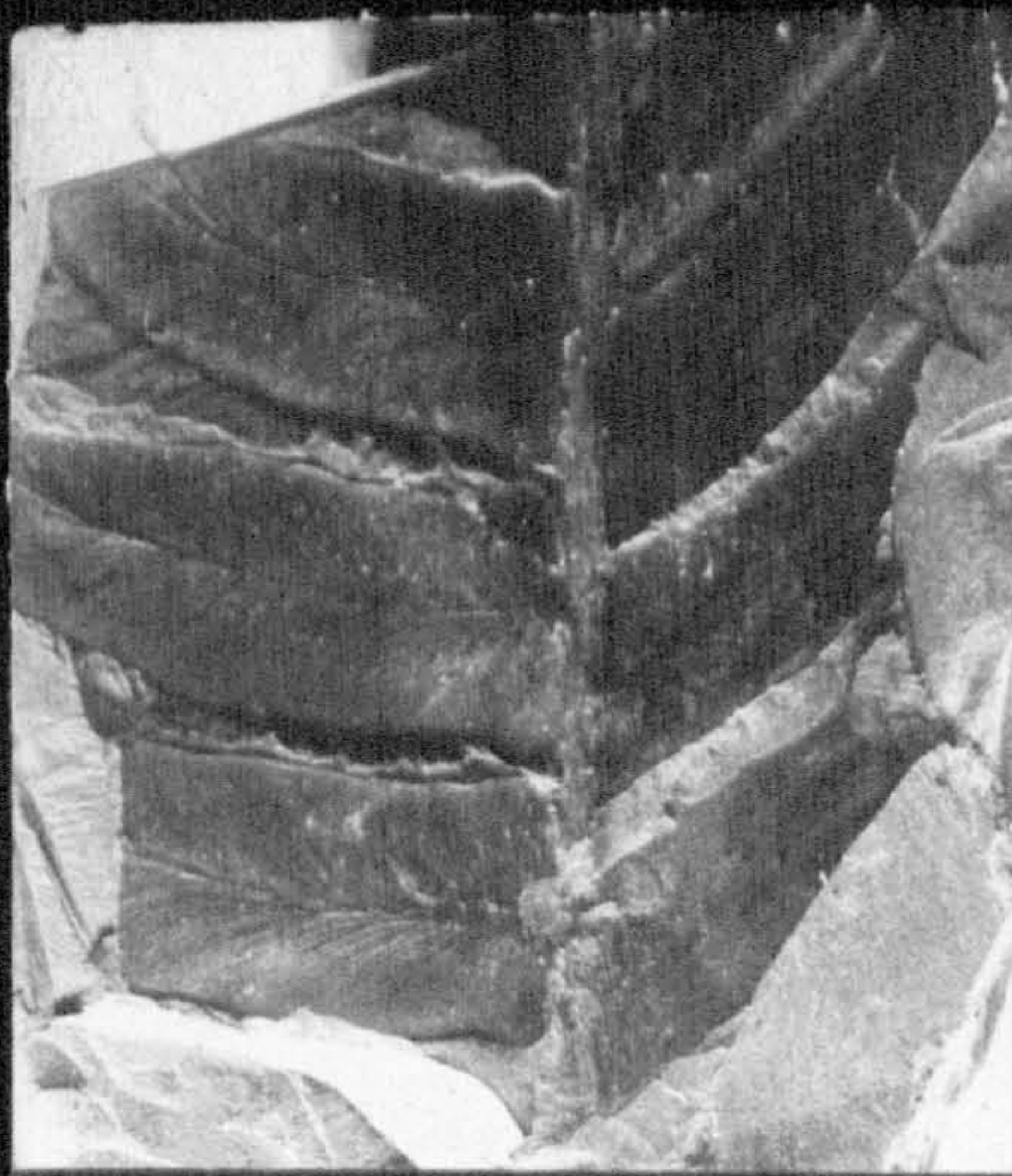


FIG. 5. N. FLEXUOSA, STB.

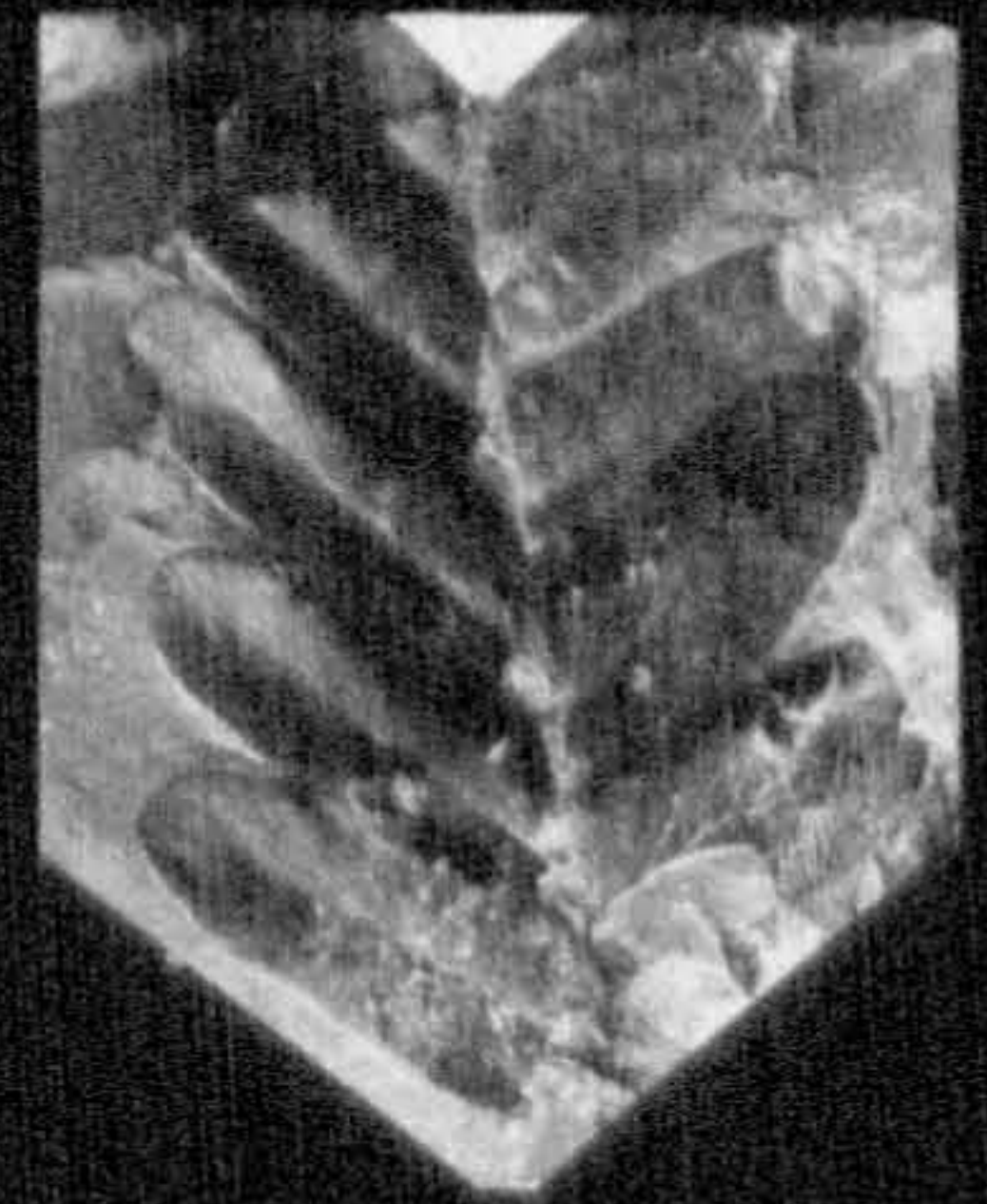


FIG. 6. N. ? RAYMONDI, ZEILL.

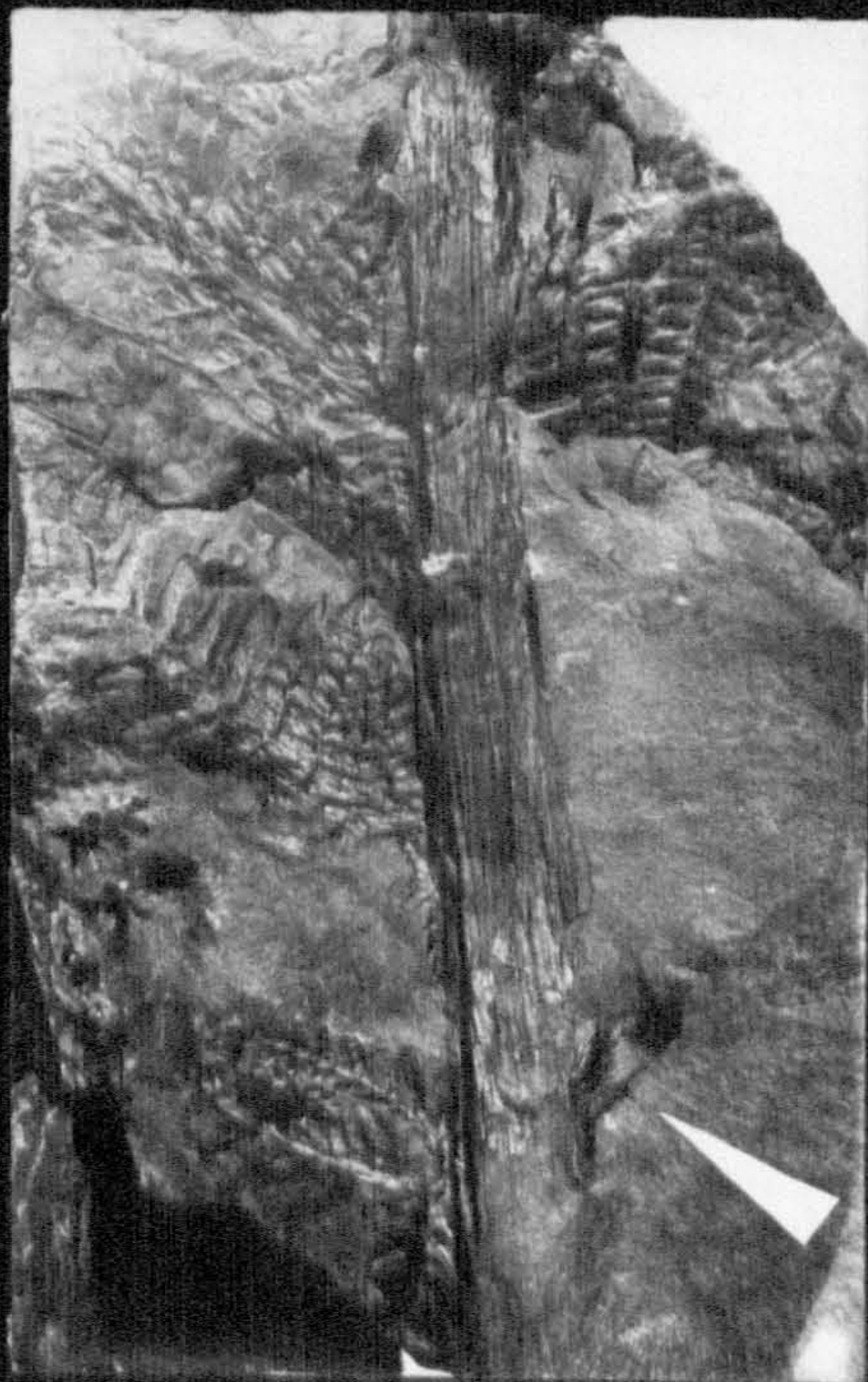


FIG. 7. N. RARINERVIS, BUMB.



FIG. 8. N. SCHEUCHZERI, HOFF.

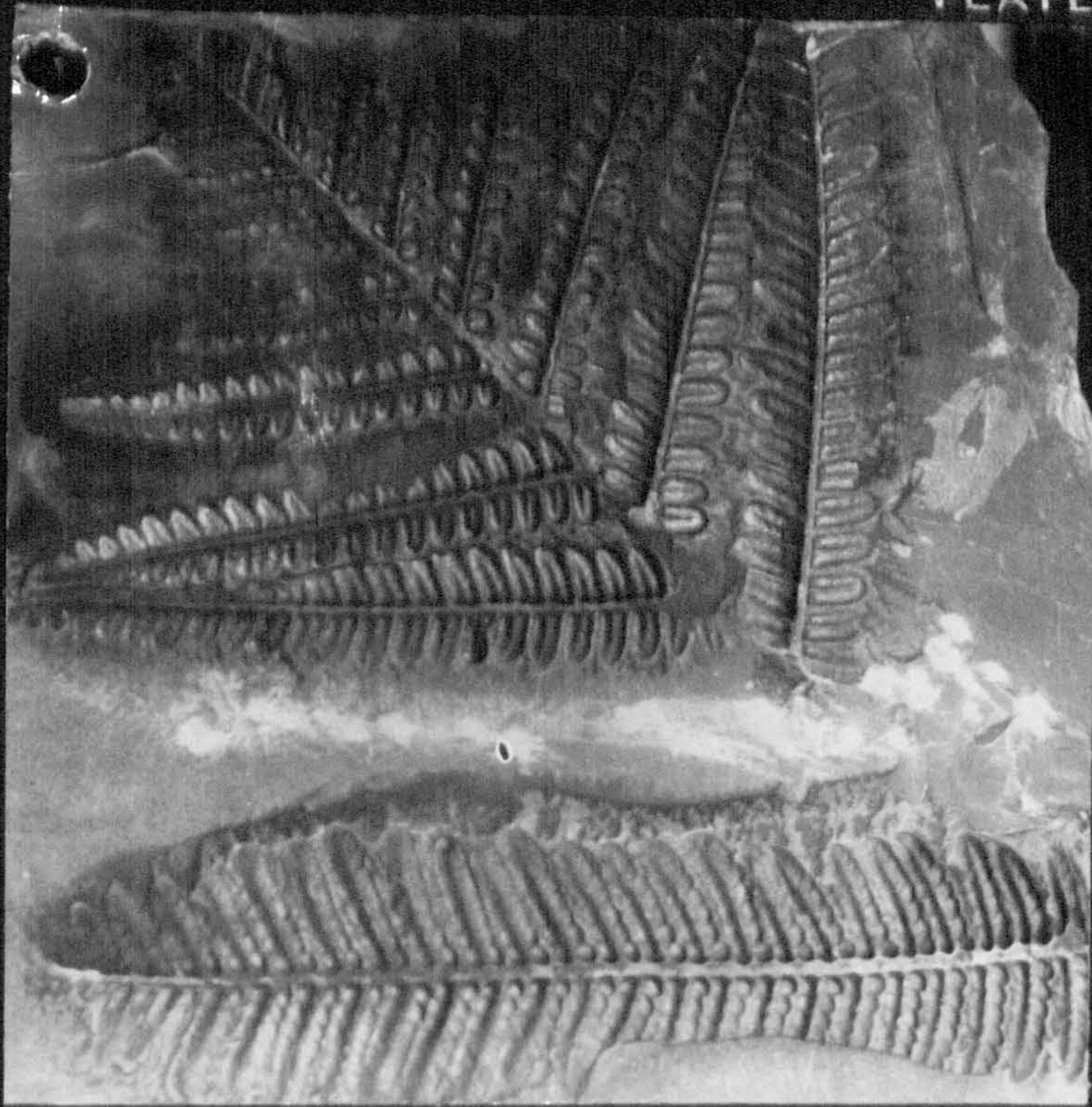


FIG. 1. PECOP. POLYMORPHA, BGT.



FIG. 2. PECOP. MILTONI, ART. SP.



FIG. 3. DICKSONIITES PLUCKENETTII, SCH.

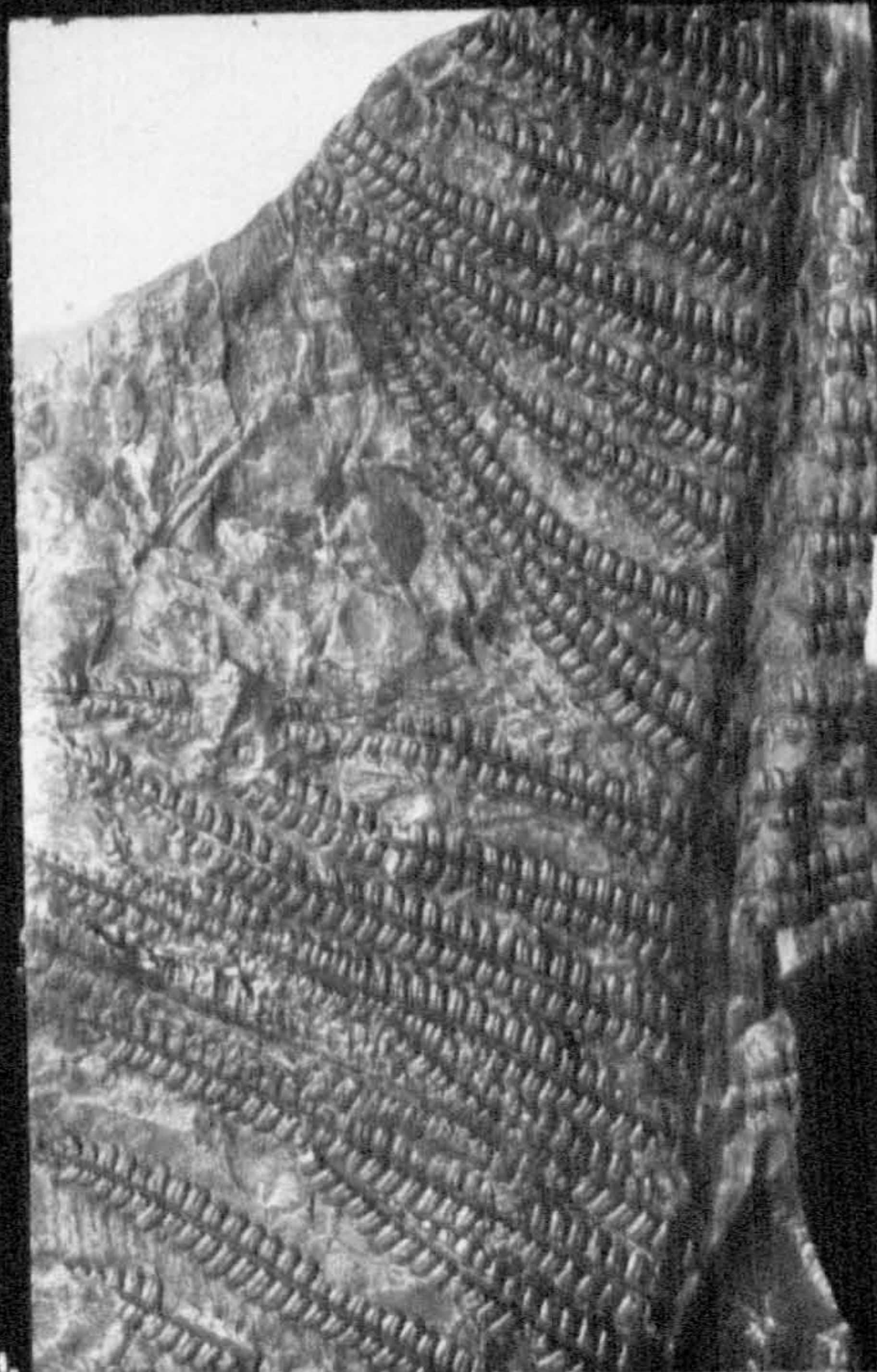


FIG. 4. PECOP. ARBORESCENS, SCH. SP.

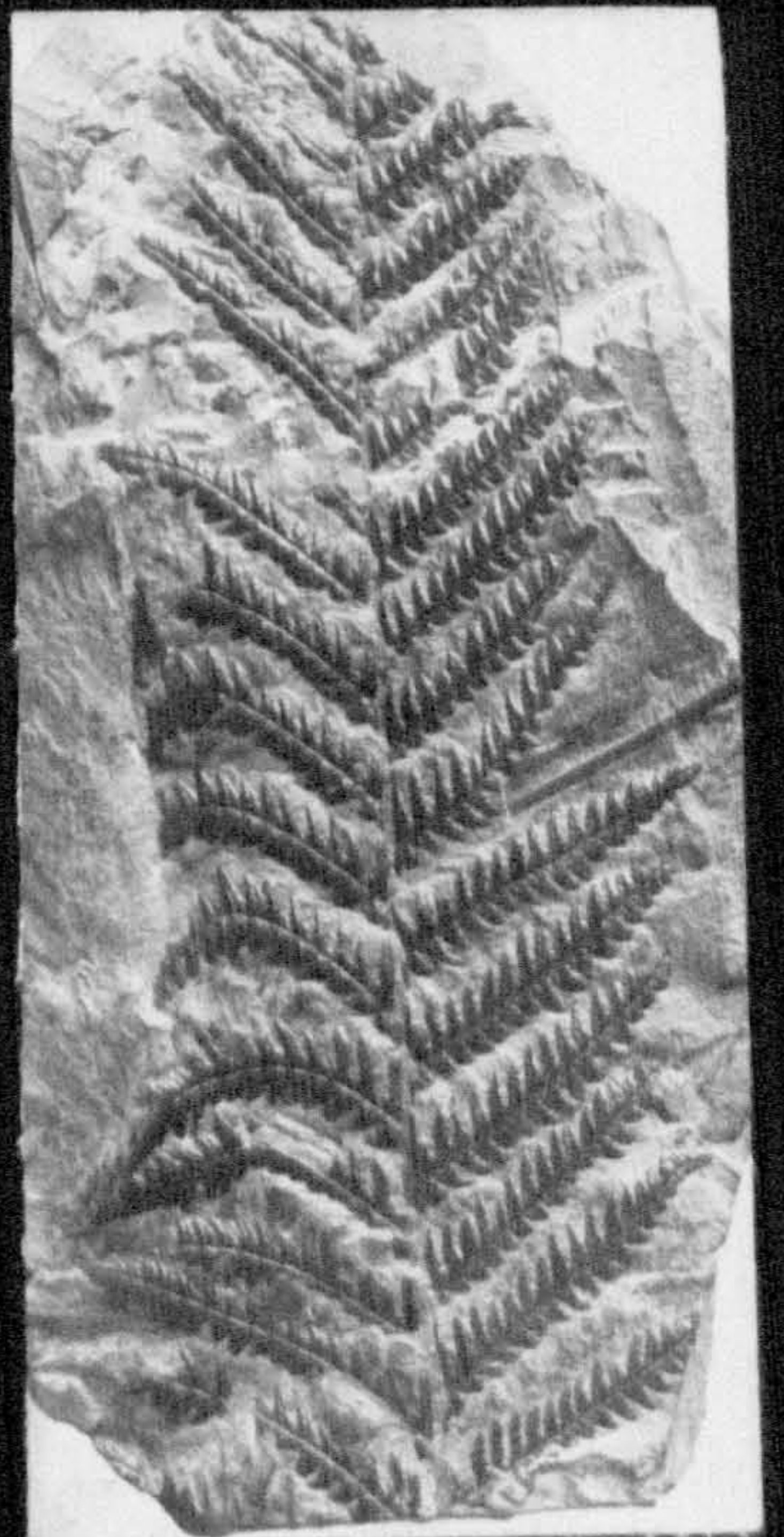


FIG. 5. DACTYL. PLUMOSA, ART. SP.

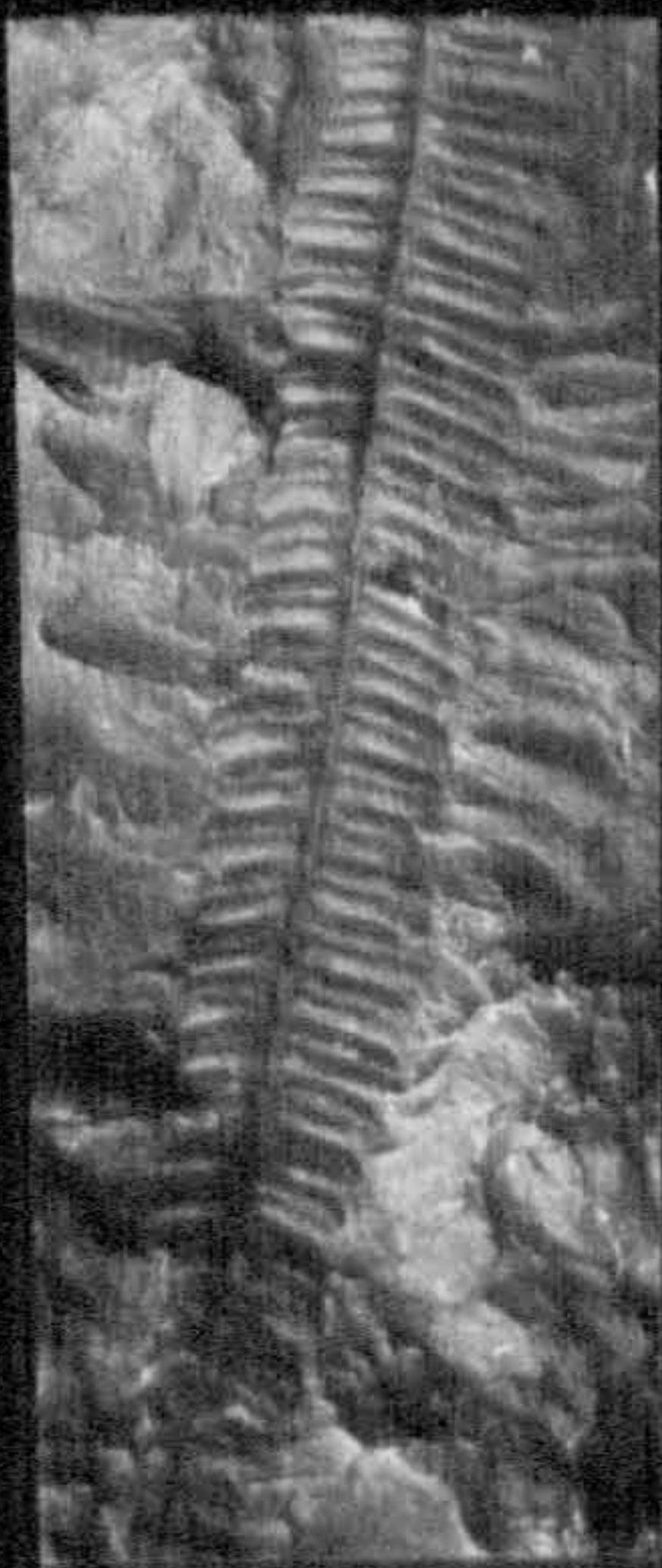


FIG. 6. PECOP. CYATHEA, SCH. SP.



FIG. 7. DICKSONIITES PLUCKENETTII, SCH. SP.

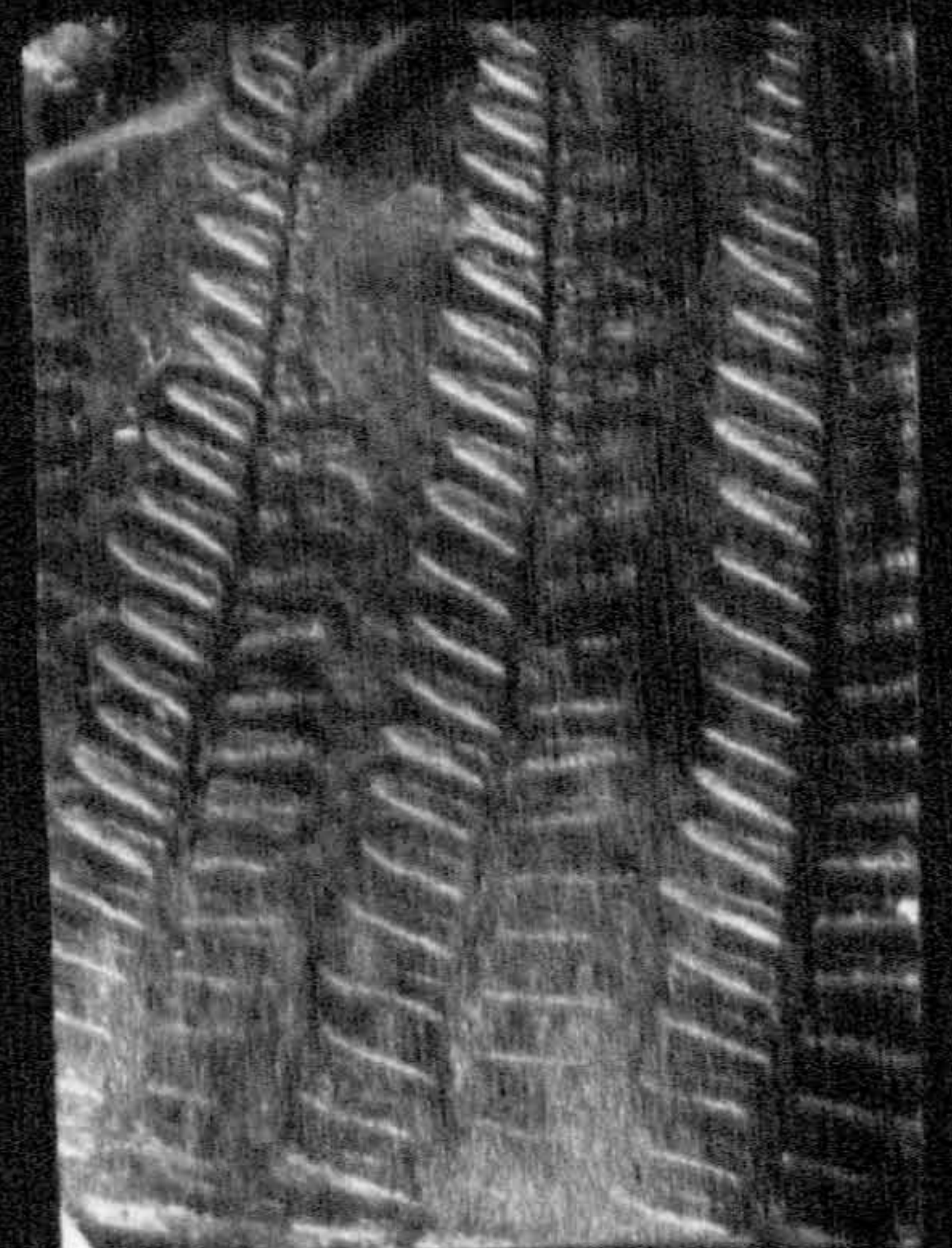


FIG. 8. EUPECOPTERIS SP.

PLATE VI

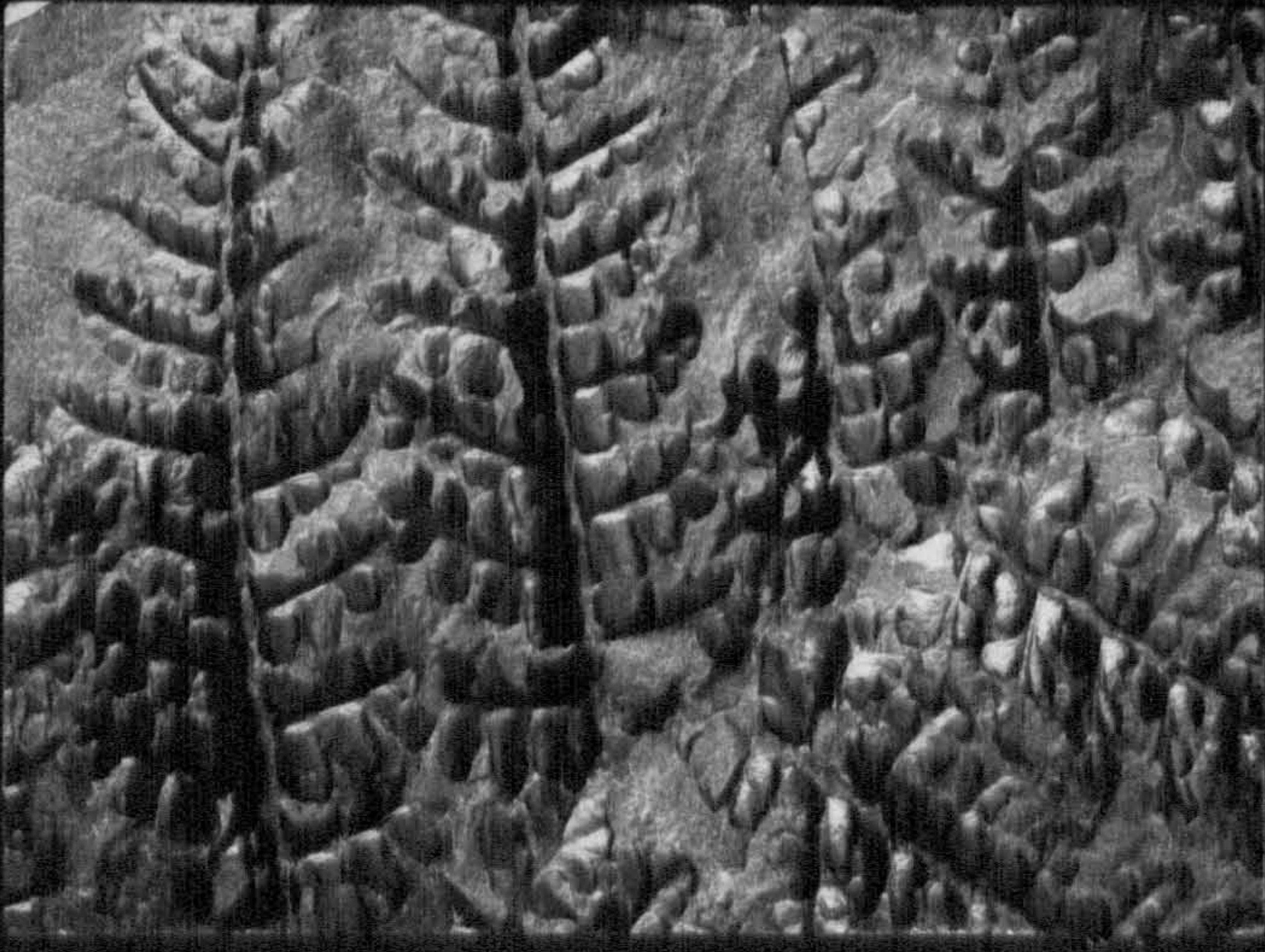
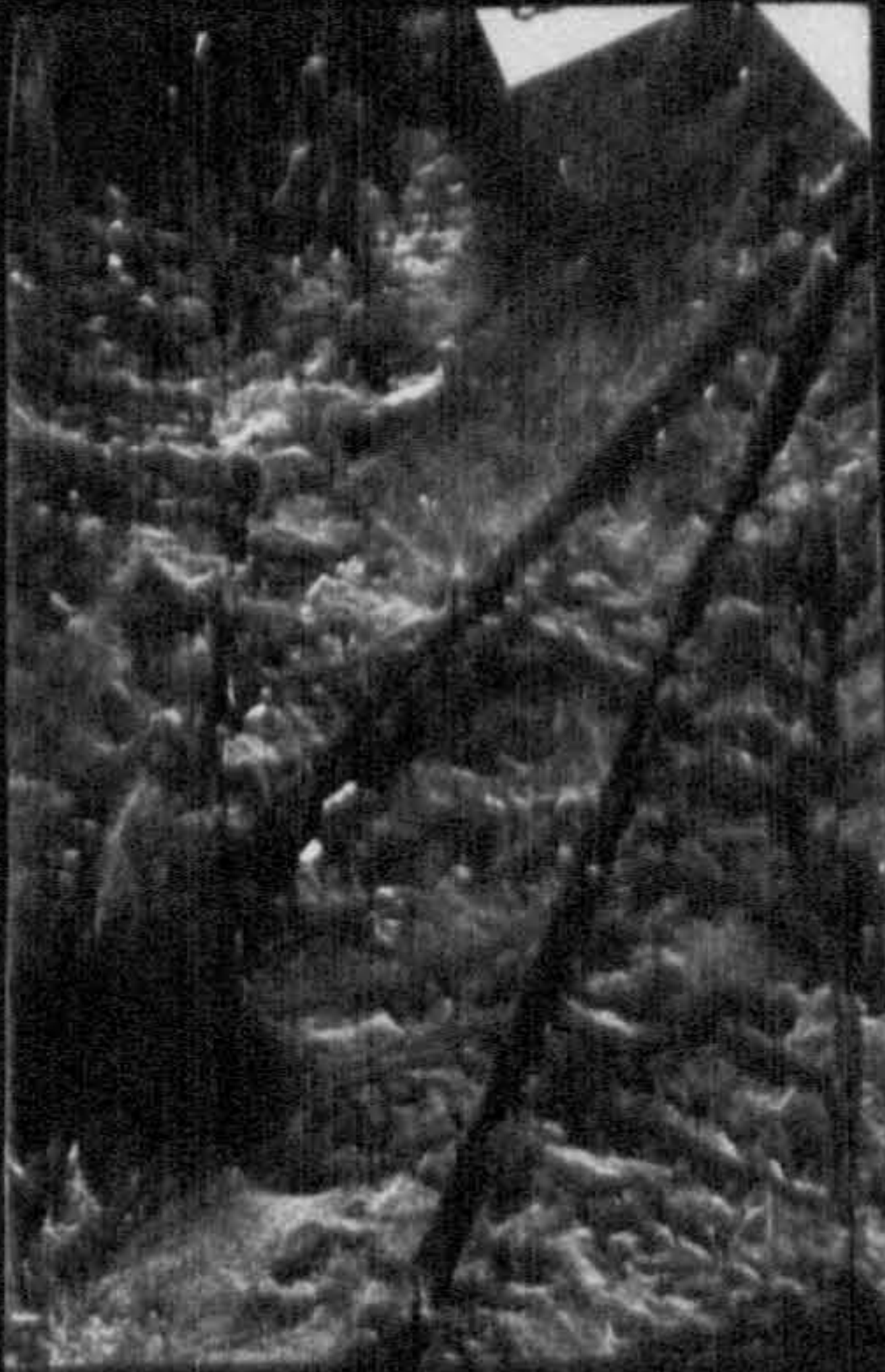


FIG. 1. SPHENOPTERIS NEUROPTEROIDES, BOUL. SP.



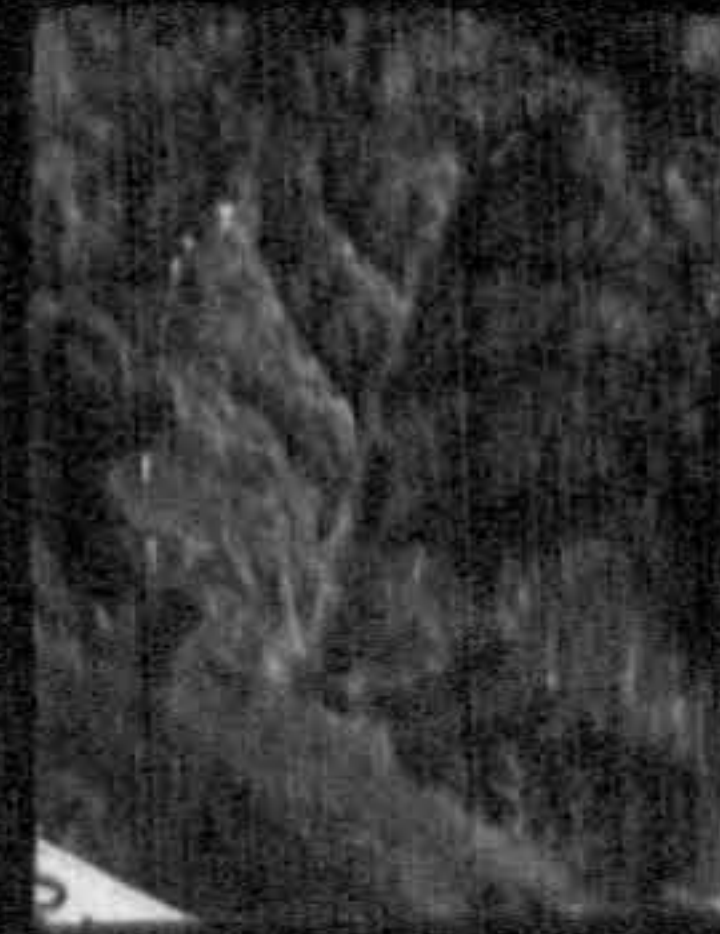
FIG. 2. SPHENOPTERIS SP.



F. 3. R. SPHENOPTEROIDES, HIRST. SP.



F. 4. S. DILATATA, L. & H.



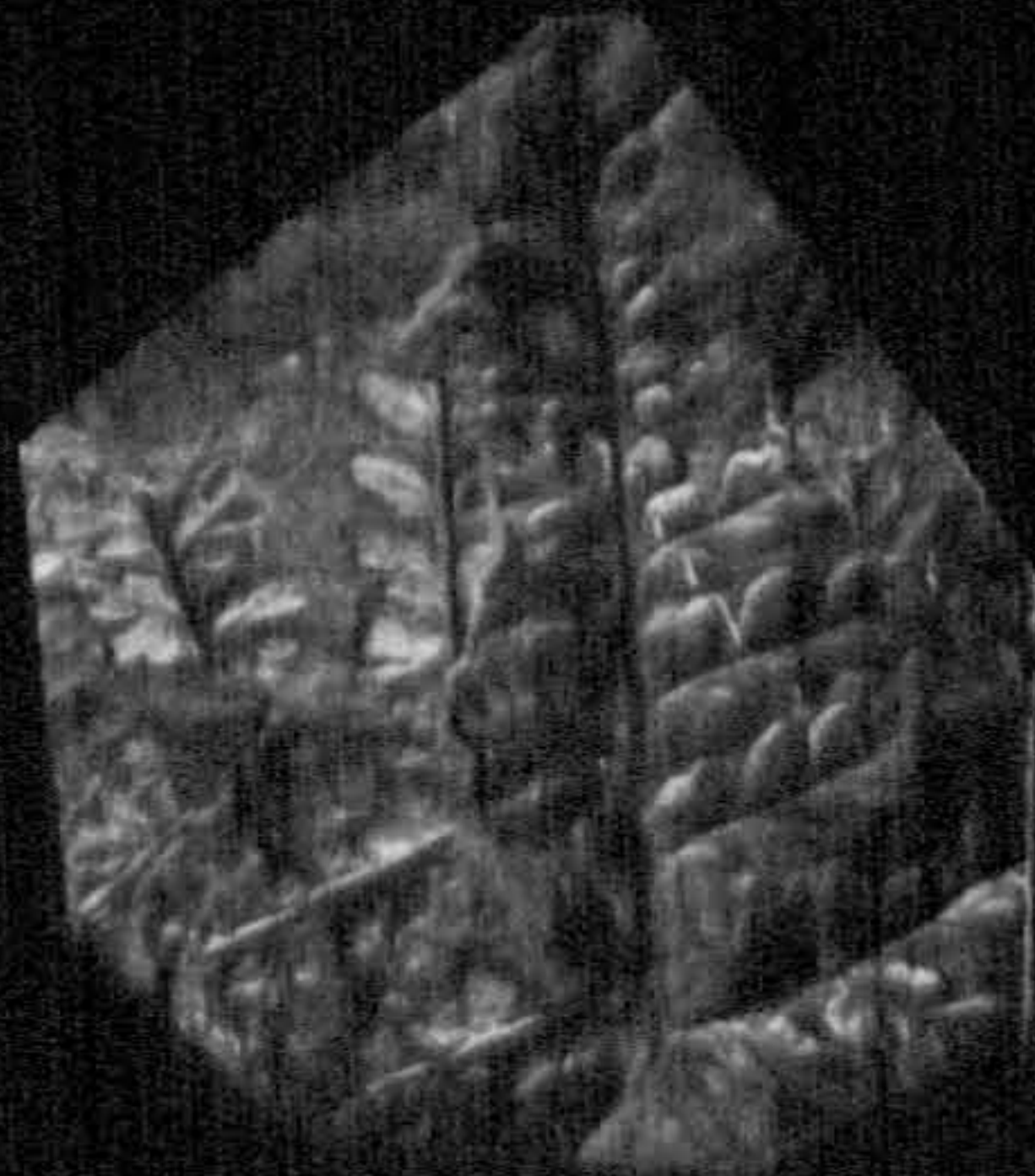
F. 5. RHODEA SP.



FIG. 6. SPHENOPTERIS SP.



FIG. 7. NEUROPTERIS SP.



F. 8. S. ? SAUVEURI, CREP.

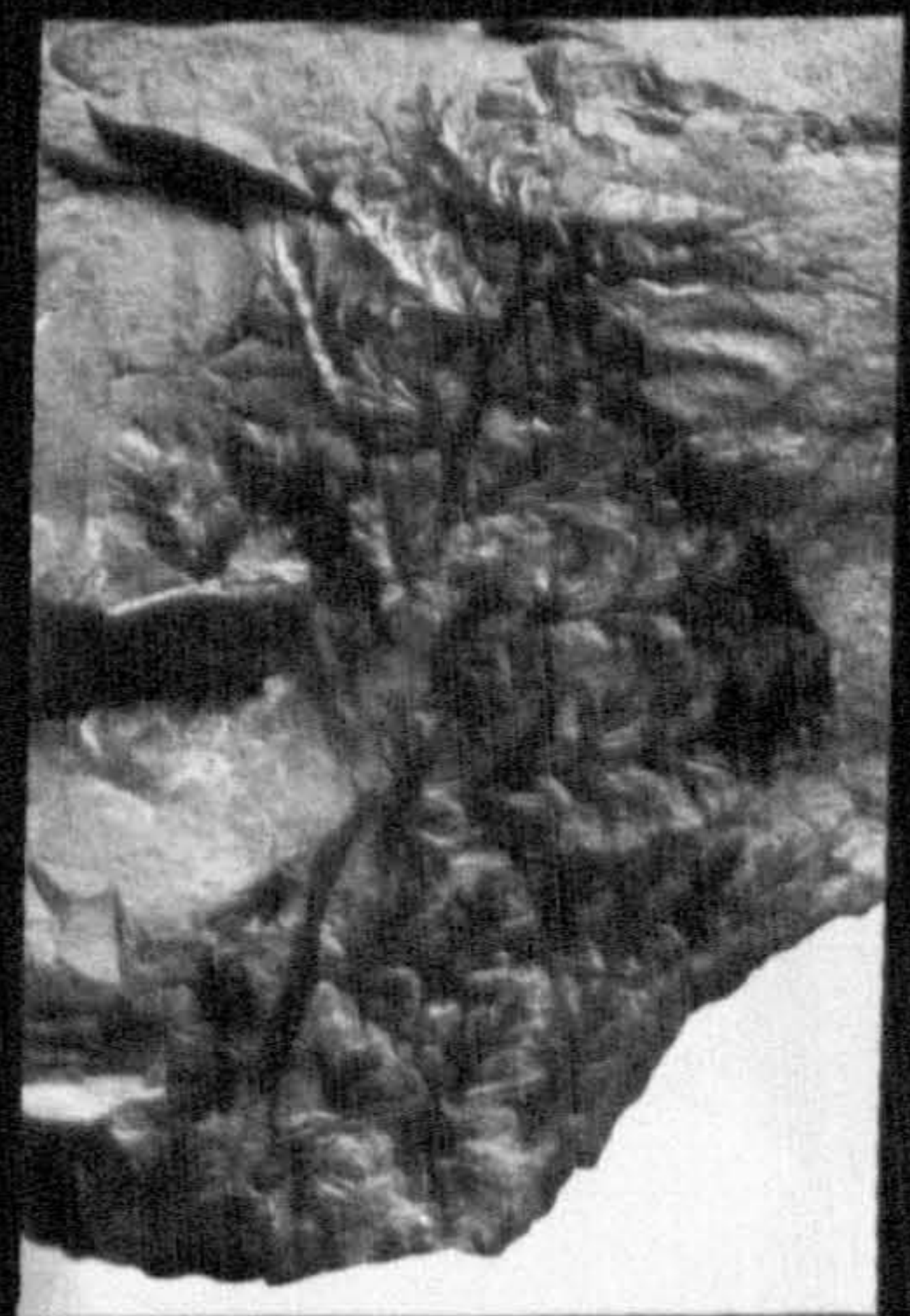


FIG. 9. SPHEN. ALATA, BGT.

PLATE VII



FIG. 1. MARIOPTERIS MURICATA, SCHL. SP.

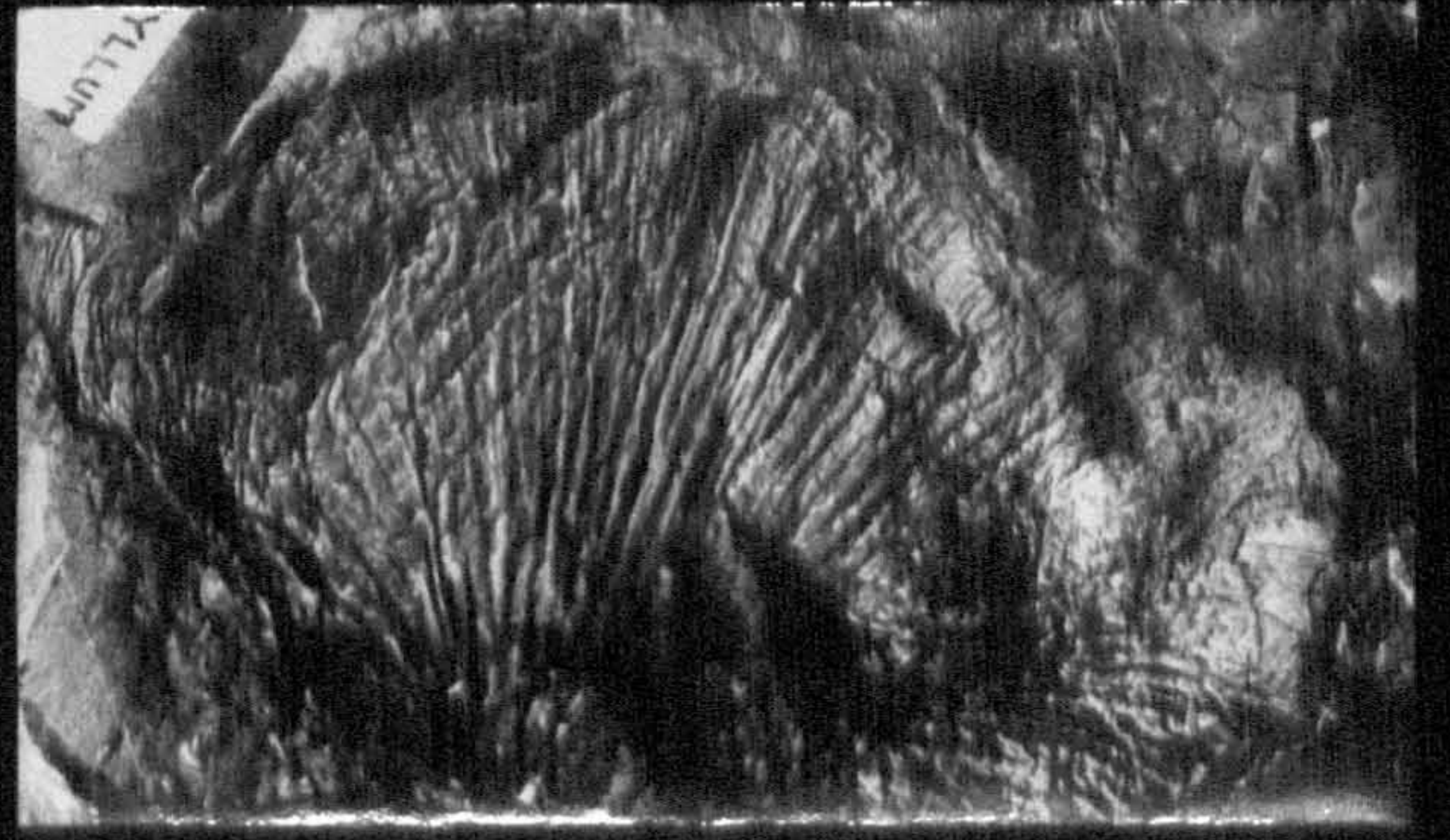


FIG. 2. DOLEROPHYLLUM SP.



F. 3. DICTYOP. MÜNSTERI, EICH. SP.

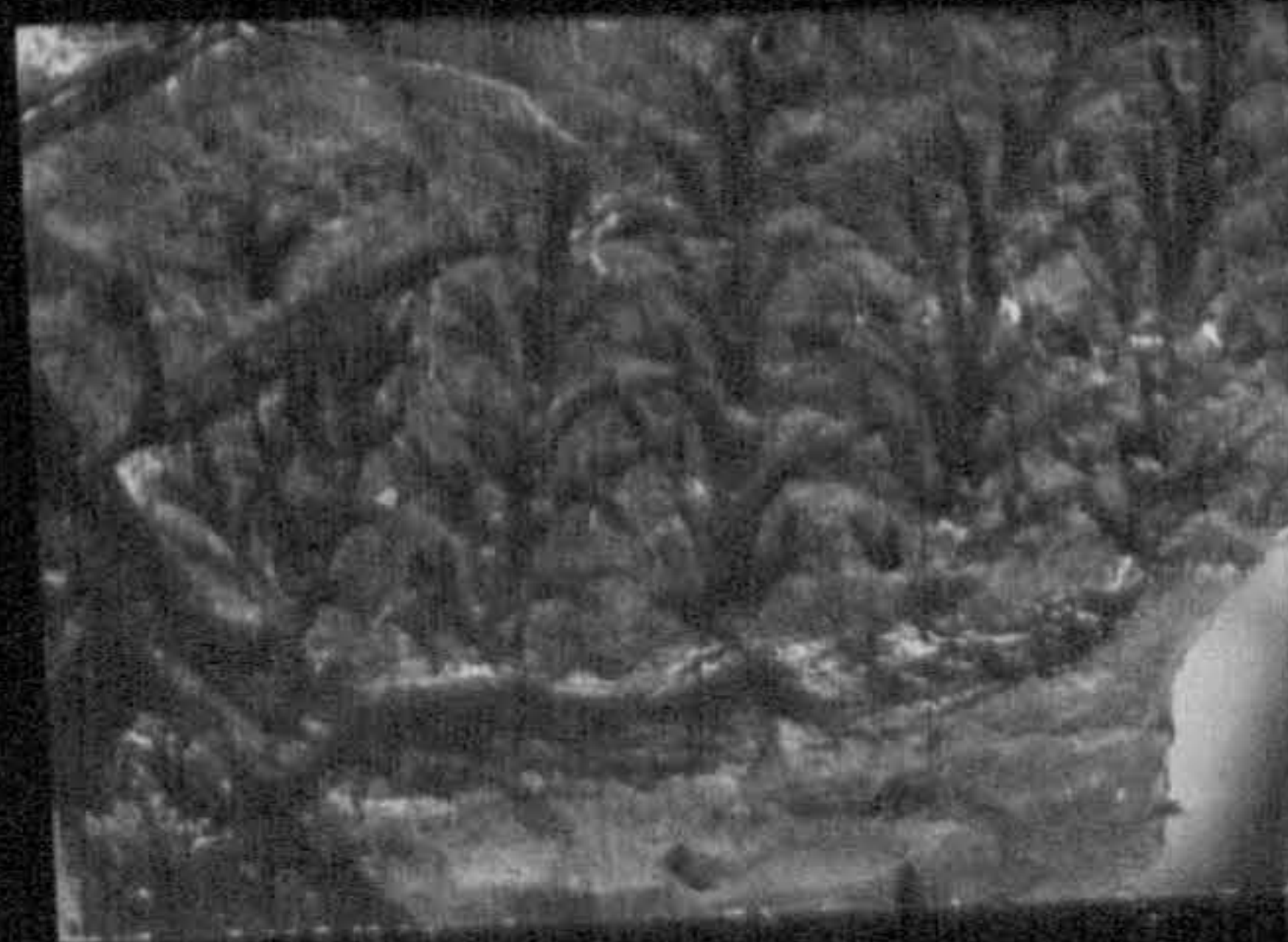
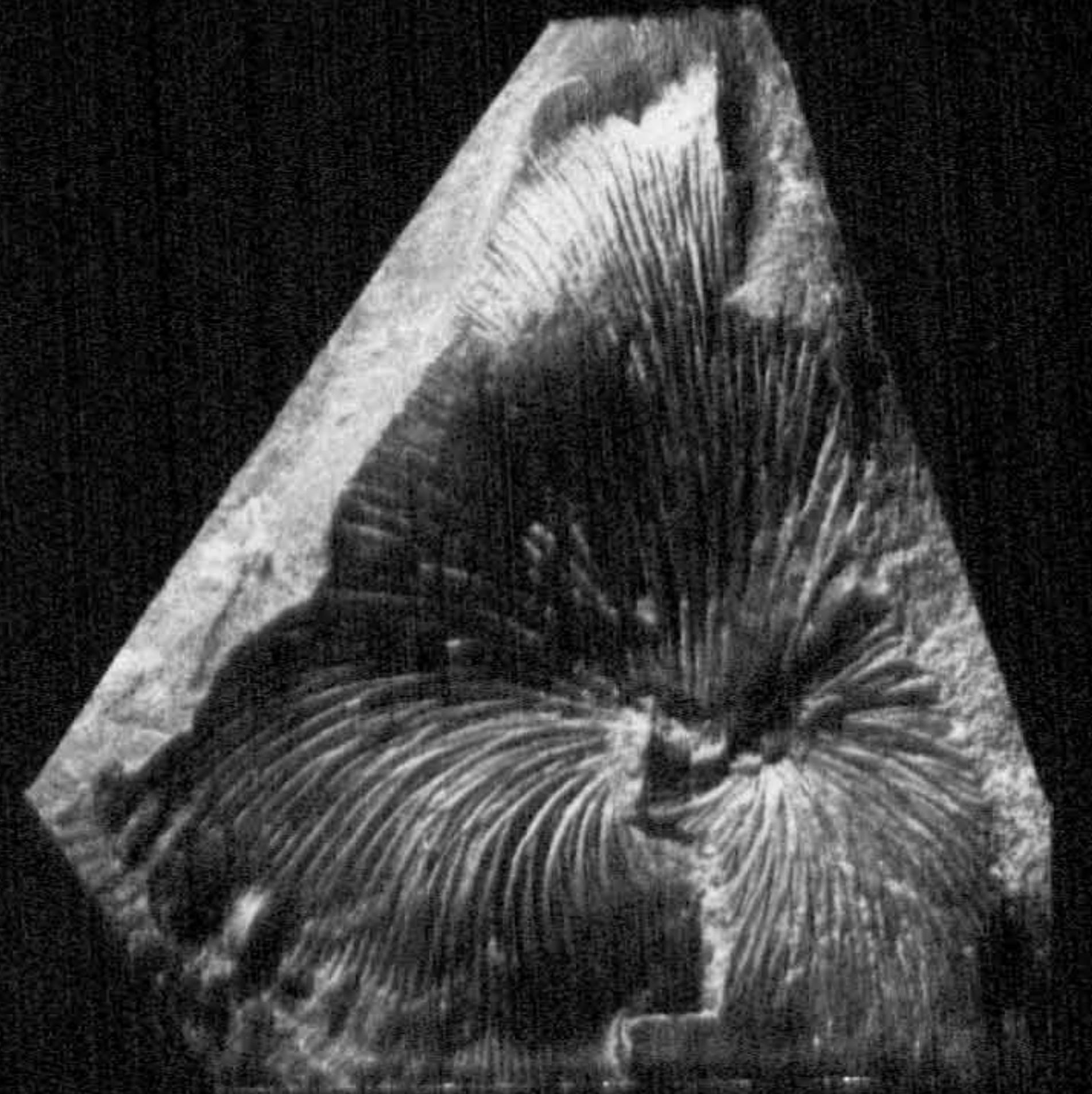
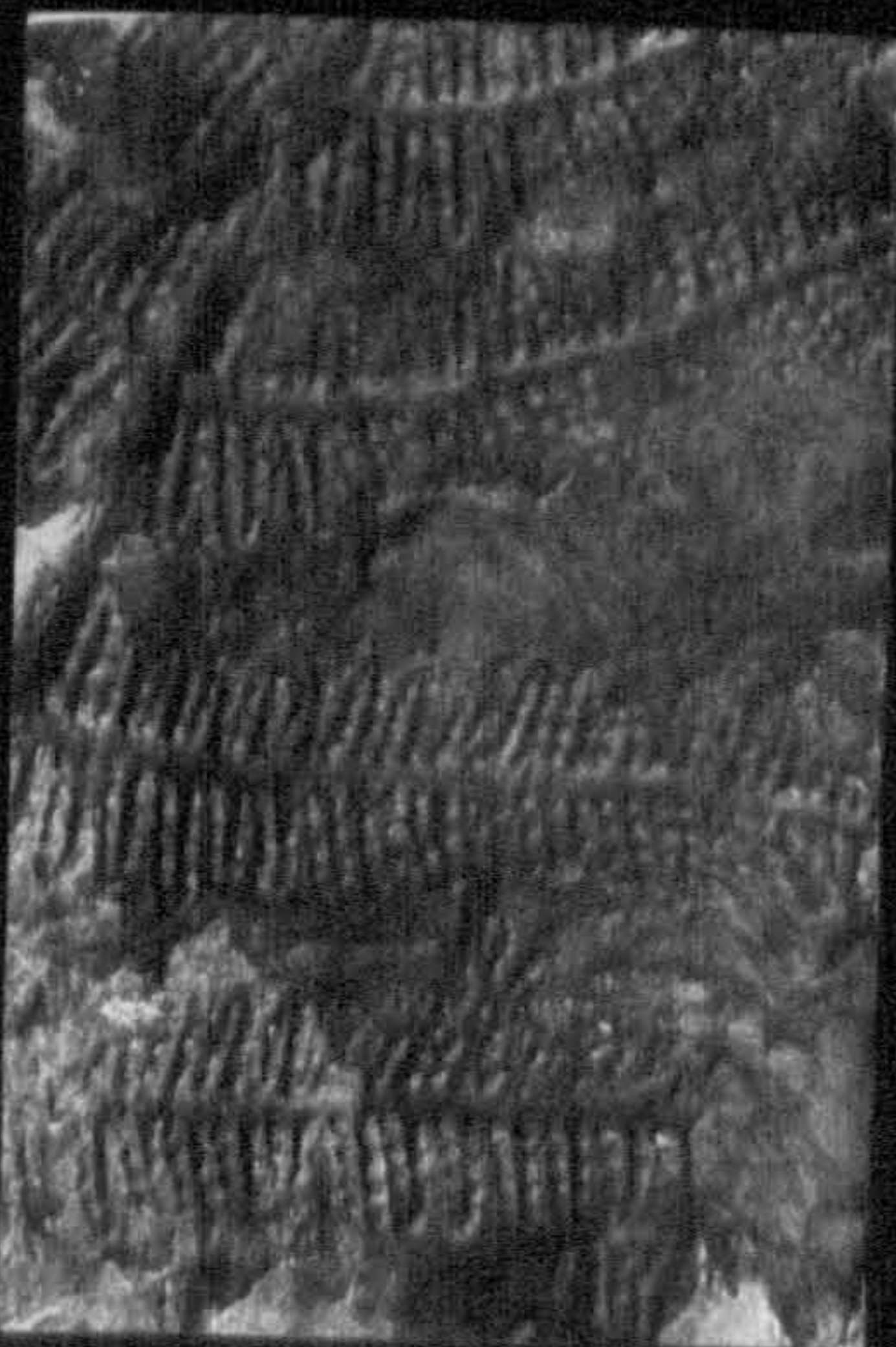


FIG. 4. RHAC. SPINOSUM, LESQX.



F. 5. CYCLOP. ORBICULARIS, BGE.



F. 6, A & B. ODONTOPTERIS CONWAYI, L&H SP.



FIG. 7. ODONTOPTERIS LINDLEYANA, STB.

PLATE VIII



FIG. 1. CAULOPTERIS ANGLICA, KEDD.



F. 2. MEGALOSP. INFLATUM, LESQ. SP.



FIG. 3. HOLCOSPERMUM SP.



FIG. 4. SAMAROPSIS SP.



F. 5. CORDAICARP. AREOLATUS,
BOUL. SP.

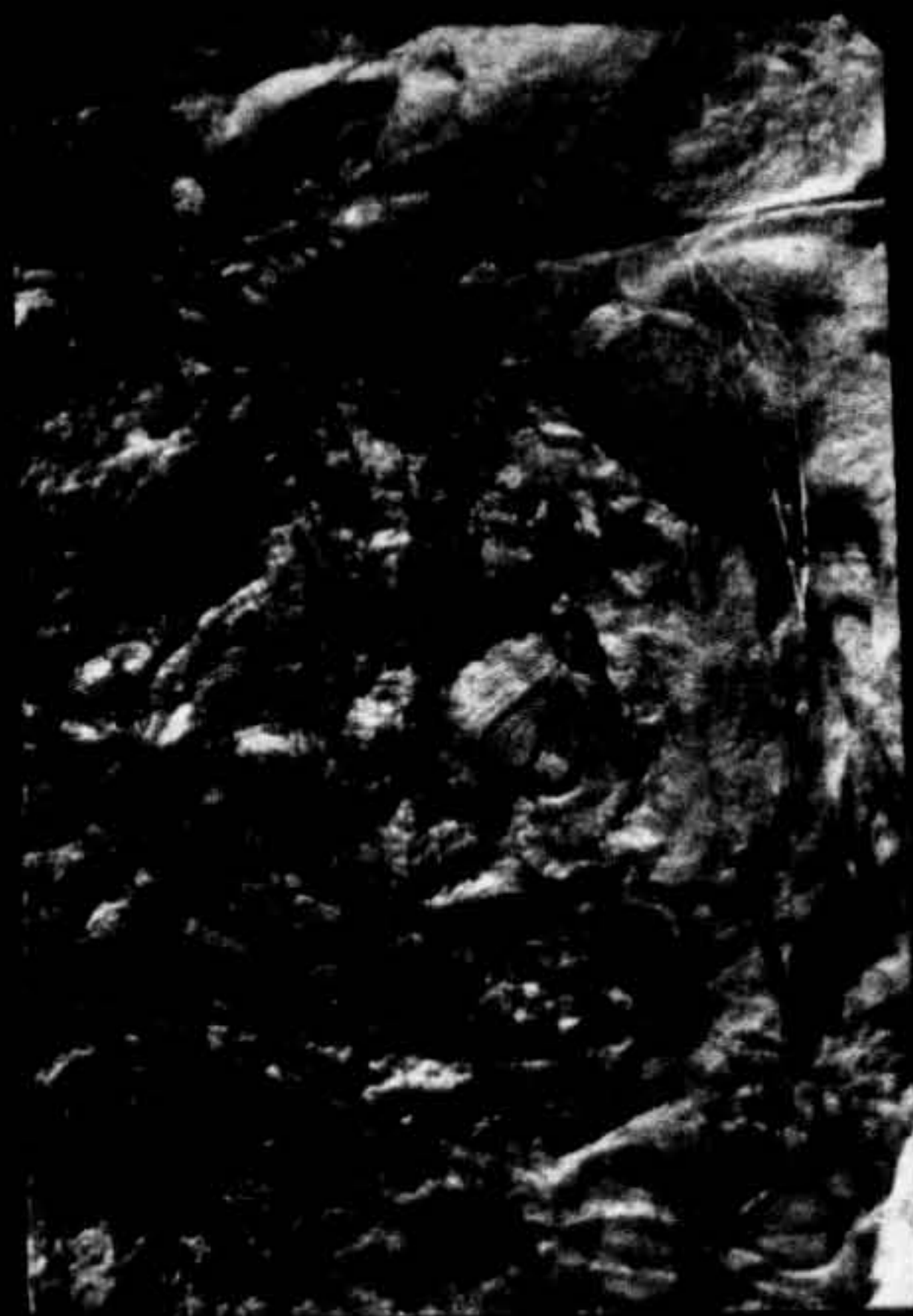


FIG. 6. SAMAROPSIS SP.



FIG. 7. CYCLOPTERIS SP.

PLATE IX

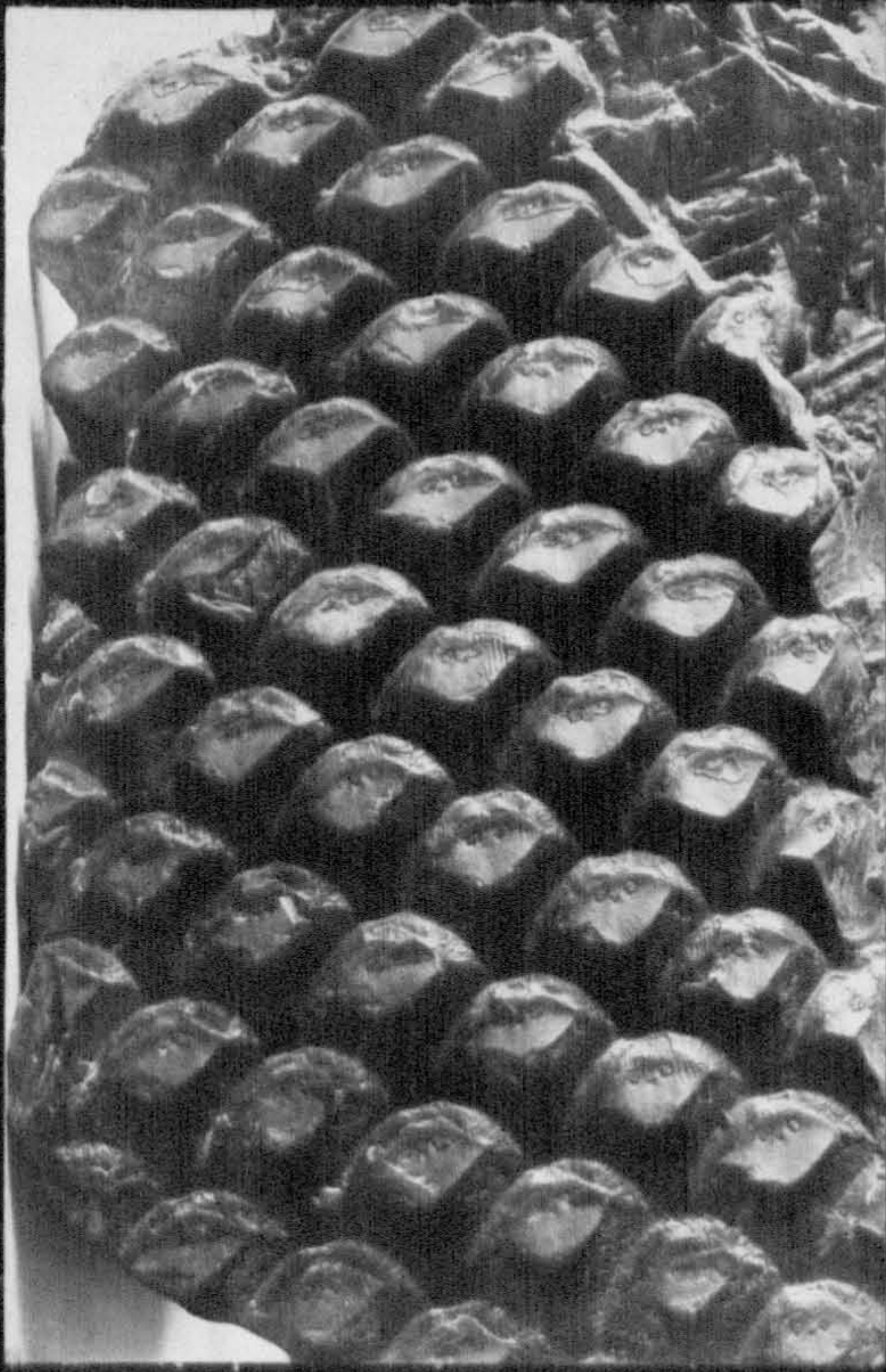


FIG. 1. SIGILLARIA MURTRIEI, KIDST.

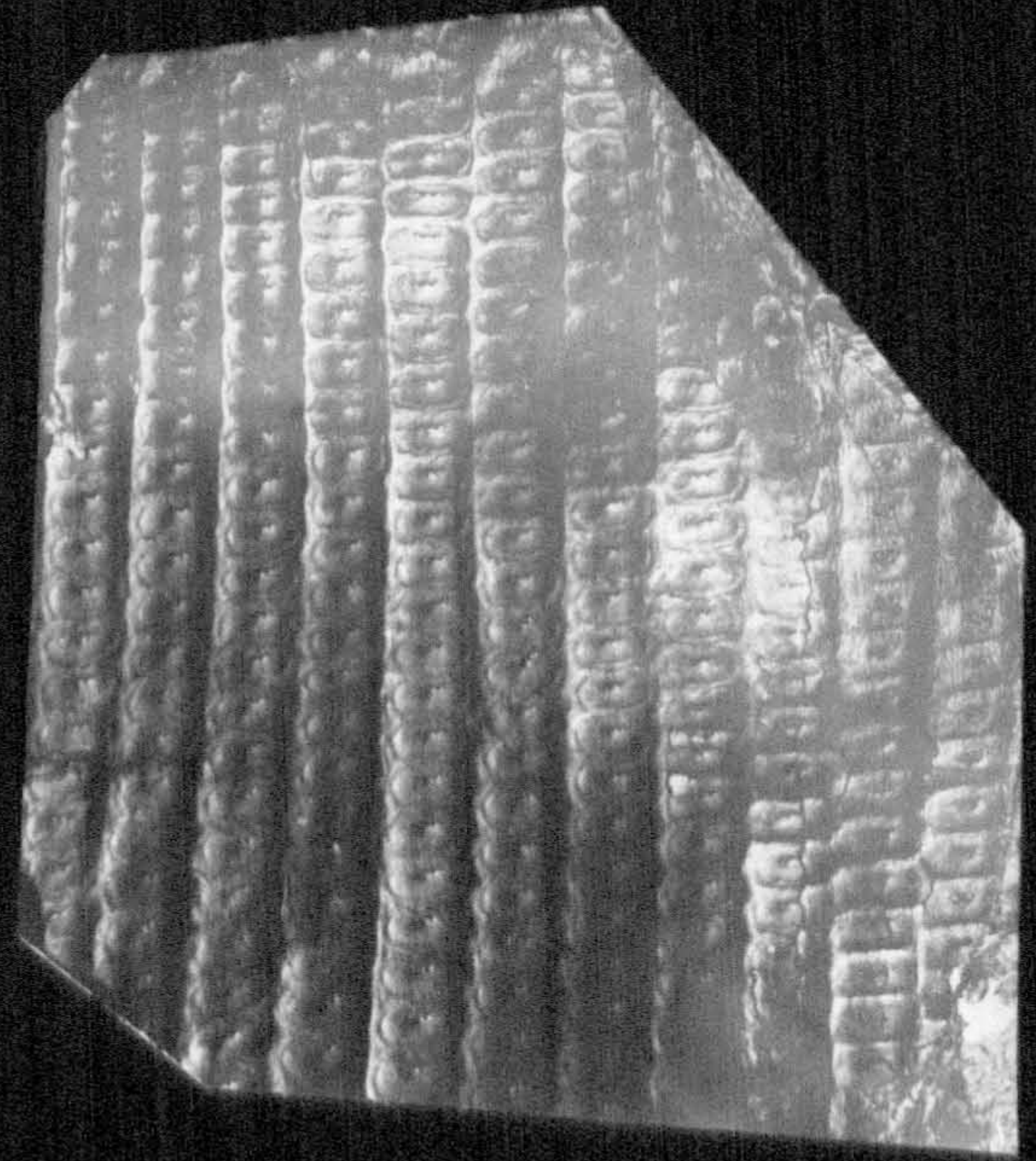


FIG. 2. S. CUMULATA, MEIKS., VAR. NODOSA, L. & H.

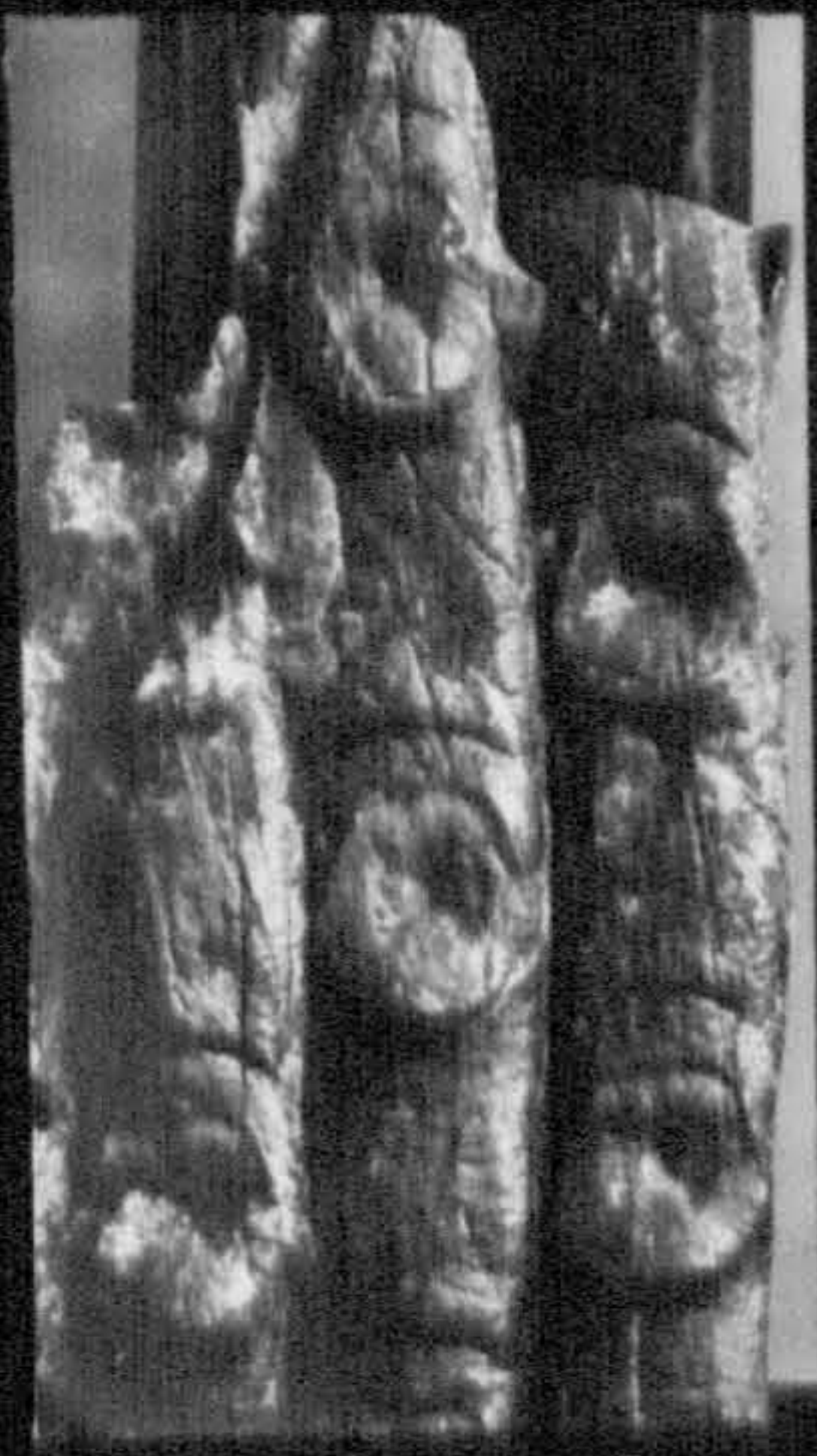


FIG. 3. SIGILLARIA SAULII, BGT.

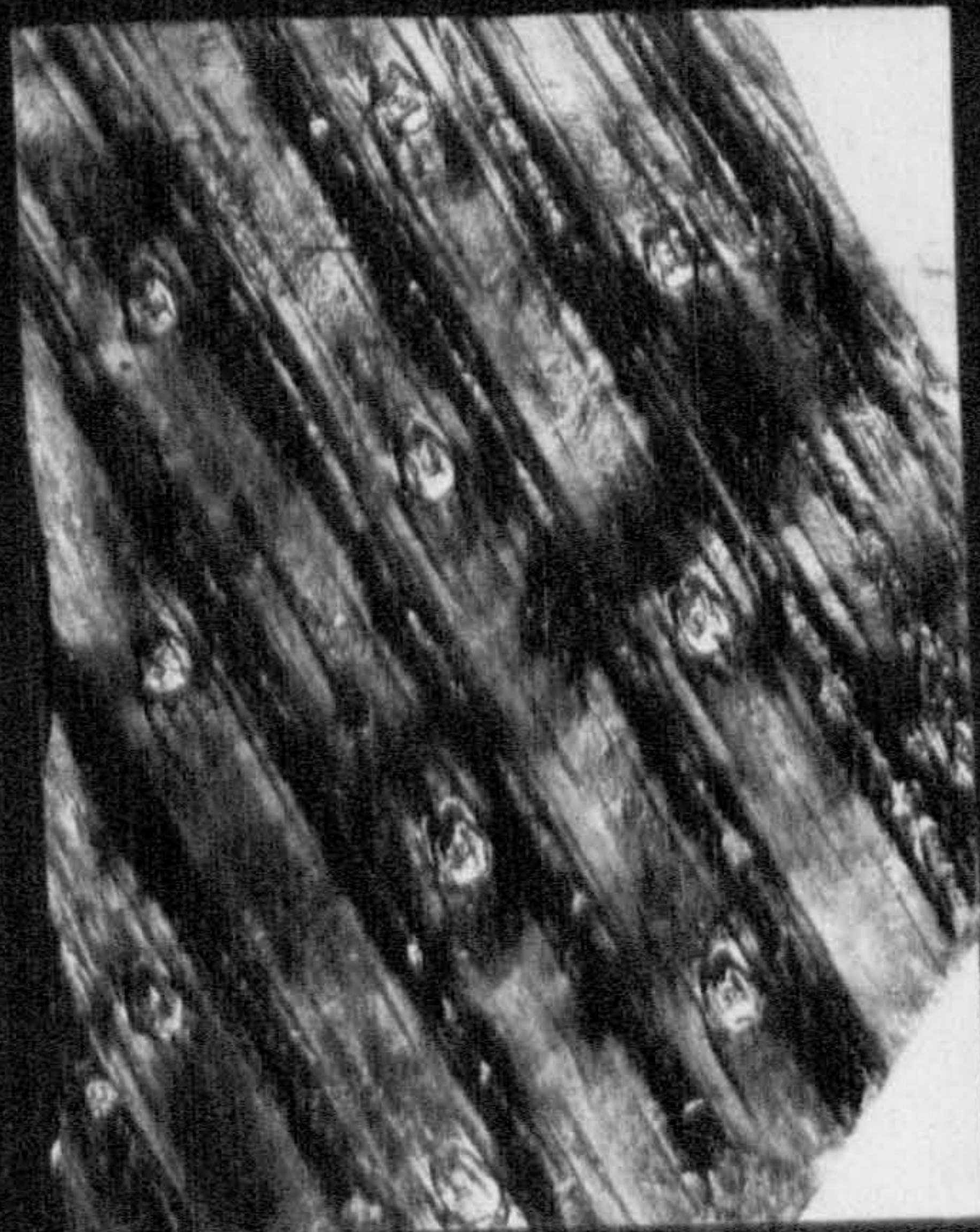


FIG. 4. SIGILLARIA RUGOSA, BGT.

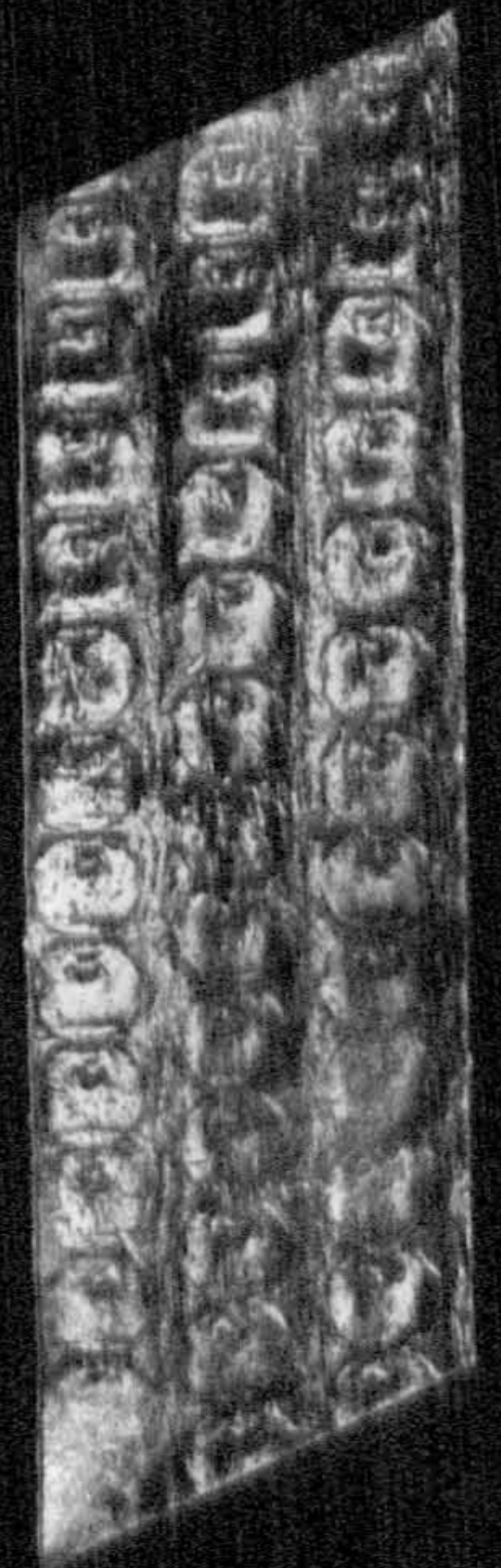


FIG. 5. S. TESSELLATA, STEIN.

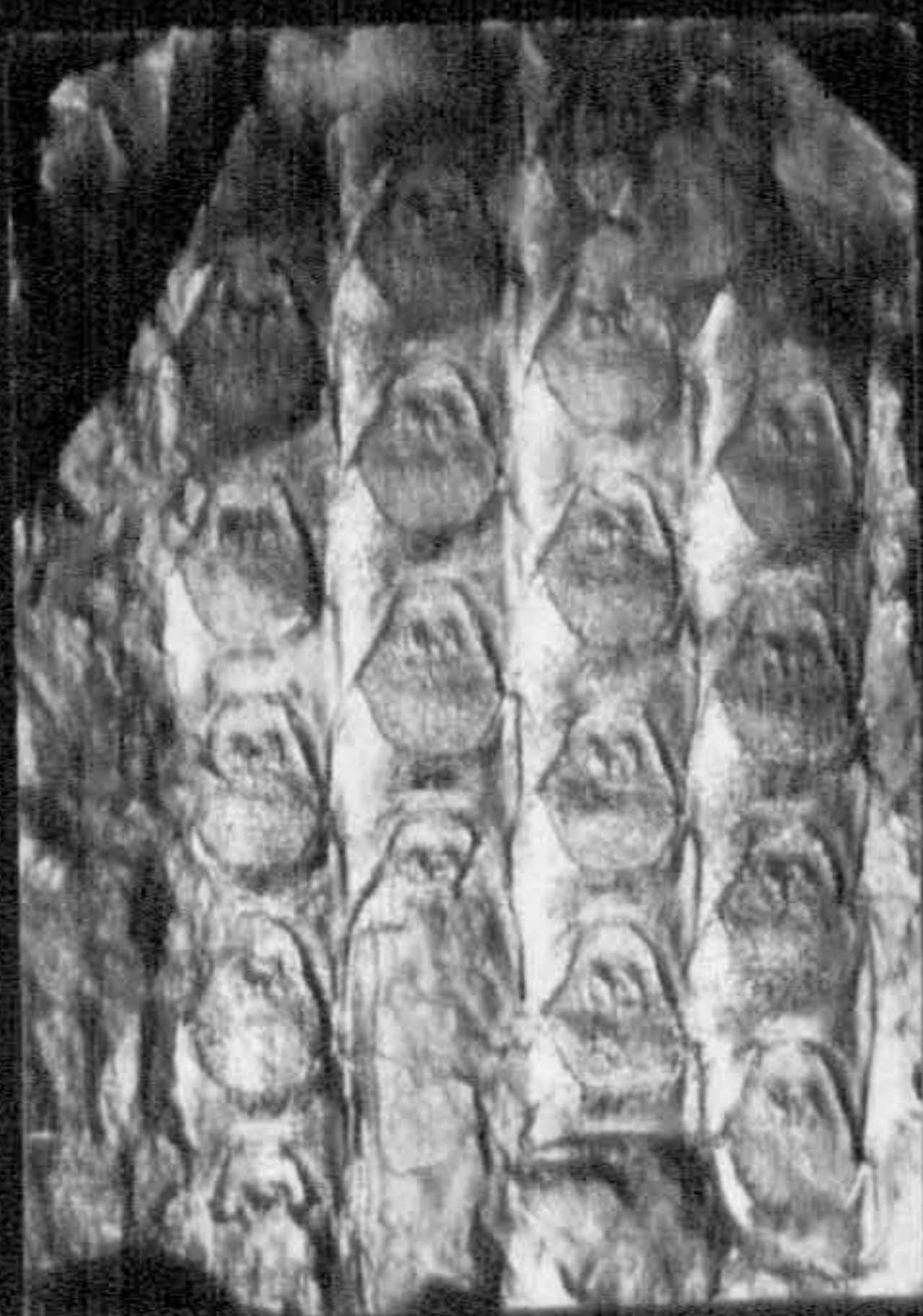


FIG. 6. S. MAMILLARIS, BGT.



FIG. 7. S. SCUTELLATA, BGT.

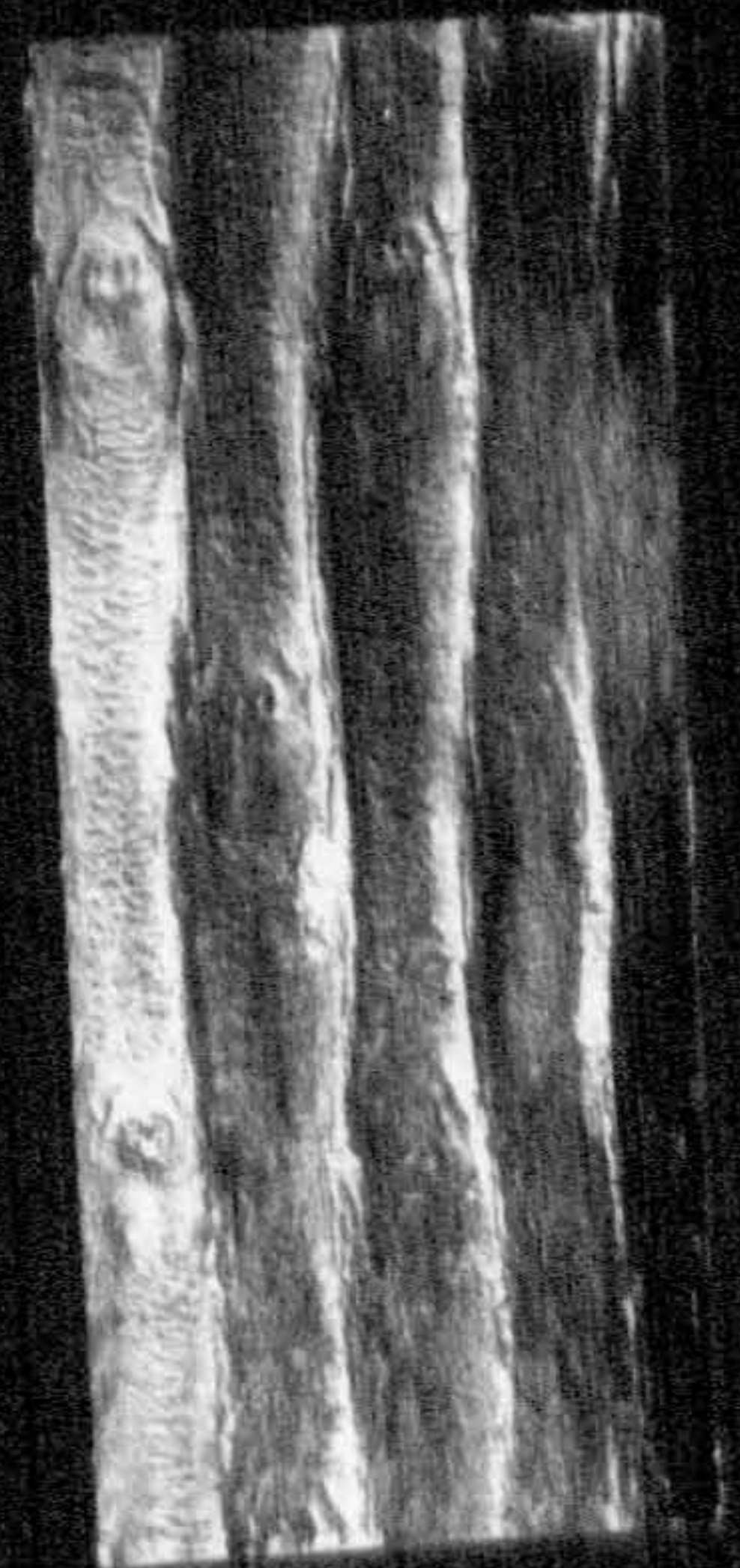


FIG. 8. S. ELONGATA, BGT.

PLATE X



FIG. 1. LEPIDODENDRON OPHIURUS, BRONIST.

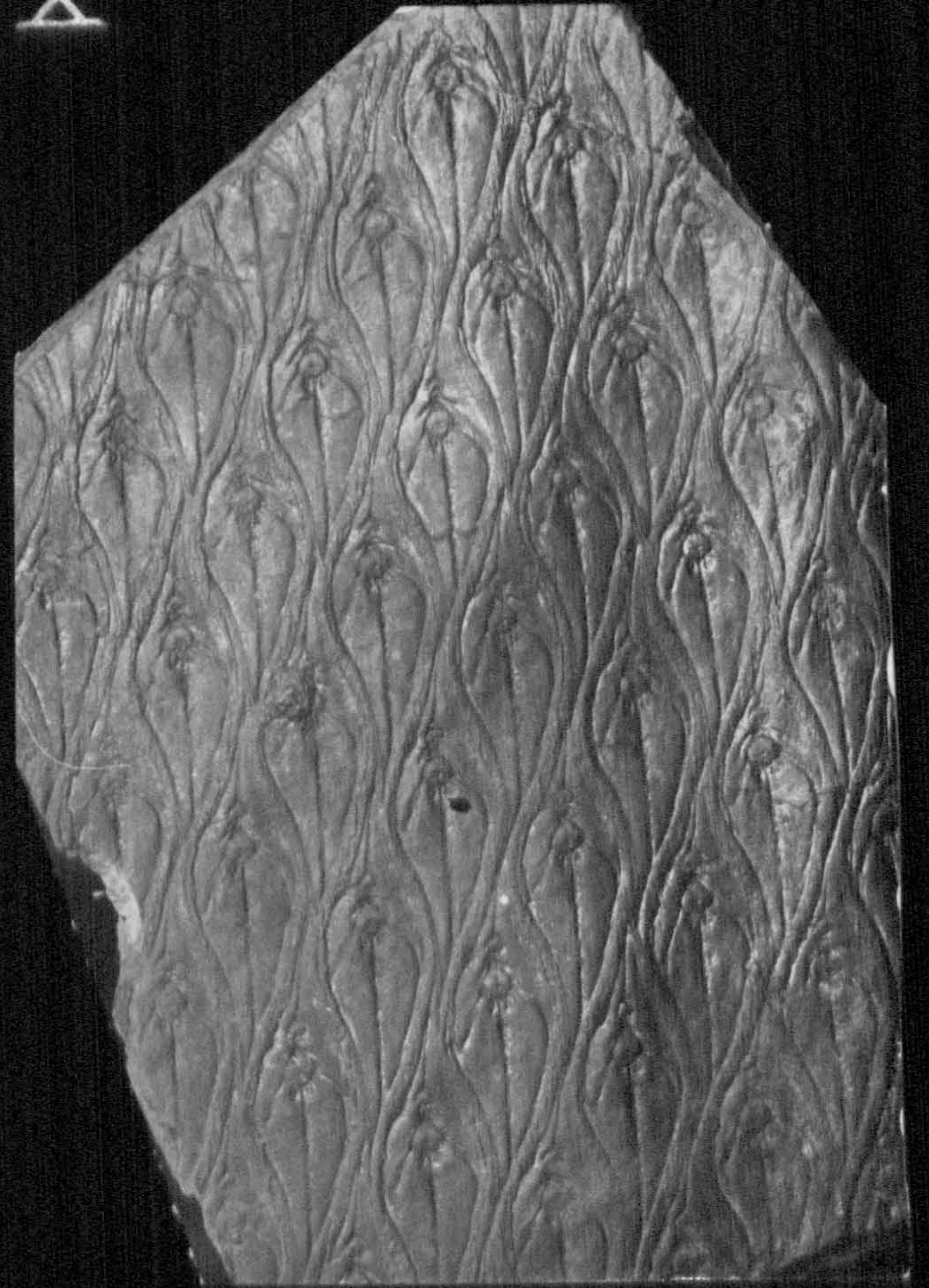


FIG. 2. LEPIDODENDRON ACULEATUM, STERNB.

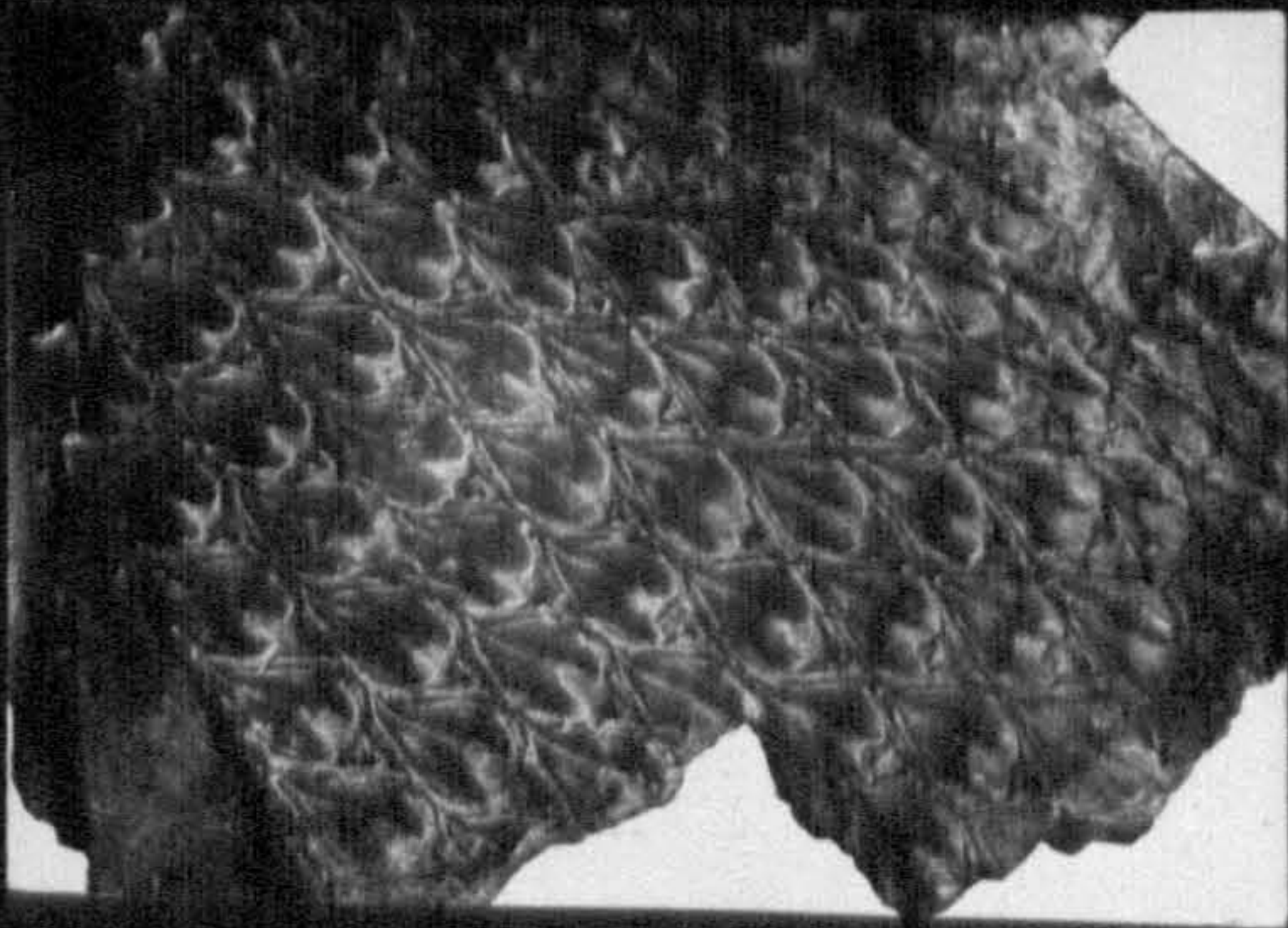


FIG. 3. LEPIDODENDRON LANCEOLATUM, LESQU.

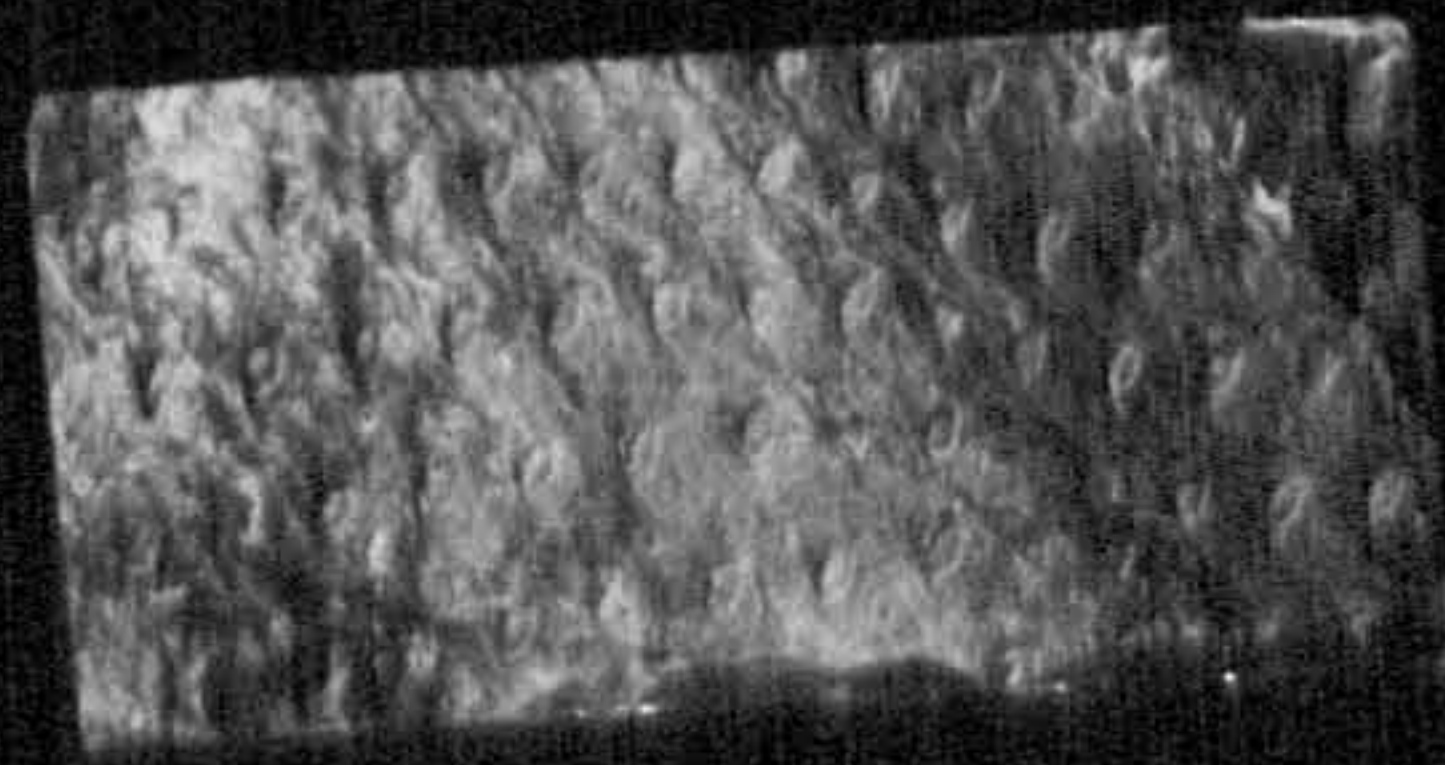


FIG. 4. LEPIDODENDRON SP.

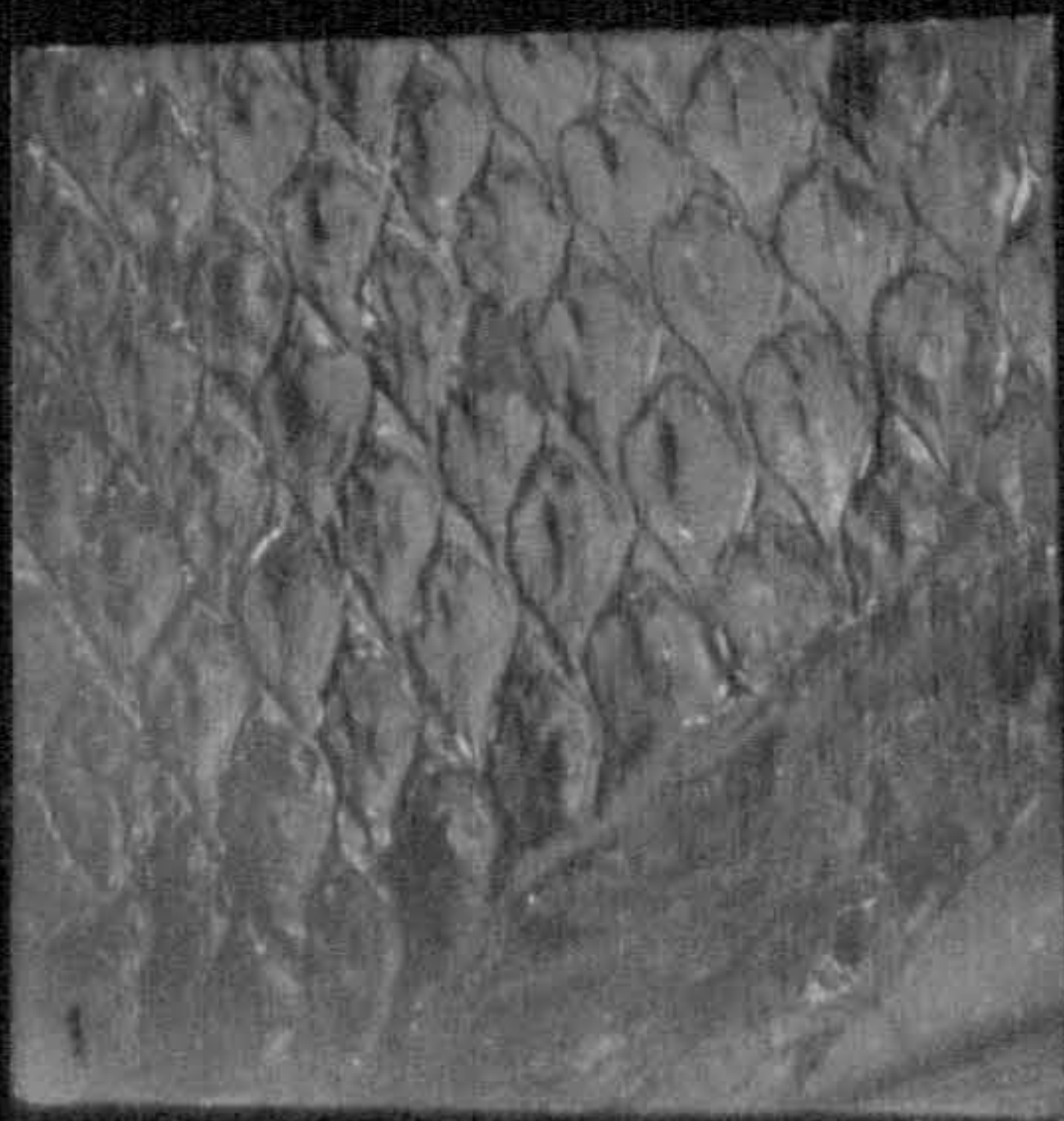


FIG. 5. LEPIDODENDRON SIMILE, HEDST. MS.

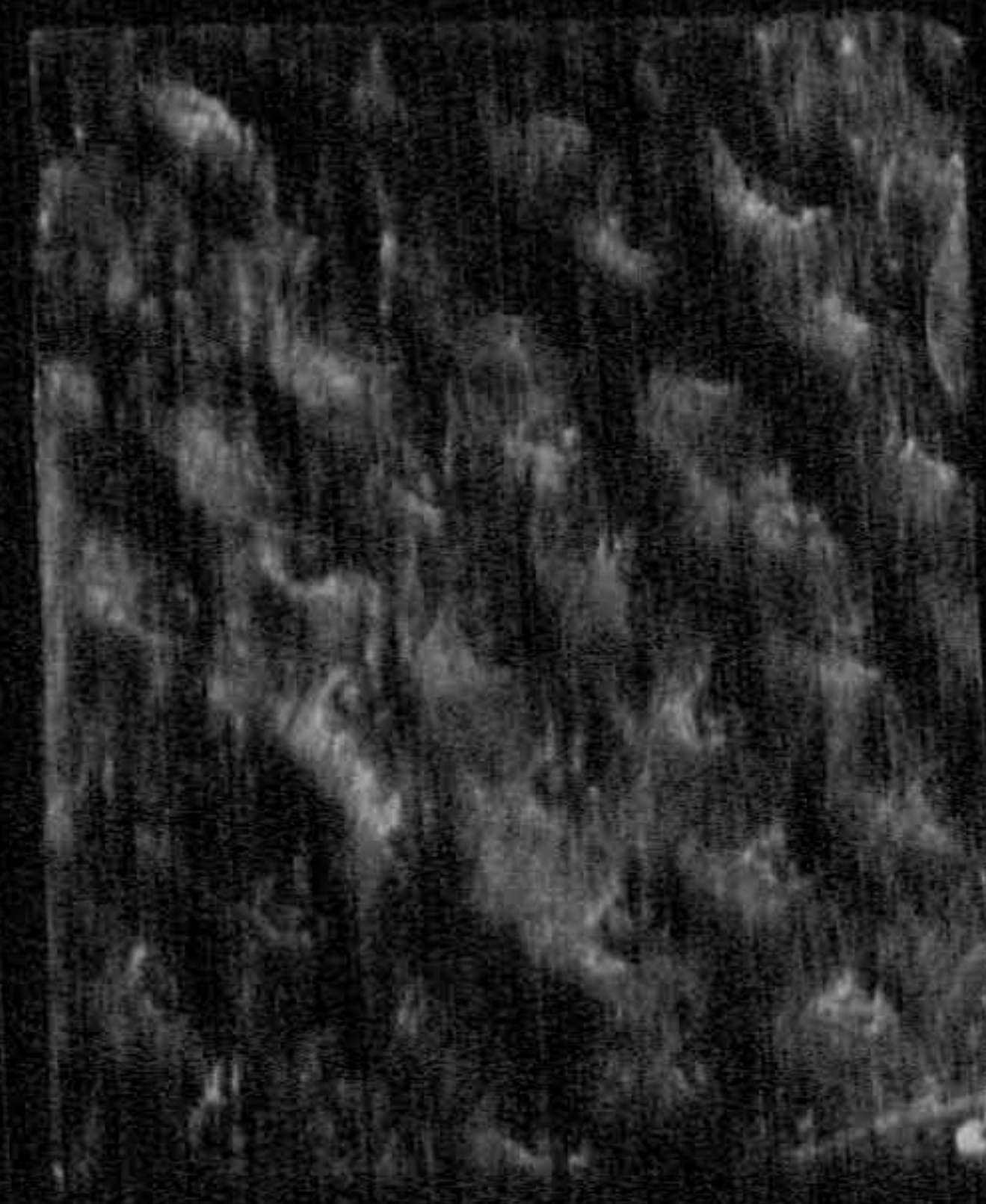


FIG. 6. ASOLANUS CAMPTOTAENIA, WOOD.

PLATE XI

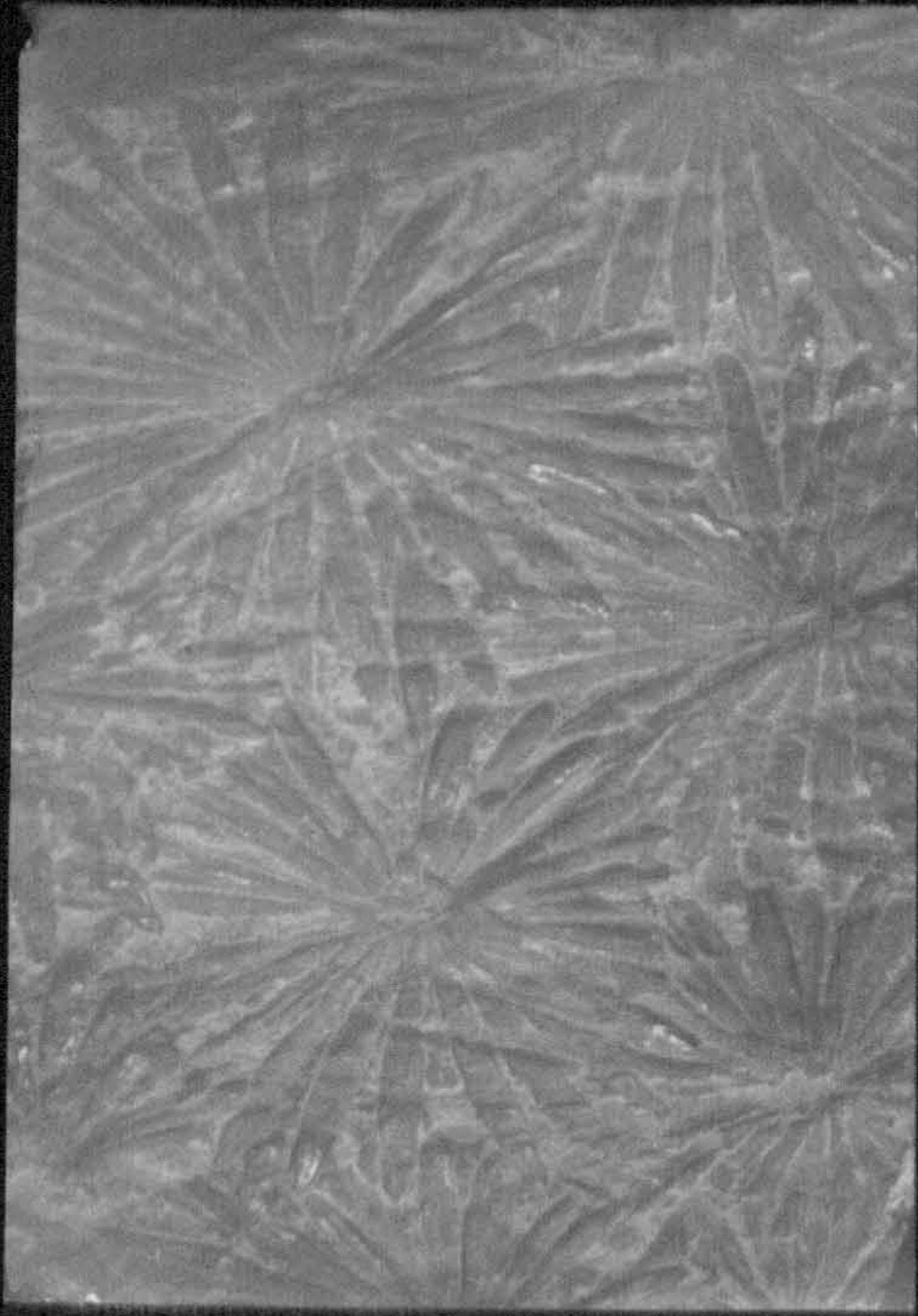


FIG. 1. ANNULARIA STELLATA, SCHL. SP.



FIG. 2. A. RADIATA, BRONGT.



FIG. 3. A. STELLATA, SCHL. SP.

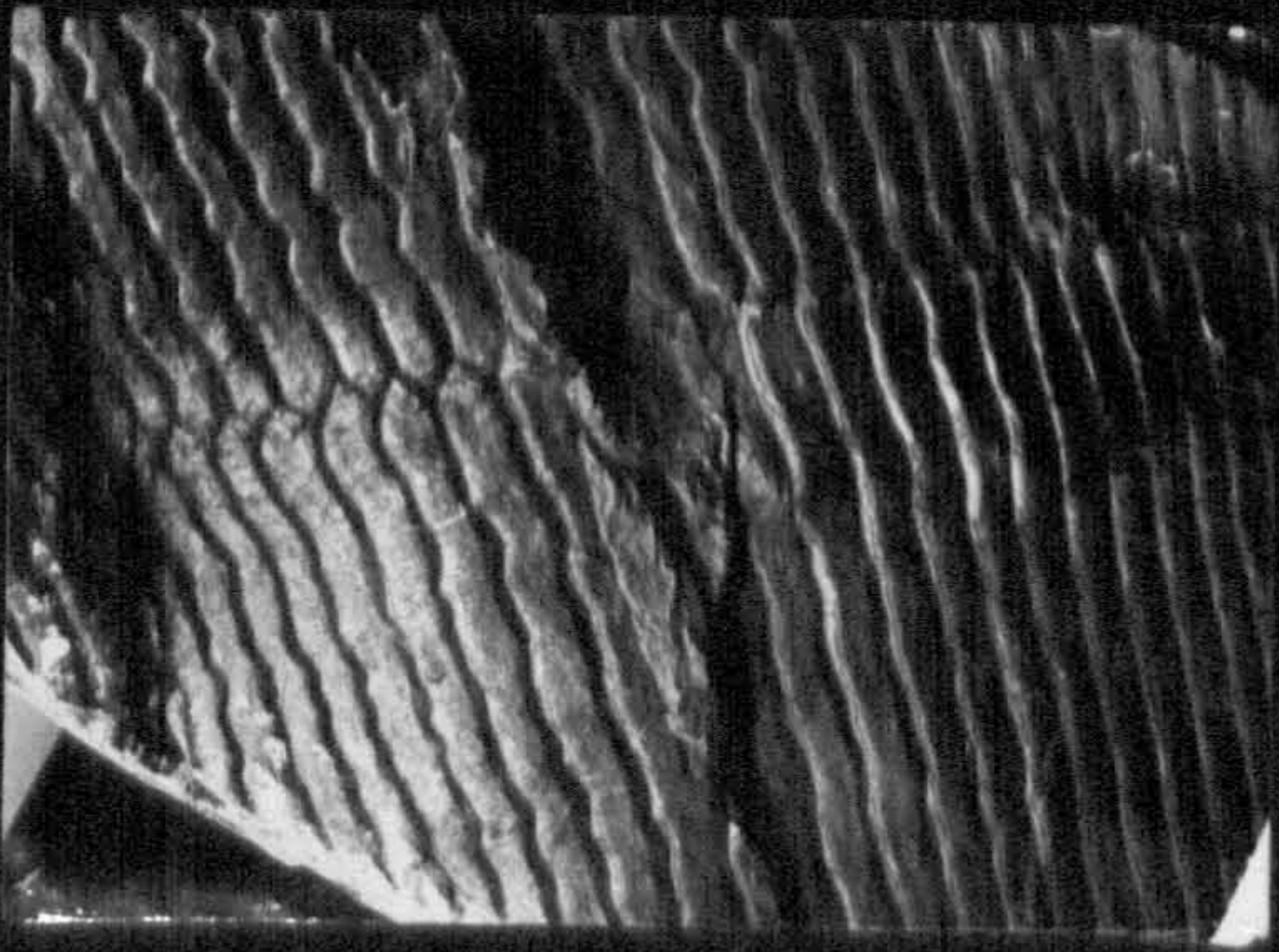
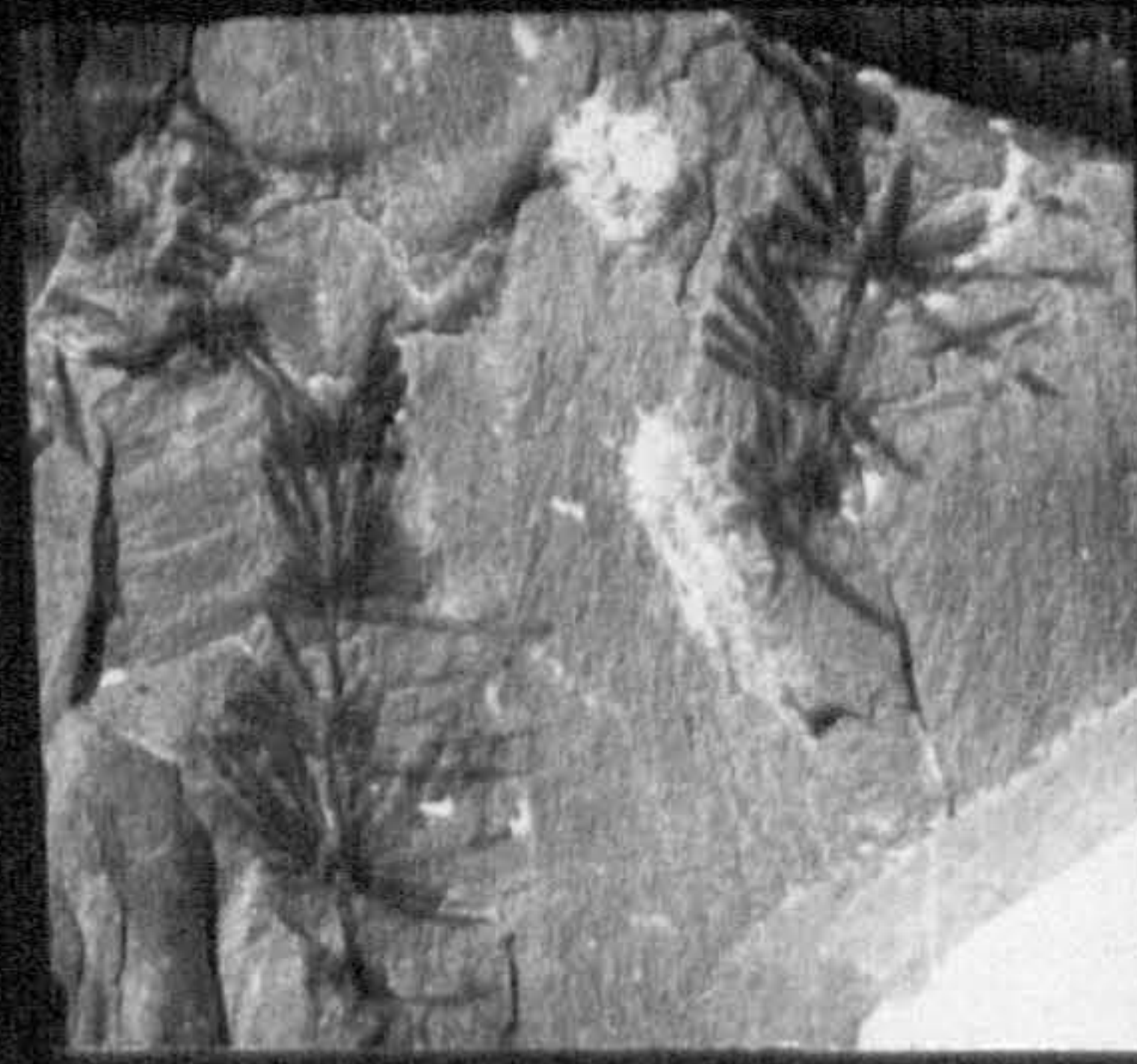


FIG. 4. CALAMITES UNDULATUS, STB.



F. 5. ASTEROPHYLLITES
EQUISETIFORMIS, SCHL. SP.



F. 6. MACROSTACHYA
? INFUNDIBULIFORMIS, DCI. SP.

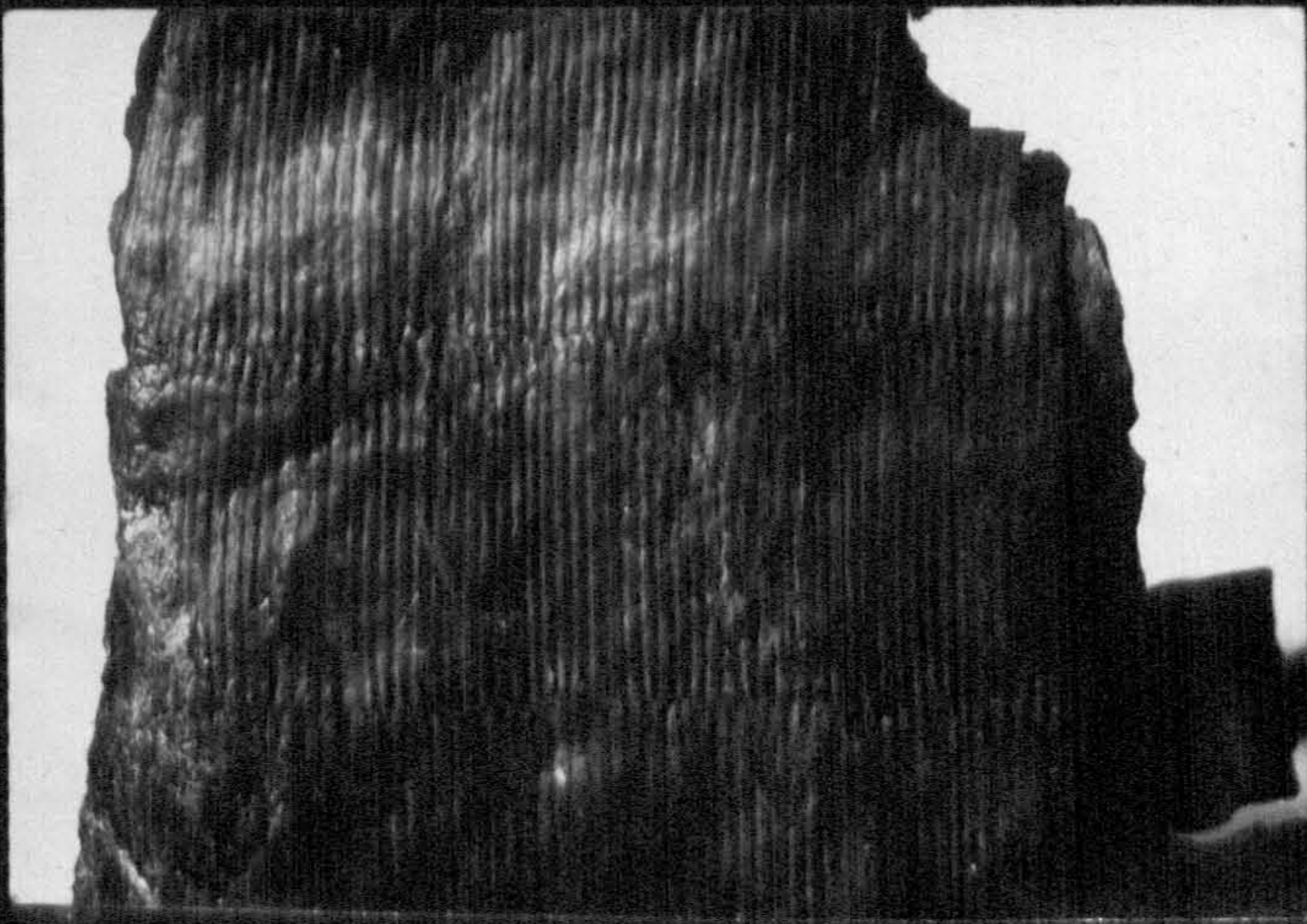


FIG. 7. CALAMITES SP.



F. 9. SPHENOPHYLLUM
? MYRIOPHYLLUM, CRÉPIN.



FIG. 8. ANNULARIA SPHENOPHYLLOIDES, ZENK. SP.

PLATE XII



FIG. 1. SPHENOPHYLLUM
EMARGINATUM, BRONGT.



FIG. 2. SPHENOPHYLLUM CUNEIFOLIUM, STE. SP.



FIG. 3. SPHENOPHYLLUM
FASCICULATUM, LEGER.



FIG. 4. POACORDAITES MICROSTACHYS,
GOLD, SP.



FIG. 5. SPHENOPHYLLUM MAJUS, BROHN



FIG. 6. SPHENOPHYLLUM
LONGIFOLIUM, GERM.

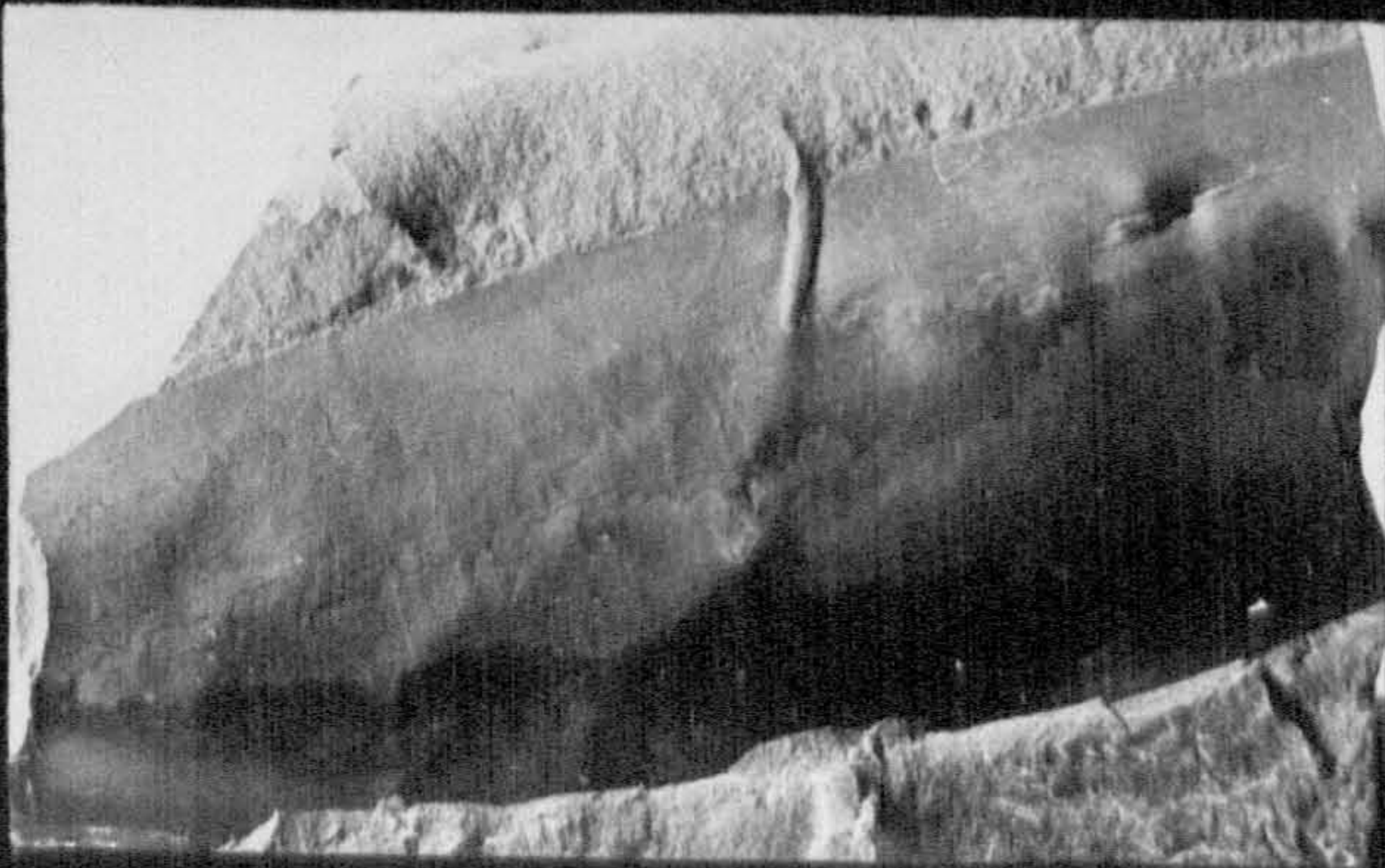


FIG. 7. CORDAITES ANGULOSOSTRIATUS, MIDDT.



FIG. 8. CORDAITES PRINCIPALIS, GERM. SP.

PLATE XIII

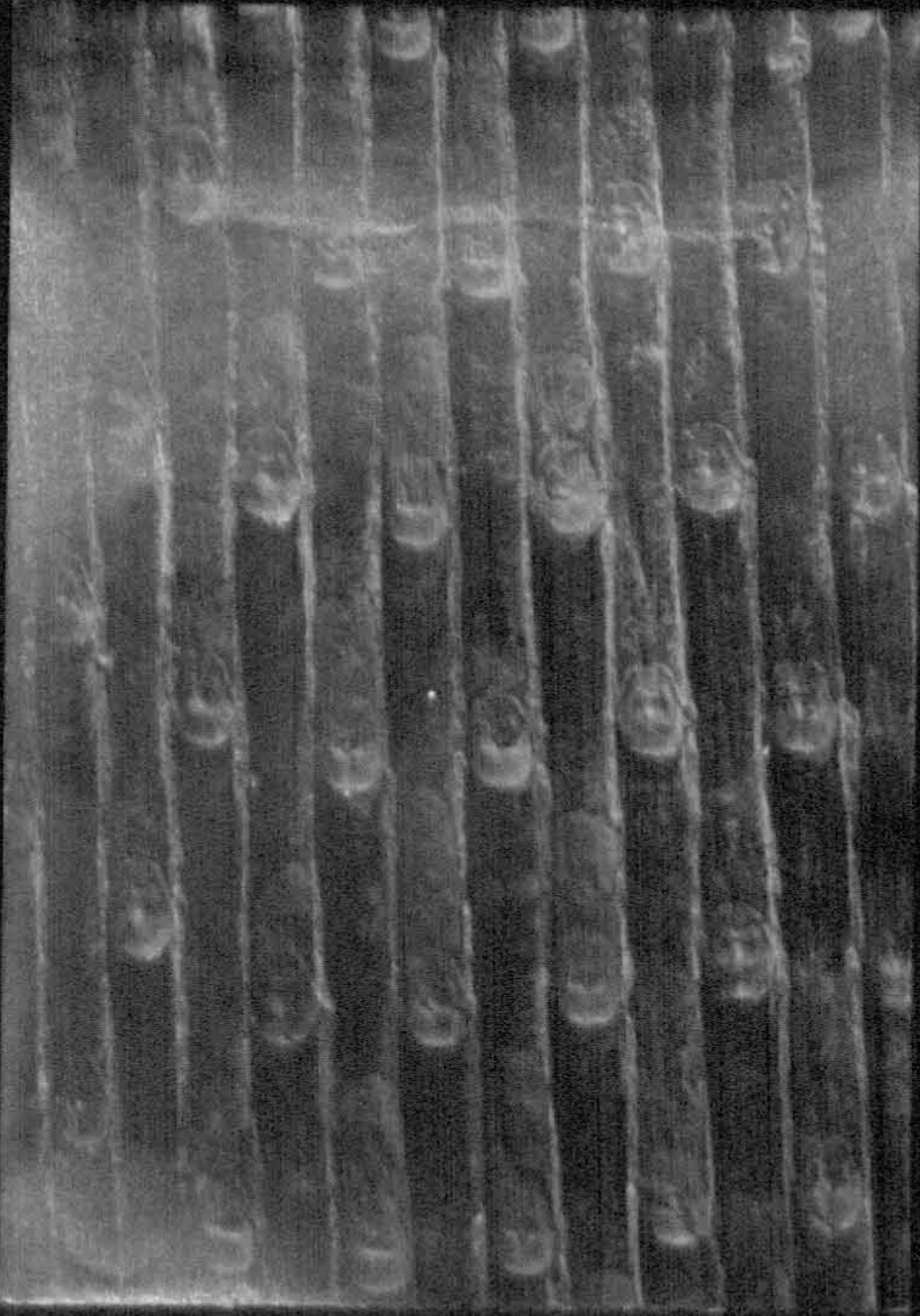


FIG. 1. SIGILLARIA RUGOSA, BRONGT.



FIG. 2. SIGILLARIA cf. GERMANICA, WEISS.



FIG. 3. NEUROPTERIS MACROPHYLLA, BRONGT.

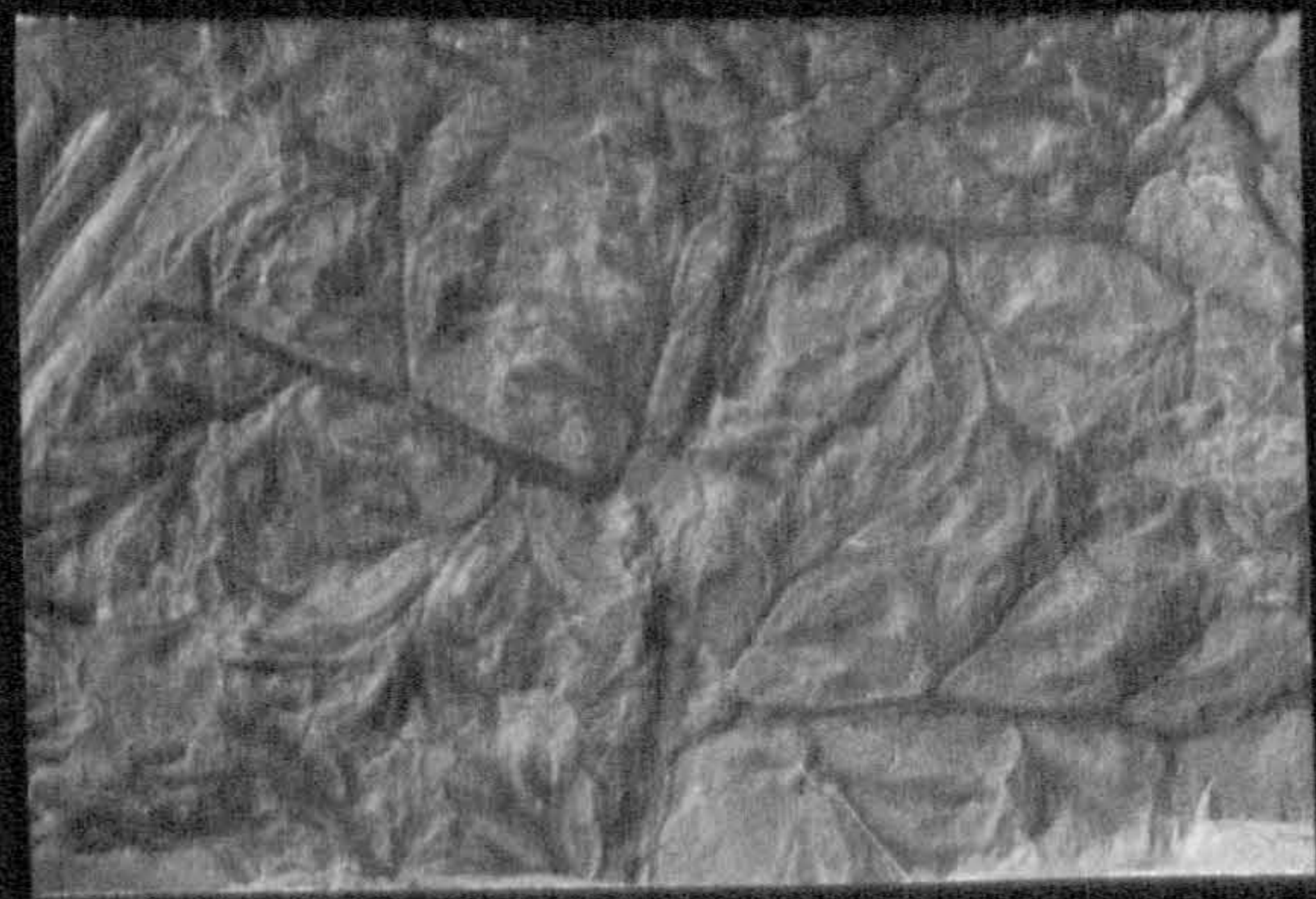


FIG. 4. DIPLOTMEMA FURCATUM, BRONGT. SP.

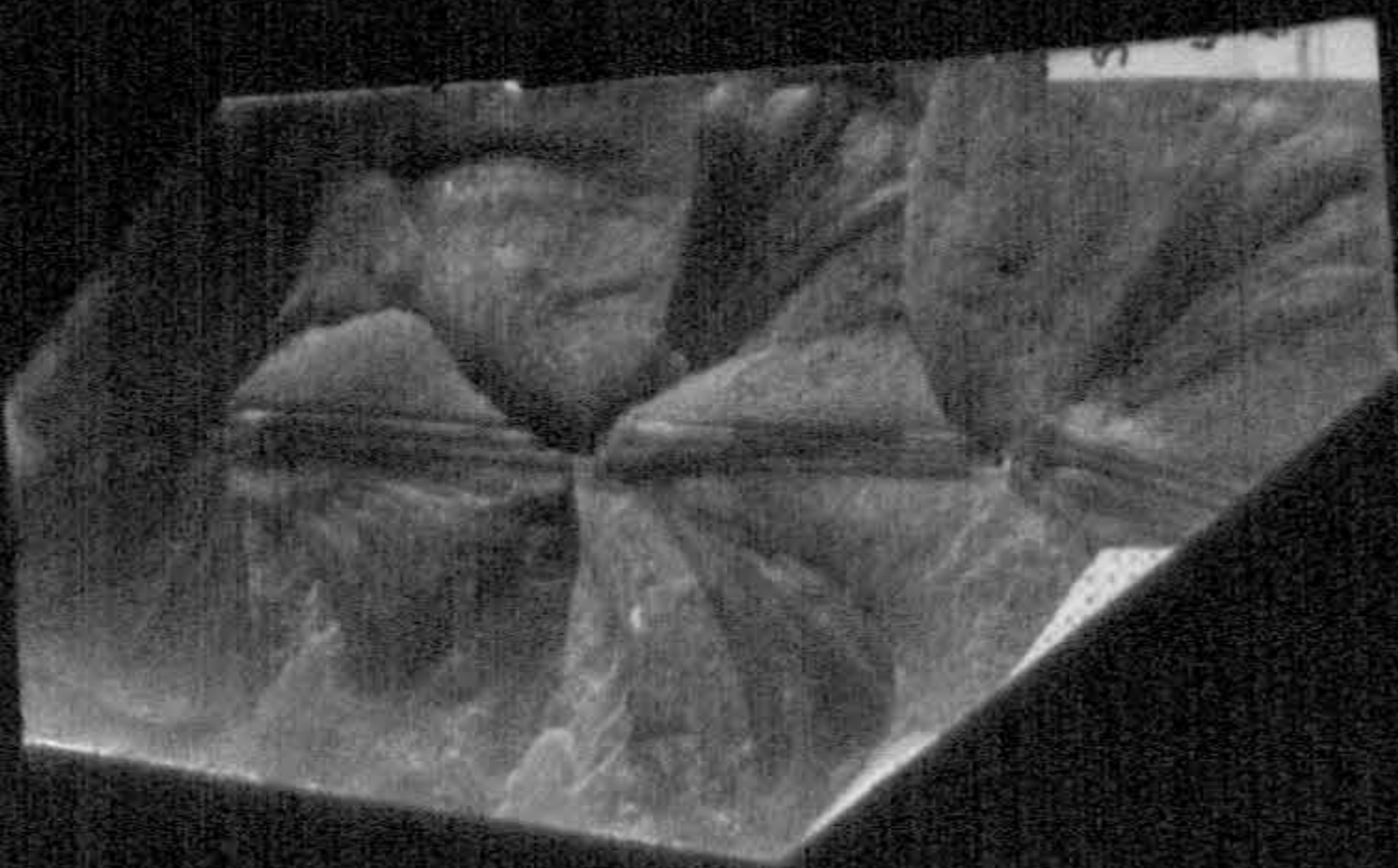


FIG. 5. SPHENOPHYLLUM MAJUS, BRONN.

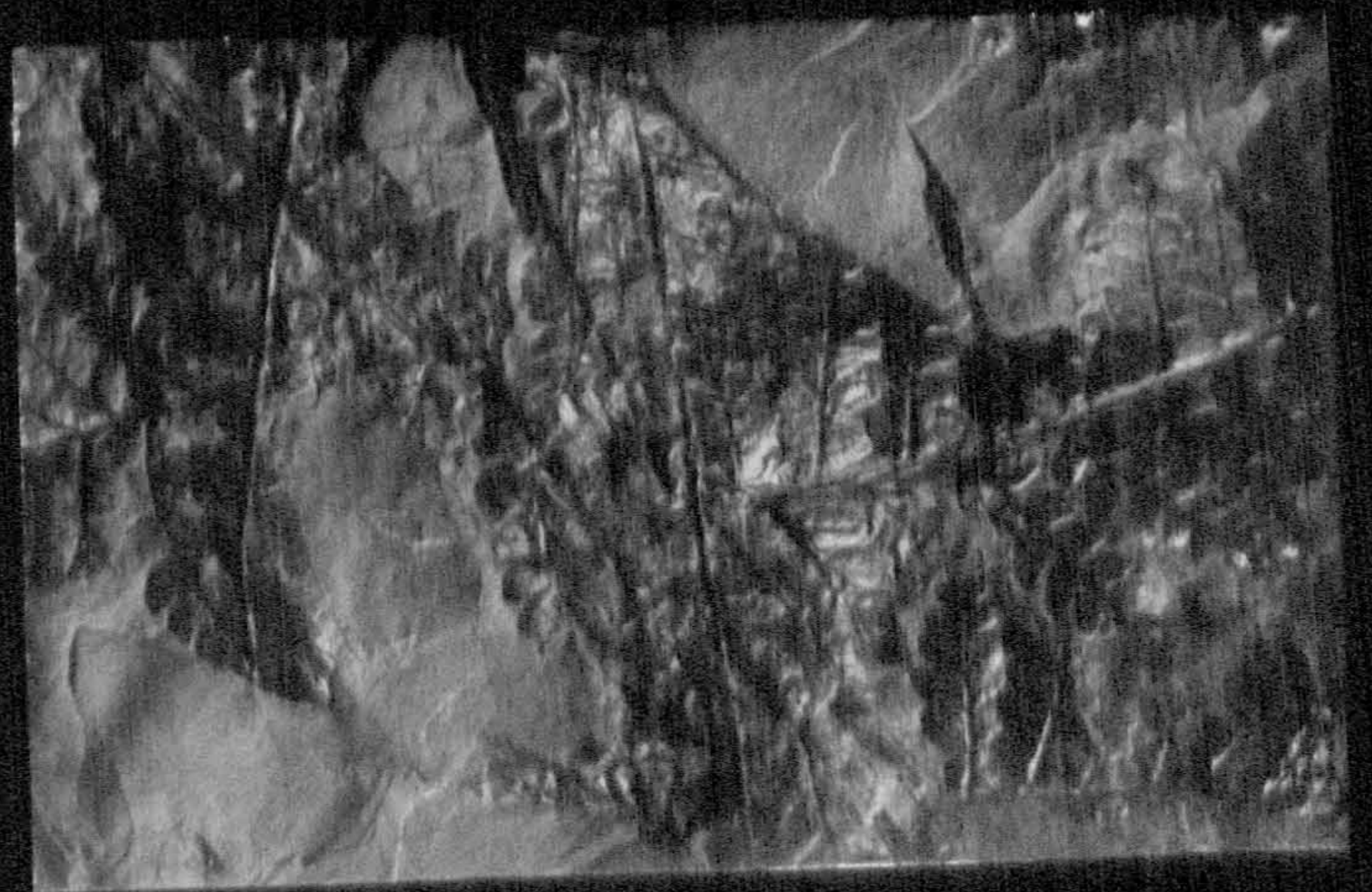


FIG. 6. SPHENOPTERIS PECOPTEROIDES, HIRST.

PLATE XIV

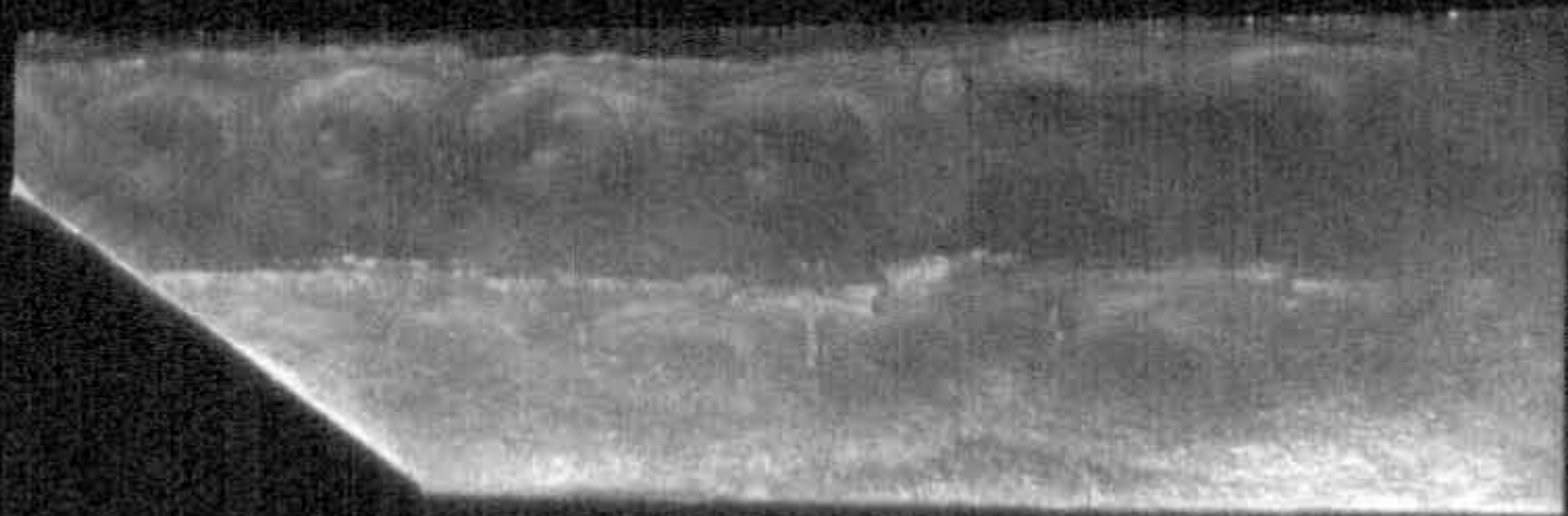


FIG. 1. SIGILLARIA CORDIGERA, ZEILL.

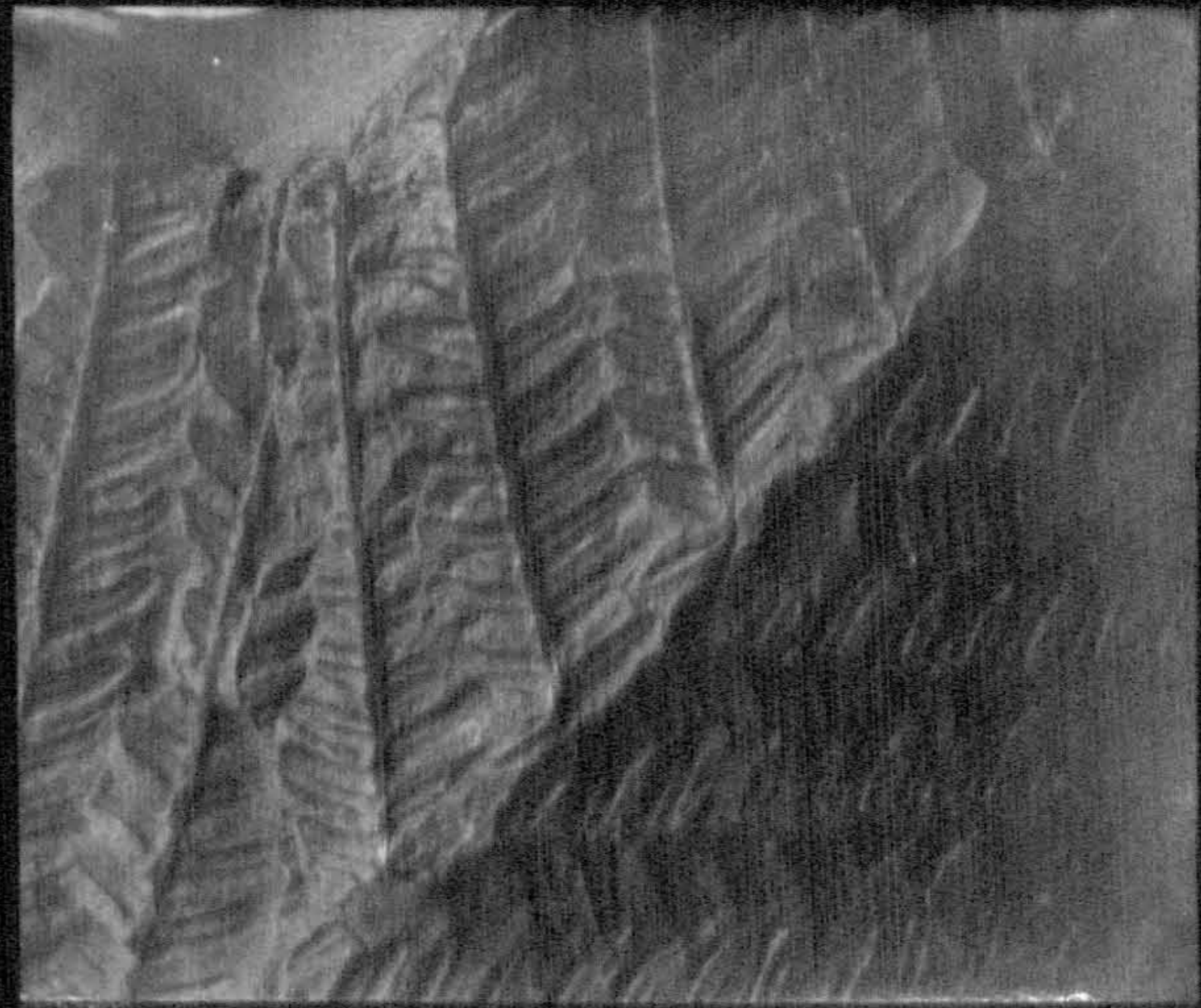


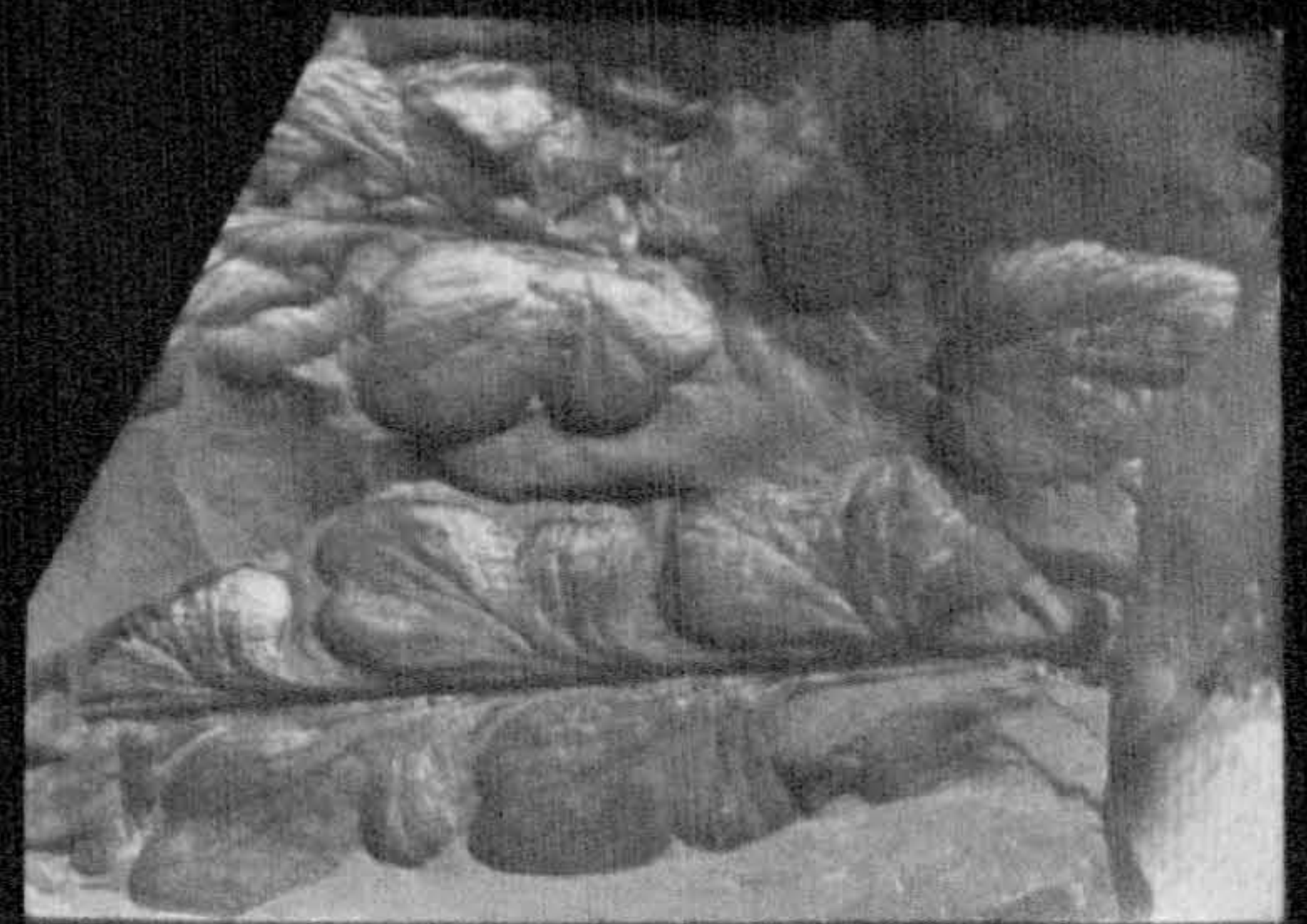
FIG. 2. PECOPTERIS BUCKLANDII, BRONGT.



FIG. 3. ASOLANUS CAMPTOTAENIA, WOOD.



F. 4. NEUROPTERIS cf. RAYMONDI, ZEILL.



F. 5. SPHENOP. MACILENTATA, L & H.

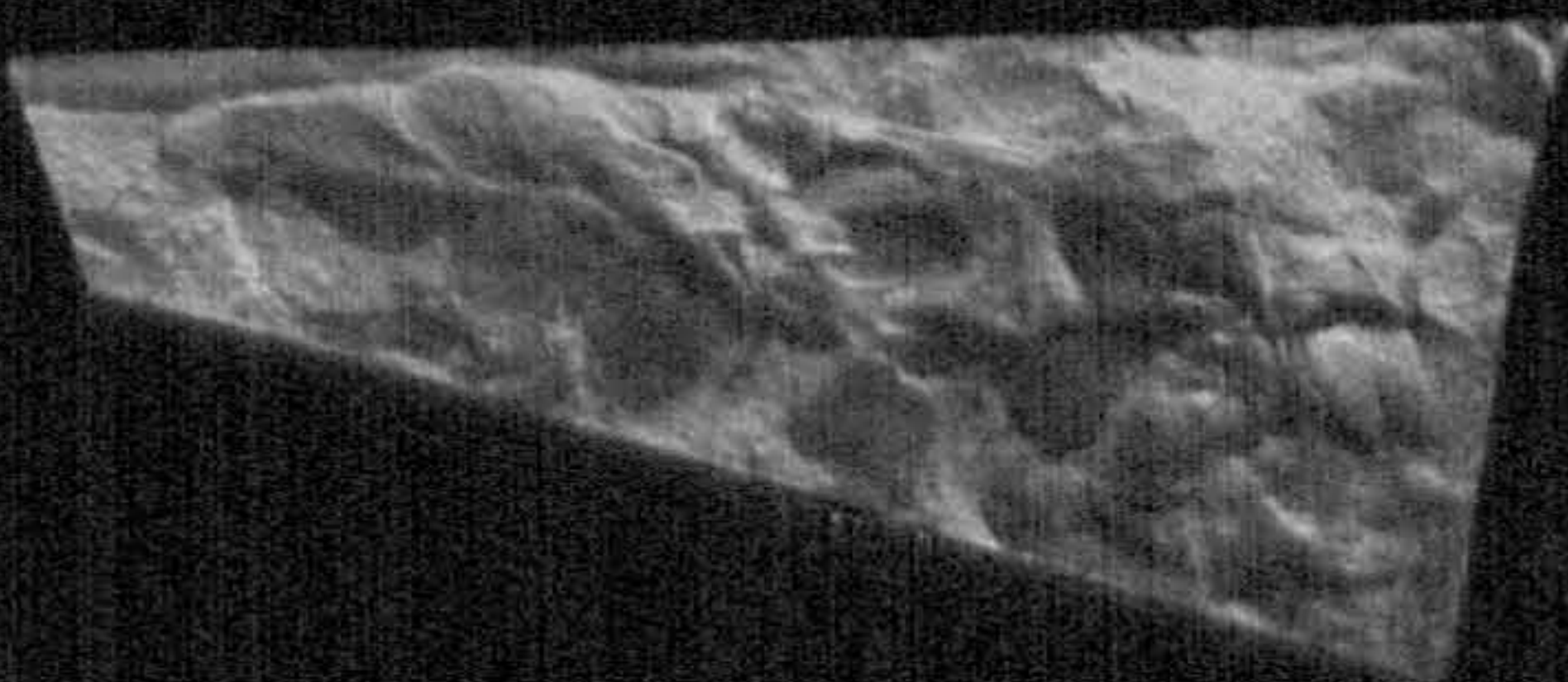


FIG. 6. NEUROPTERIS HETEROPHYLLA, BRONGT.

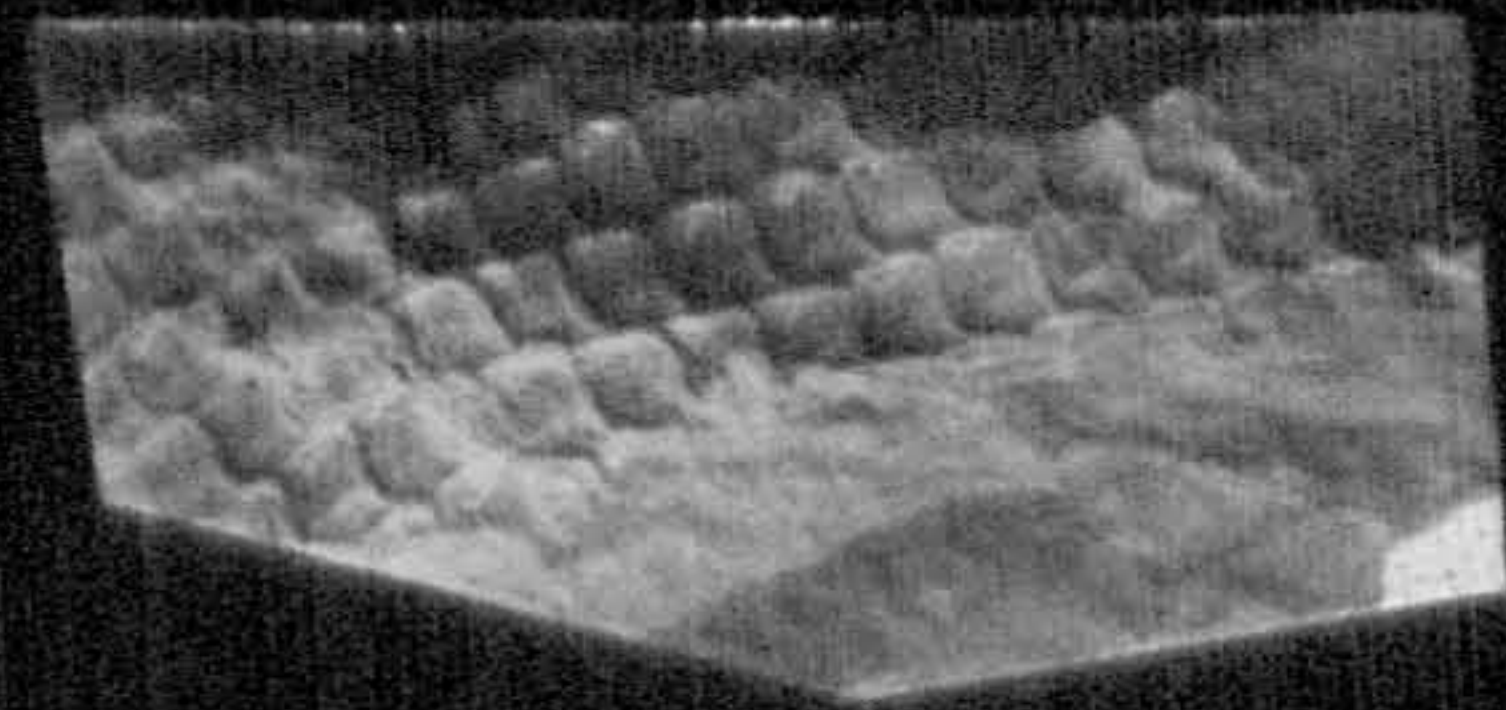


FIG. 7. LEPIDODENDRON LORICATUM, ARB. (FORS.)

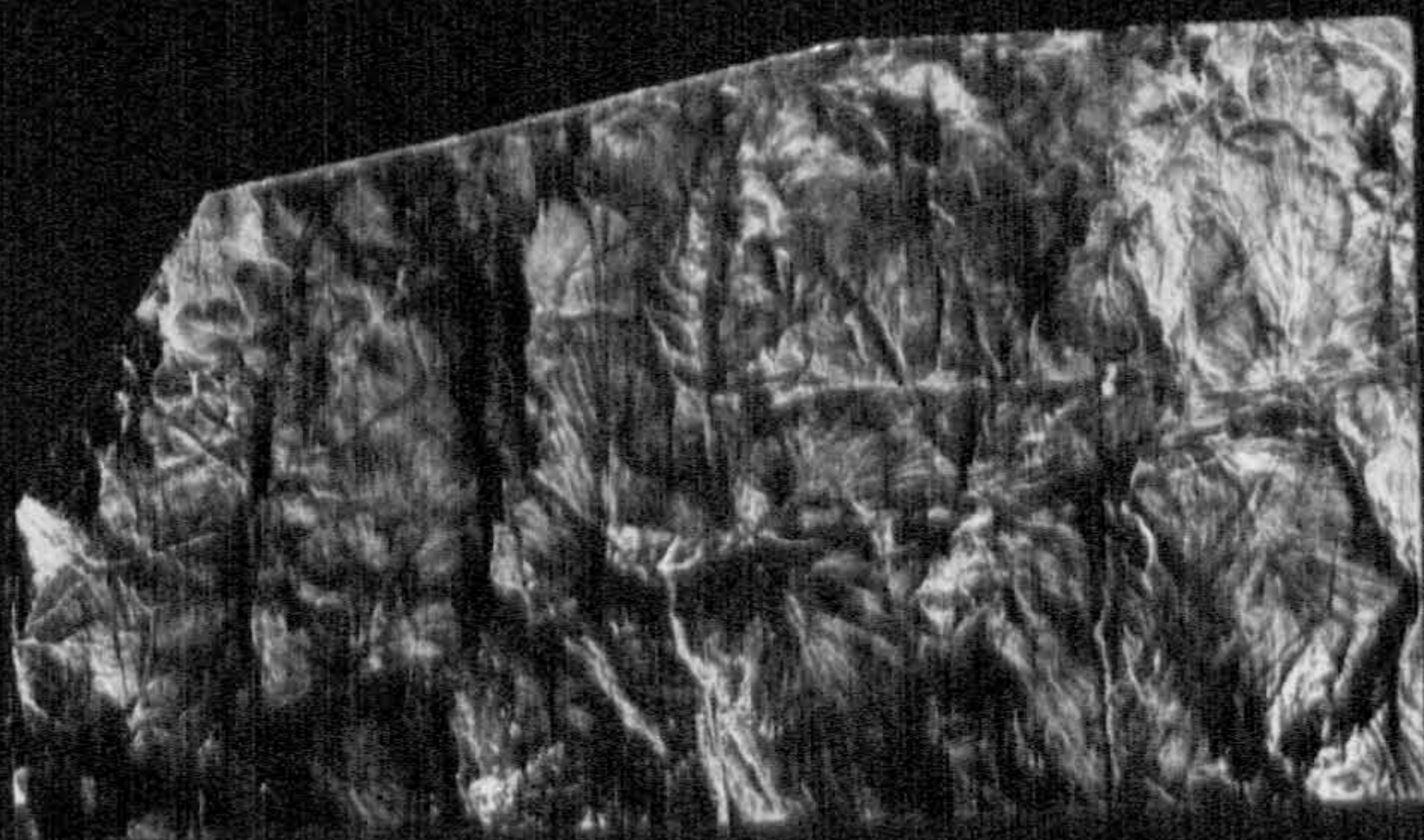


FIG. 8. NEUROPTERIS SP.

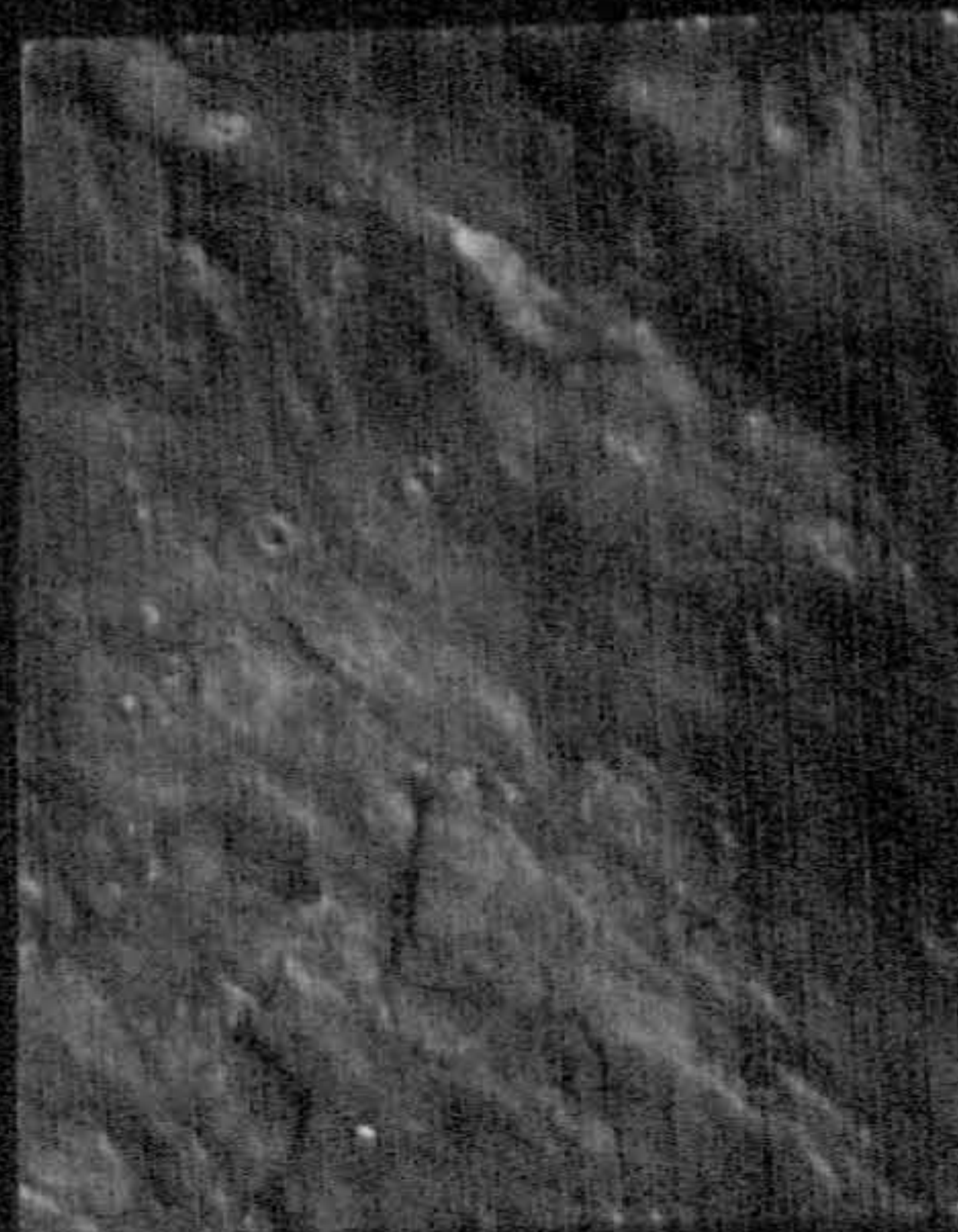
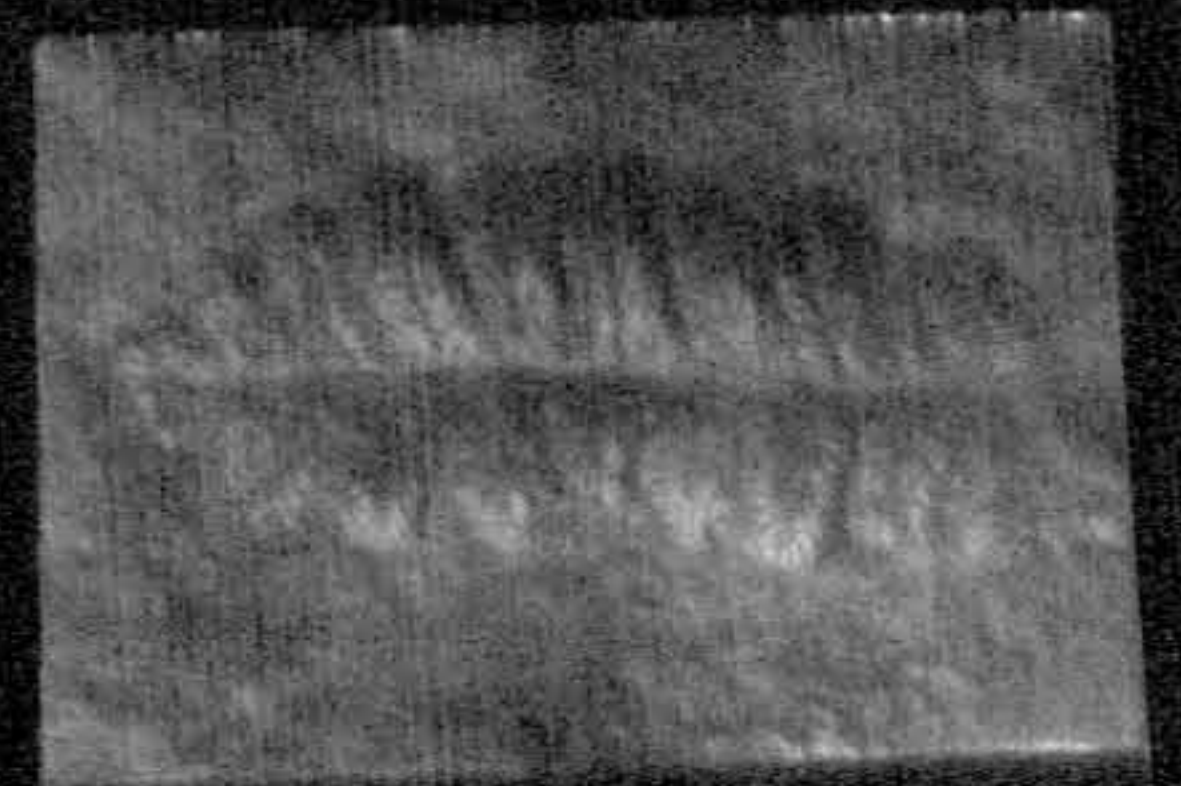


FIG. 9. STIGMARIA MINUTA, GÖPP.



F. 10. PECOP.

OREOPTERIDIA, SCHL. SP.

PLATE XV



FIG. 1. PECOPTERIS SP.

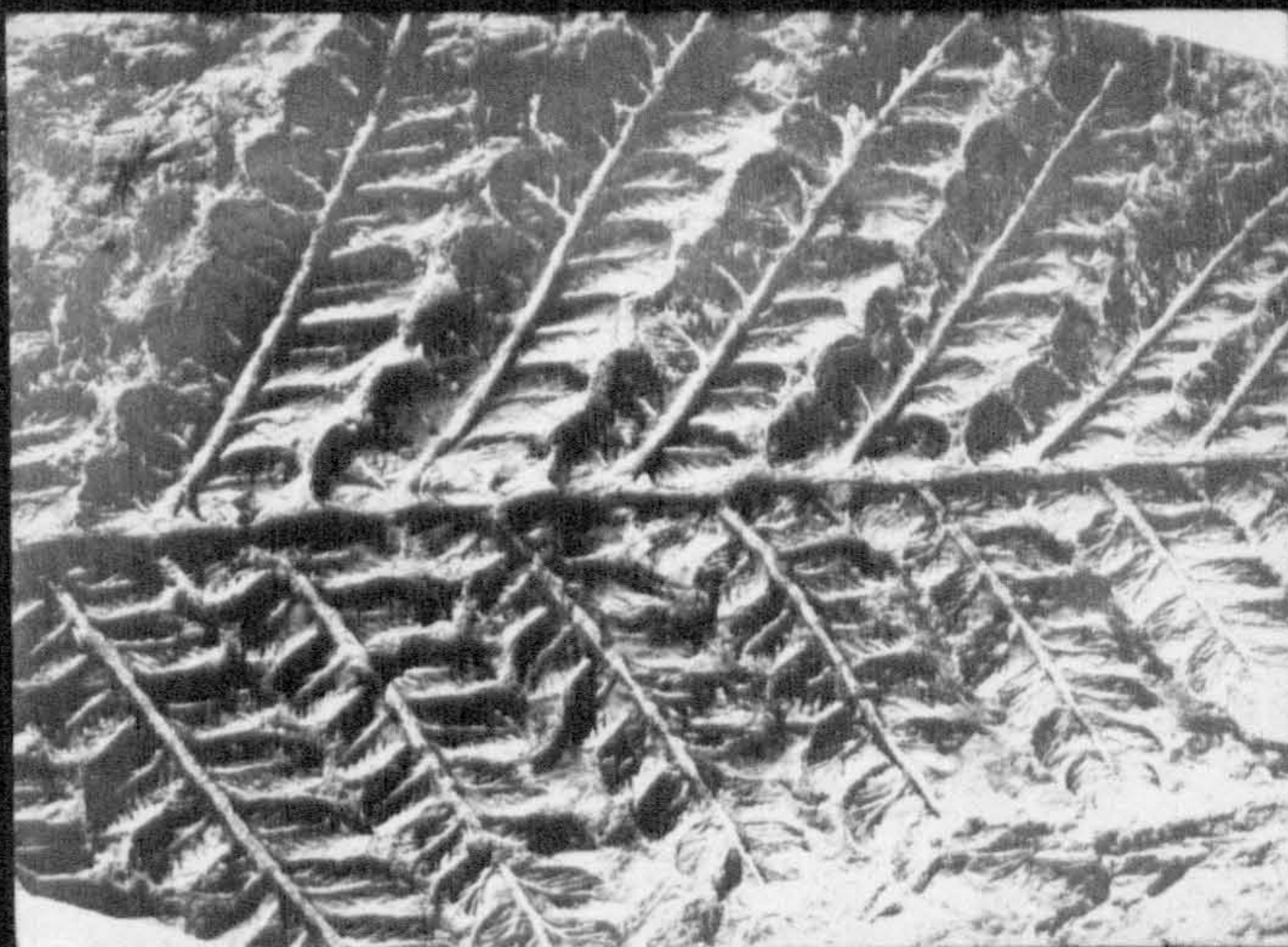


FIG. 2. MARIOPTERIS MURICATA, SCHL. SP.

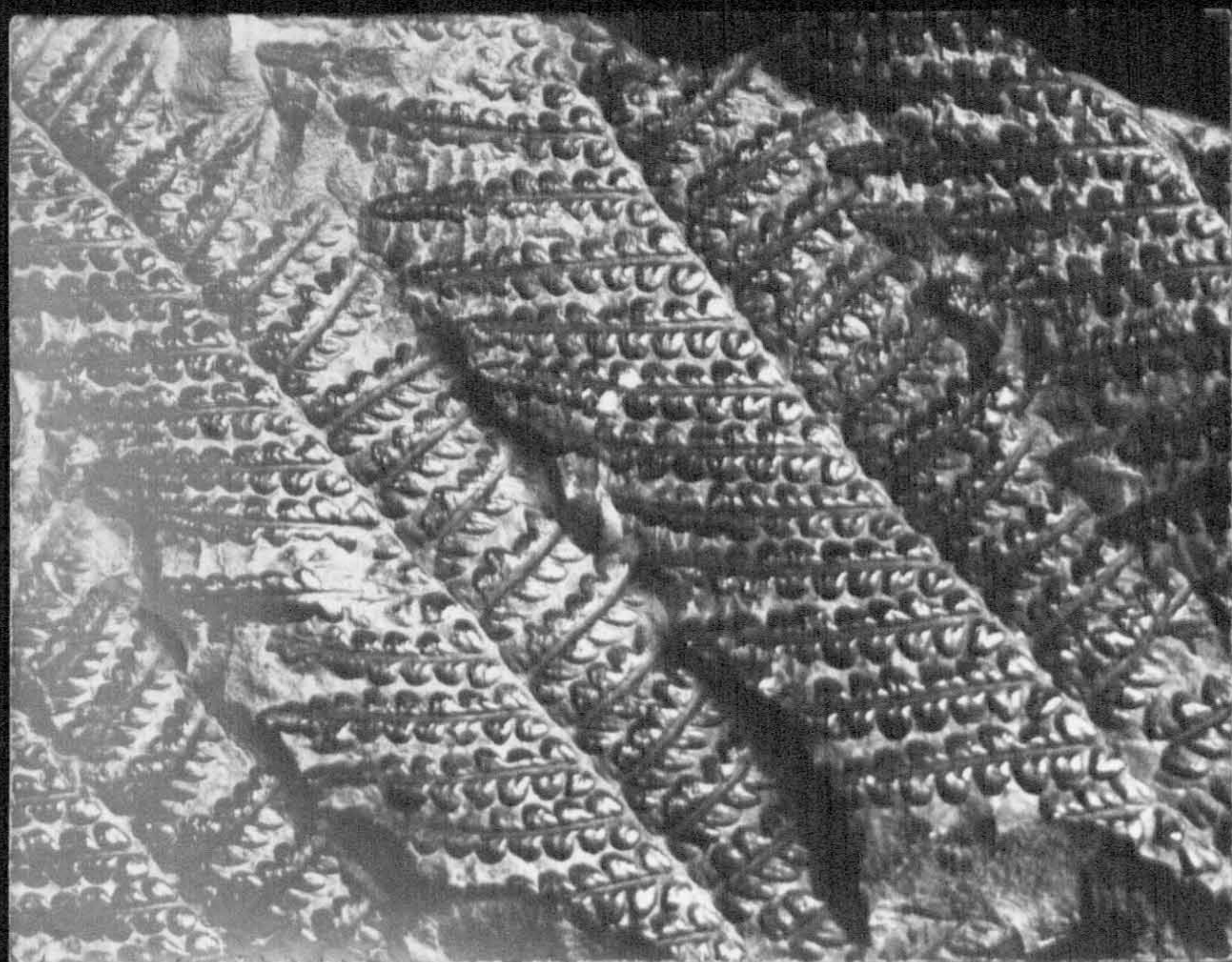
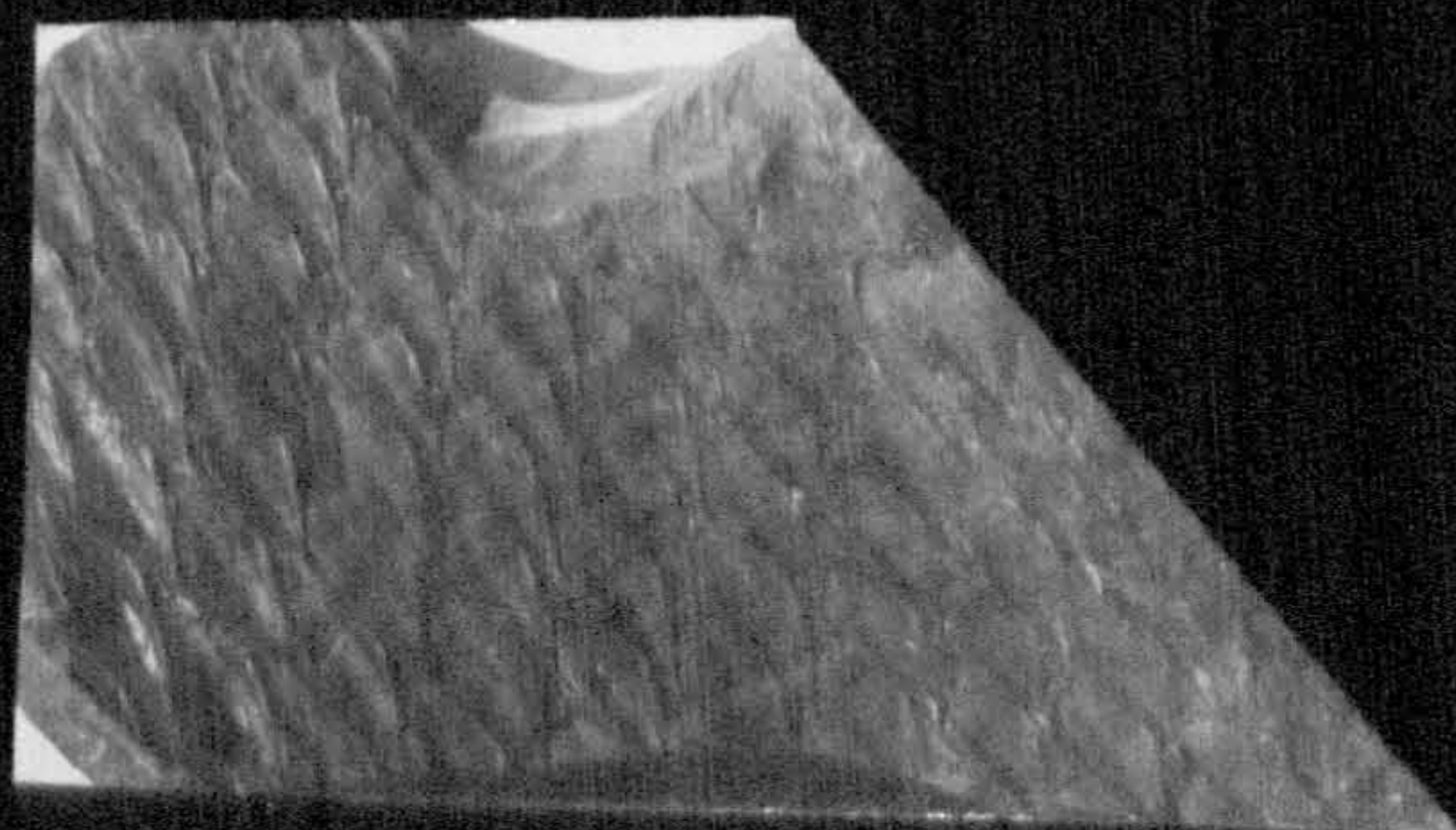


FIG. 3. PECOPTERIS POLYMORPHA, BRONGT.



F. 4. LEPID. LANCEOLATUM, LESQX.

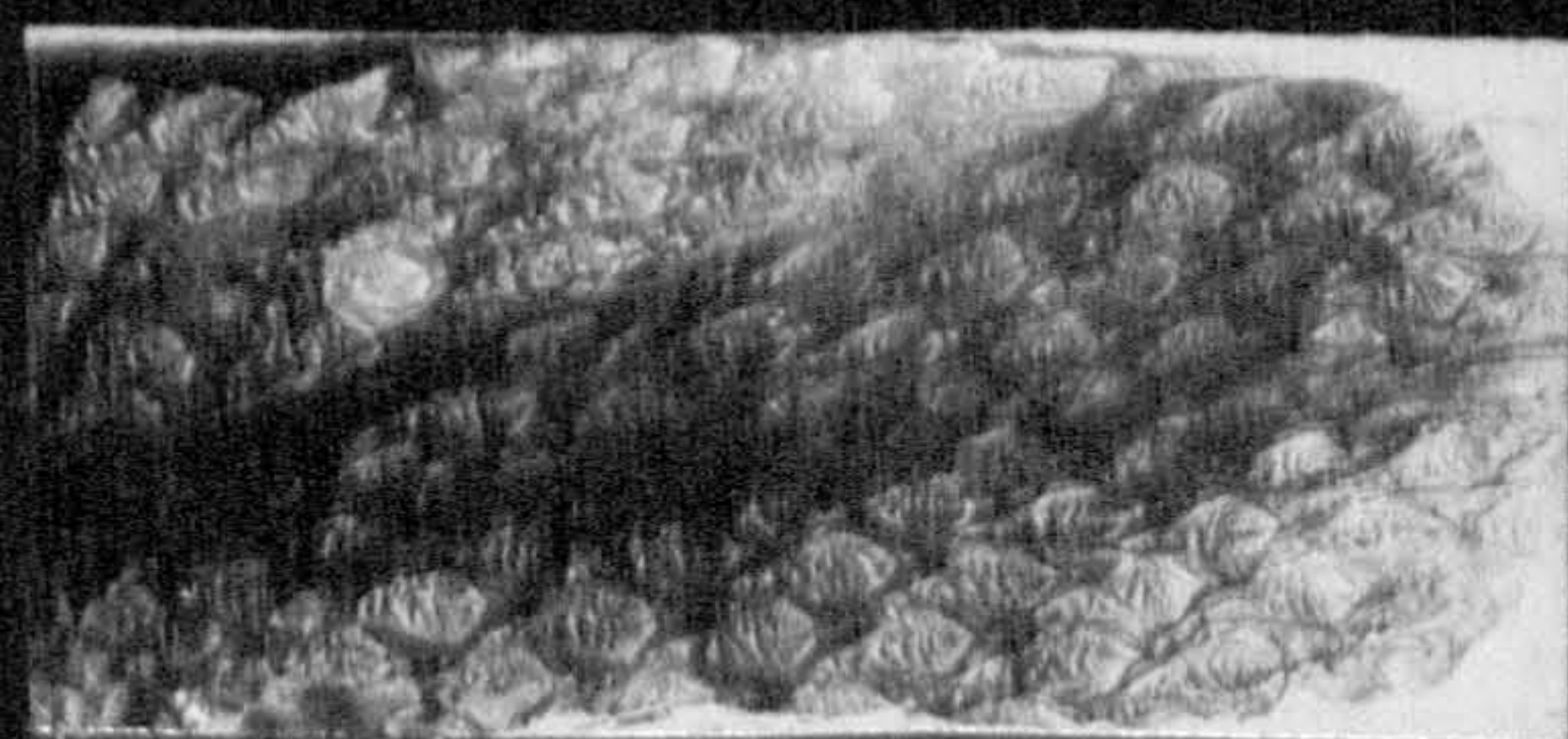
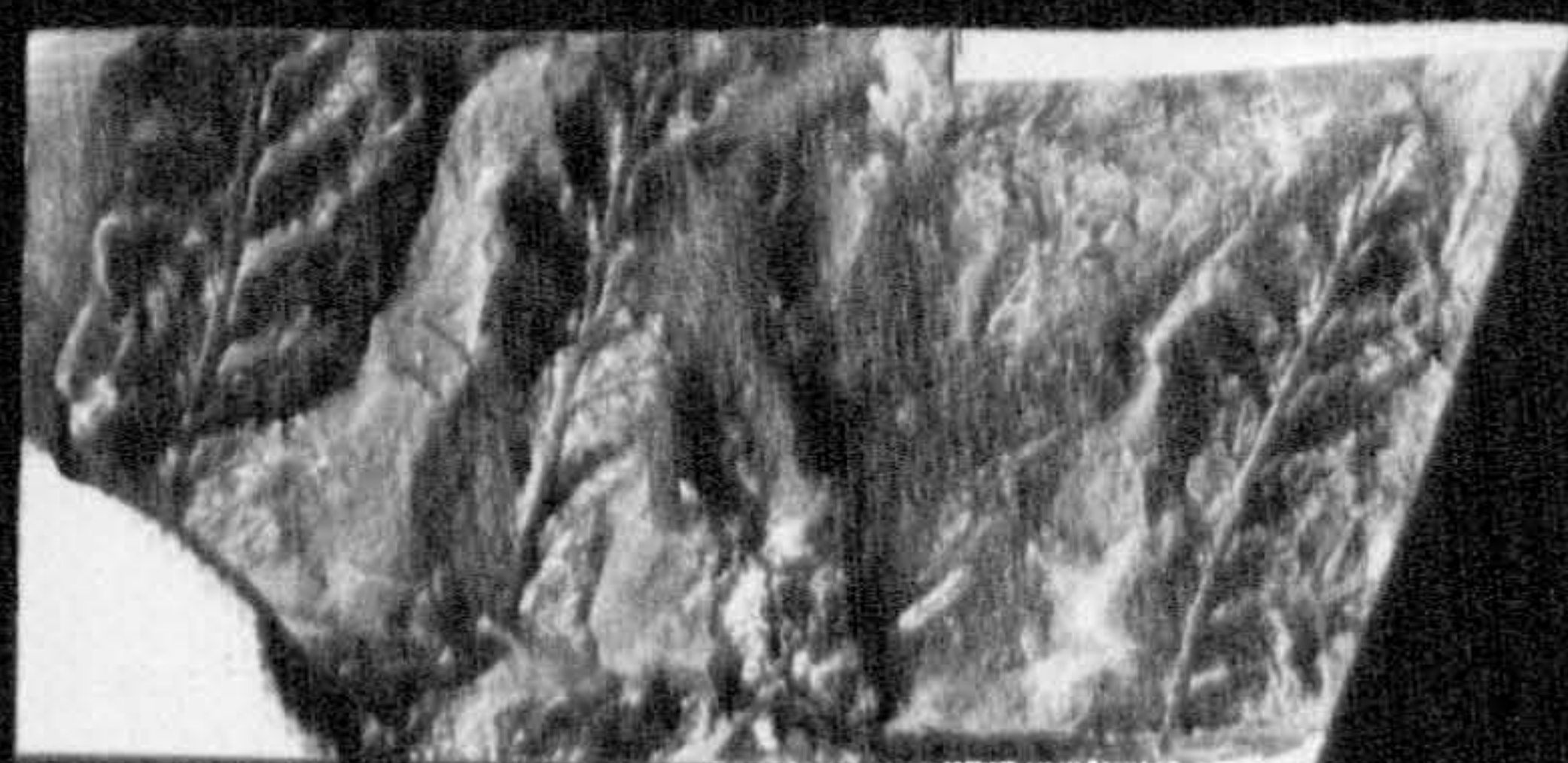
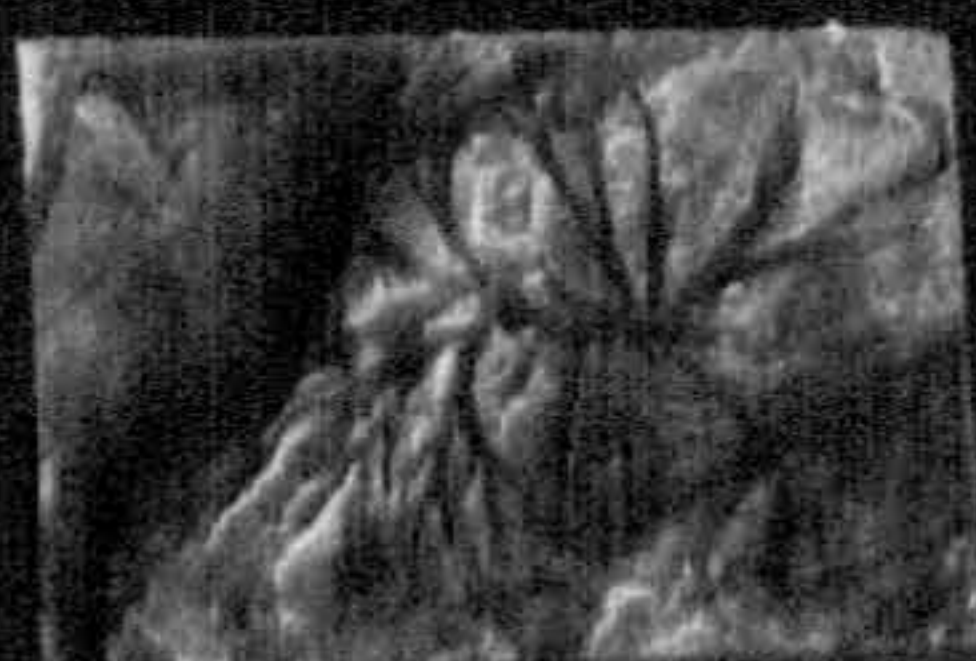


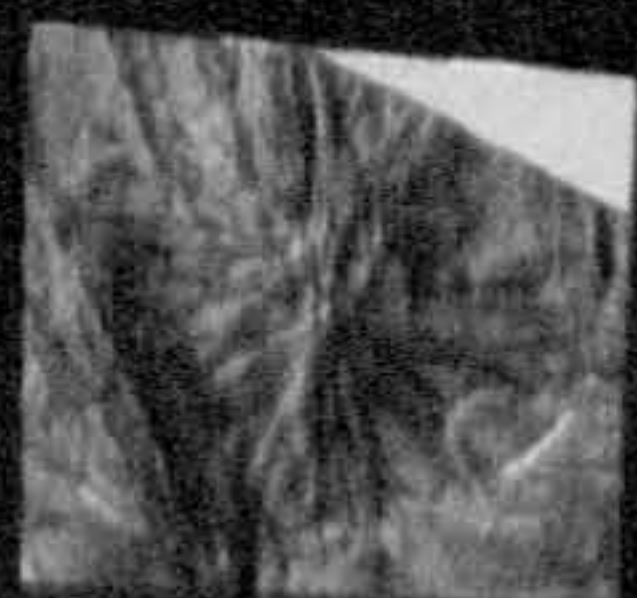
FIG. 5. LEPID. WORTHENI, LESQX.



F. 7. ?OLIGOCARPIA BRONGNIARTI, STUR.



A



B

FIG. 6 A & B. SPHENOPHYLLUM

TRICHOMATOSUM, STUR.

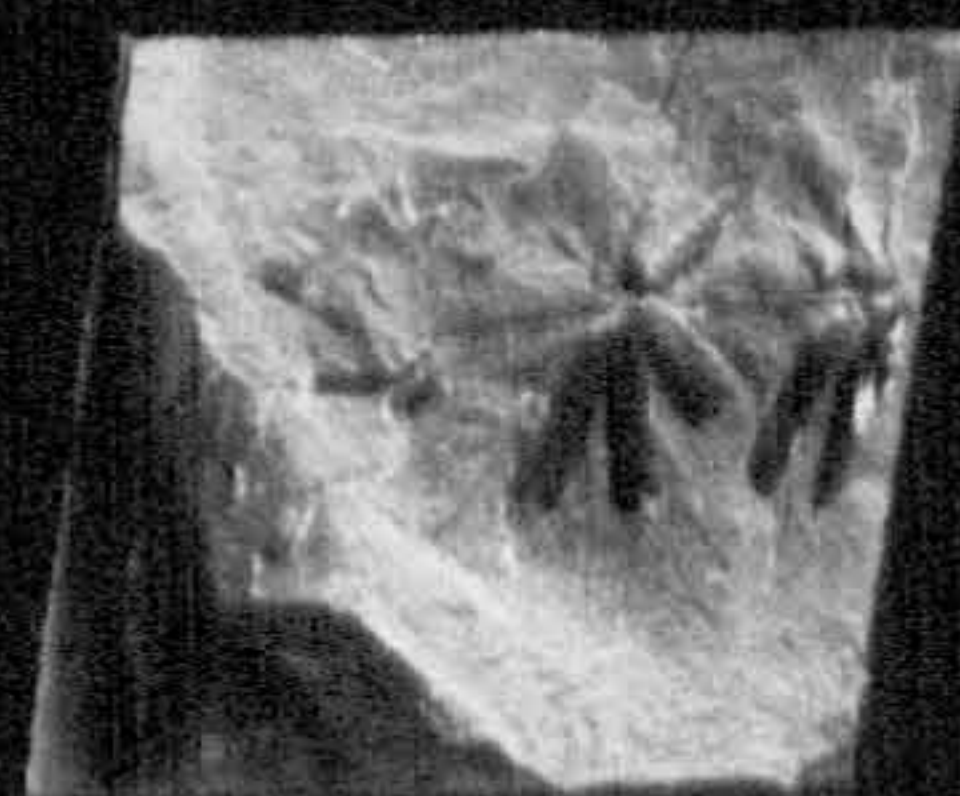
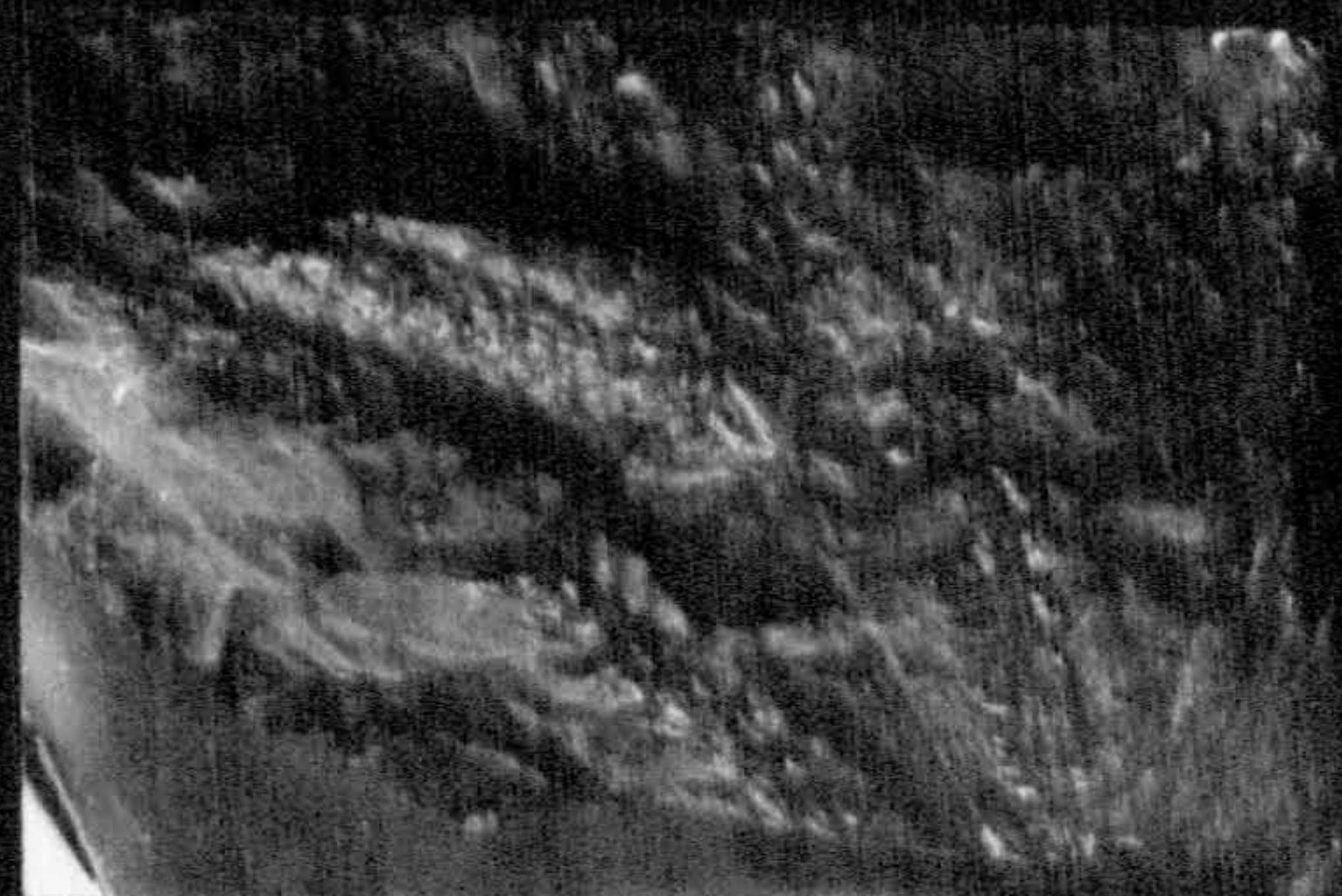


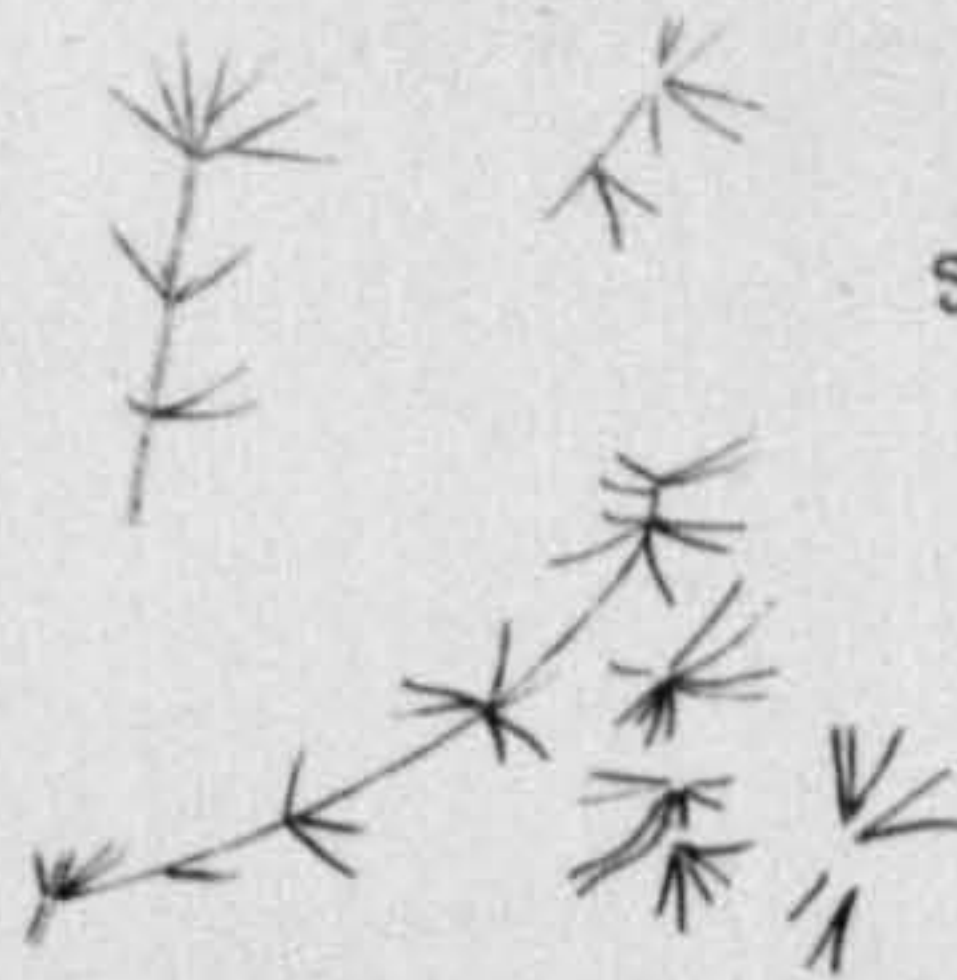
FIG. 8. SPHENOPHYLLUM ?OBLONGIFOLIUM, (GEMM.)



F. 9. PALAEOSTACHYA ?PEDUNCULATA, WILL.



(x 1)
F. I. LEPIDOSTROBUS MINOR
GOODE.



SPHENOPHYLLUM
FASCICULATUM, LESQA.

FIG. 2. (x1).

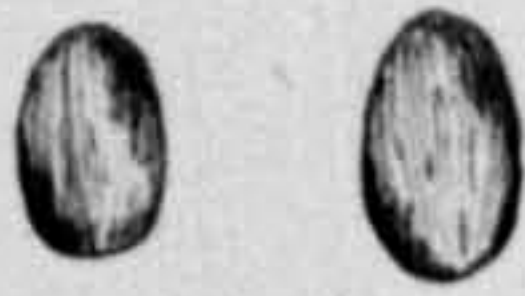


FIG. 3. x 1.

HOLCOSPERMUM MAMILLATUM, LESQA.

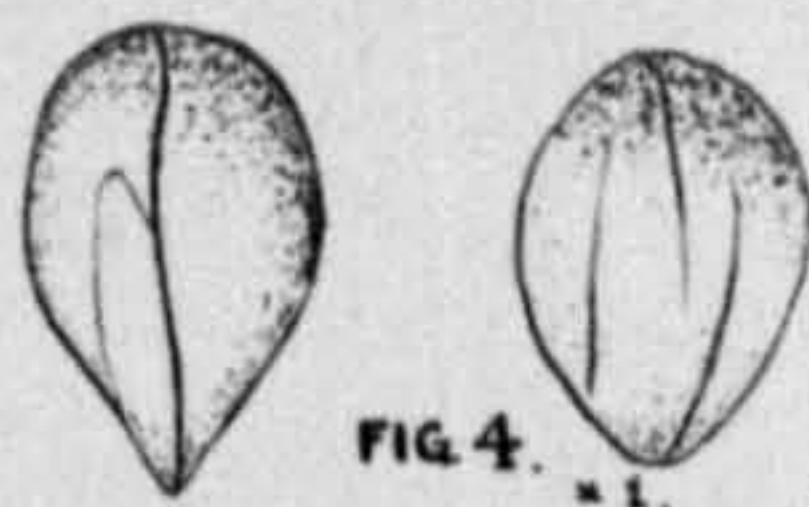


FIG. 4. x 1.

TRIGONOCARPUS PARKINSONI, BROUET.



FIG. 5.

CYCLOPTERIS SP. (x 1)

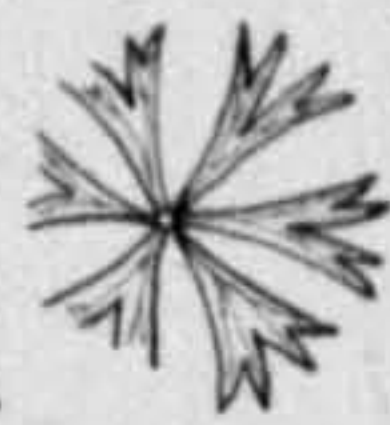


FIG. 6.

SPHENOPHYLLUM CUNEIFOLIUM

var. saxifragæfolium, STERNB.
(x 1).



FIG. 7. x 1.

LEPIDOSTROBUS LANCEOLATUS, L. & H. SP.



FIG. 8.

NEUROPTERIS SCHLEHANI, STUR.

PLATE XVII

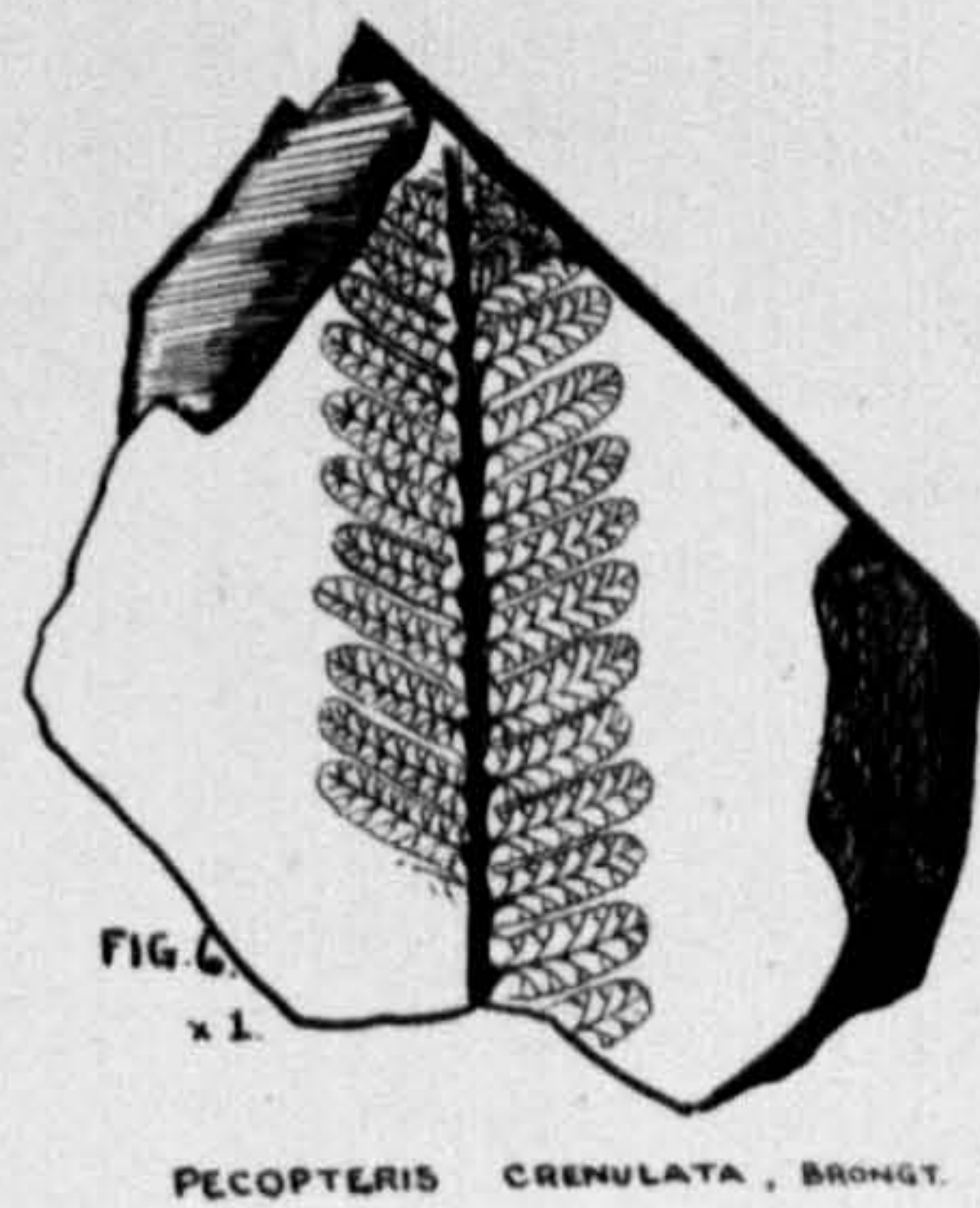
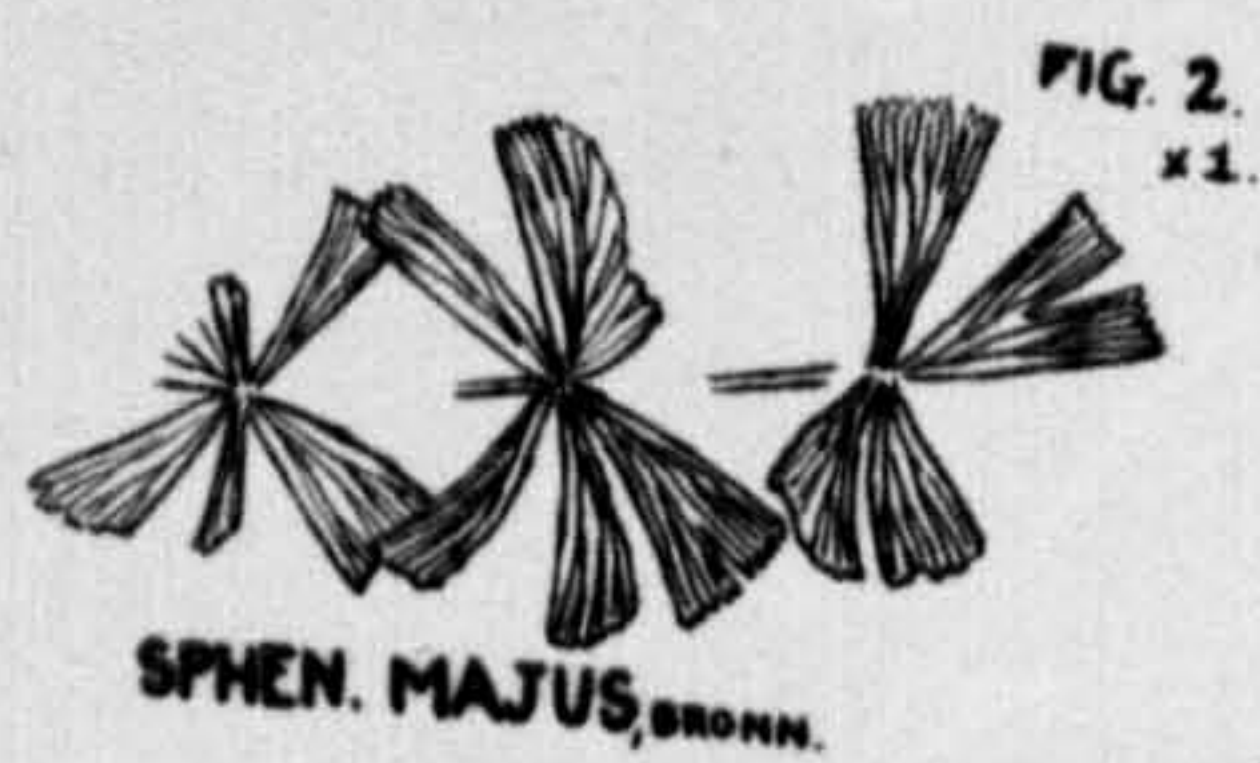
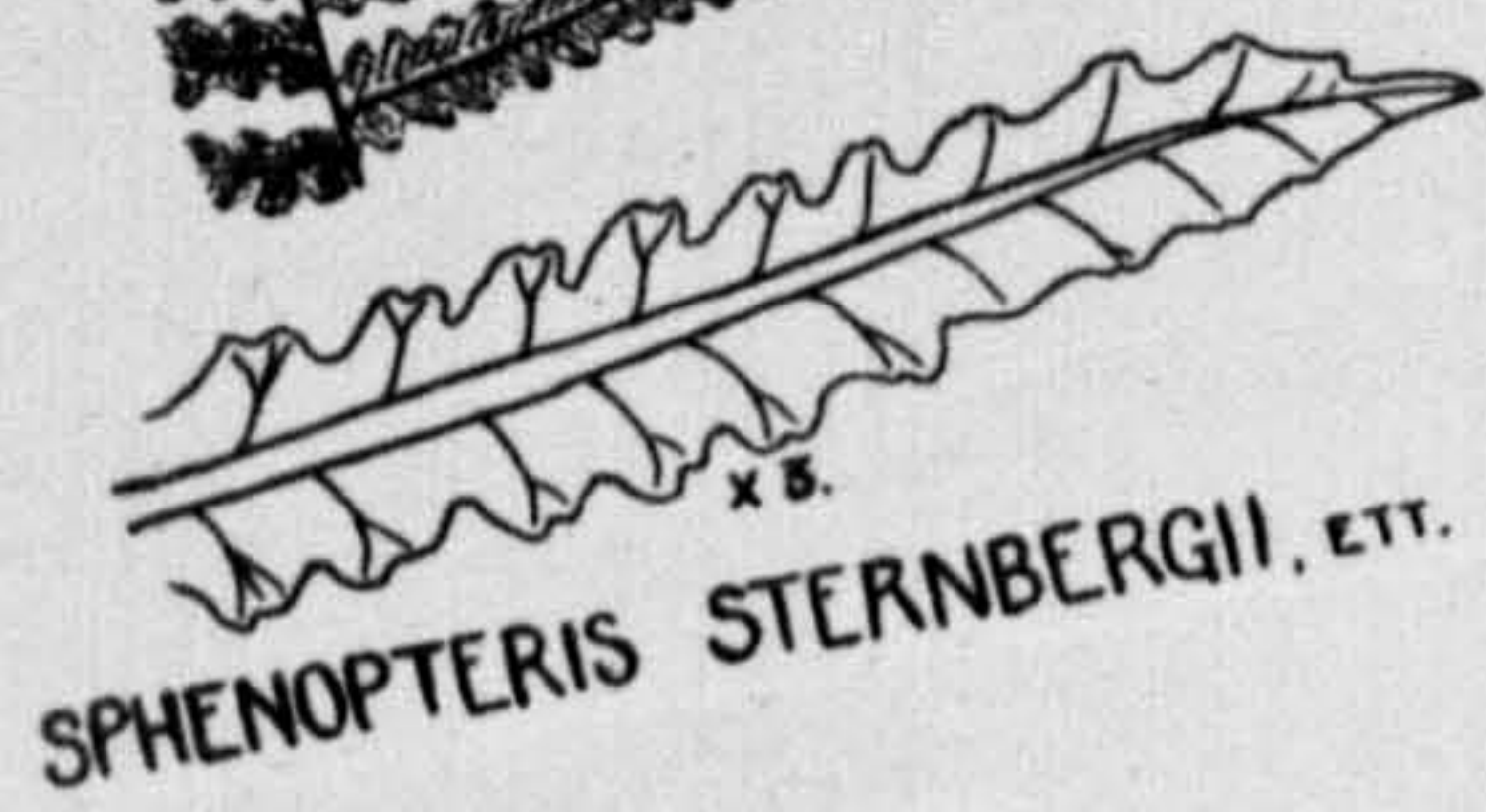
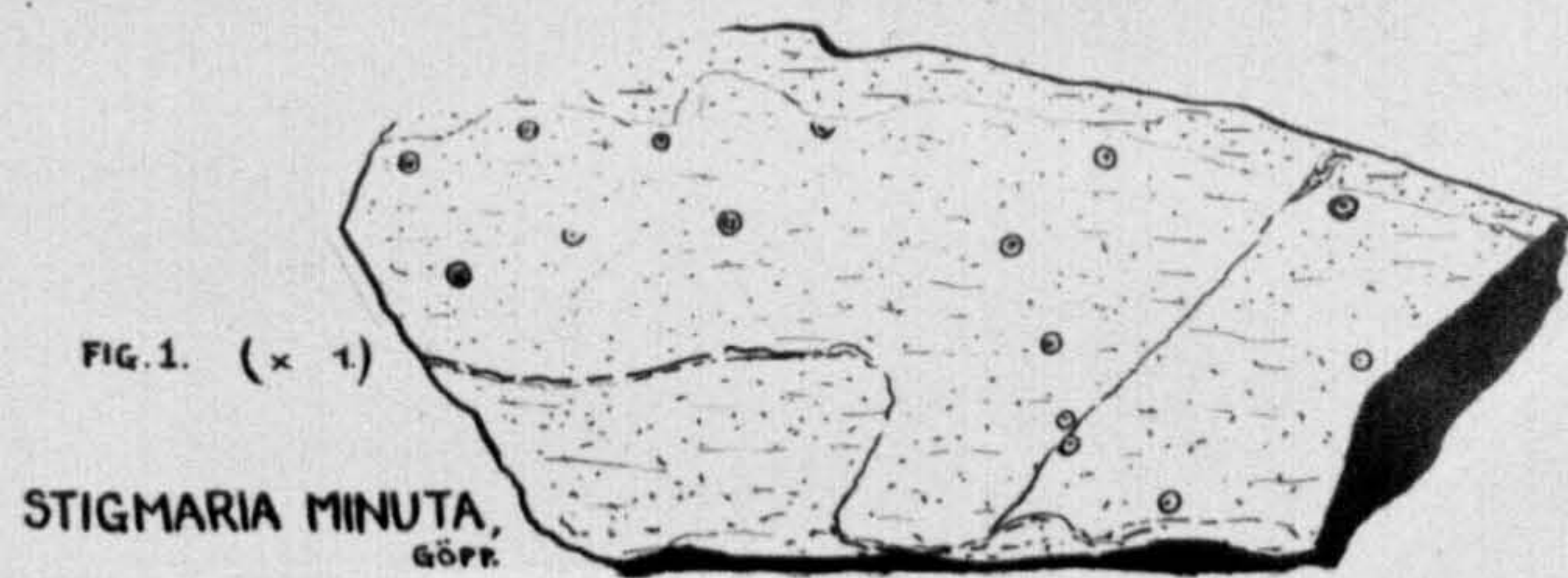


PLATE XVIII

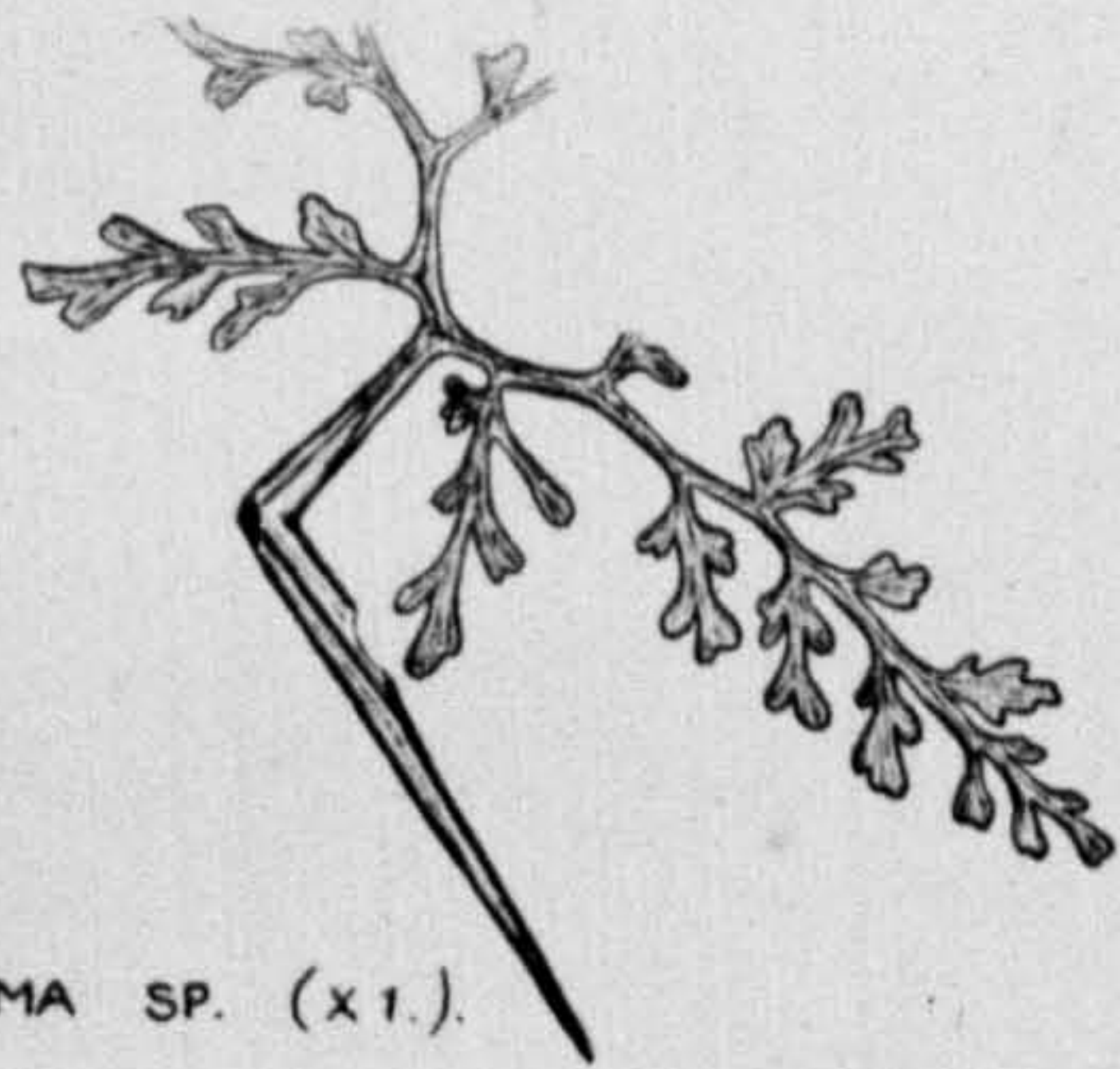


FIG. 1.
DIPLOTMEMA SP. (x 1.)



FIG. 3.
x 1.
LEPIDOSTROBUS MAJUS, BOY. DP.

FIG. 4.
x 1.
L. INCERTUS, LL.

FIG. 5.
x 1.
L. MORISSIANUM, LESQX.

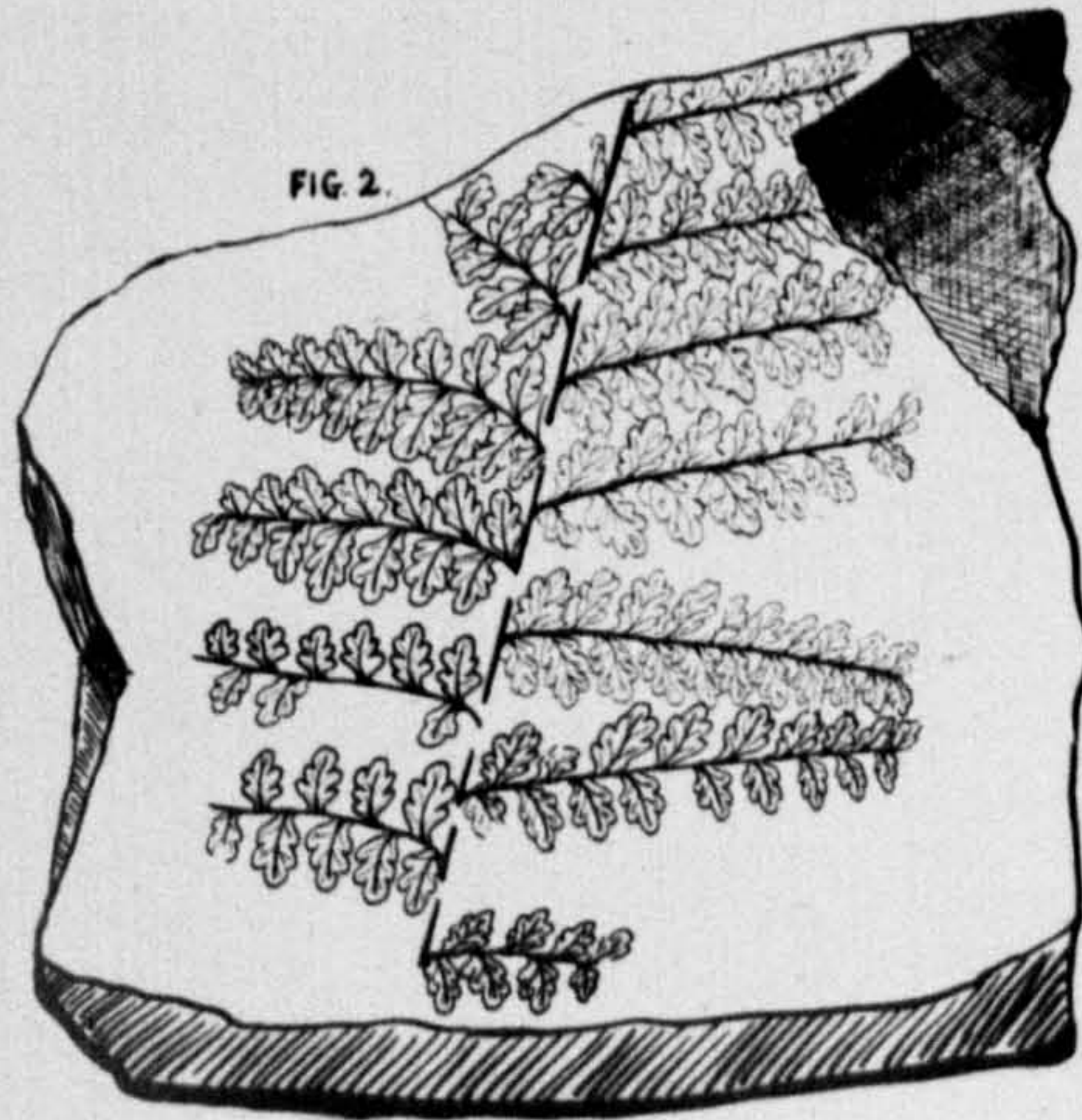


FIG. 2.



FIG. 2A.
x 6.

SPHENOPTERIS SP.