

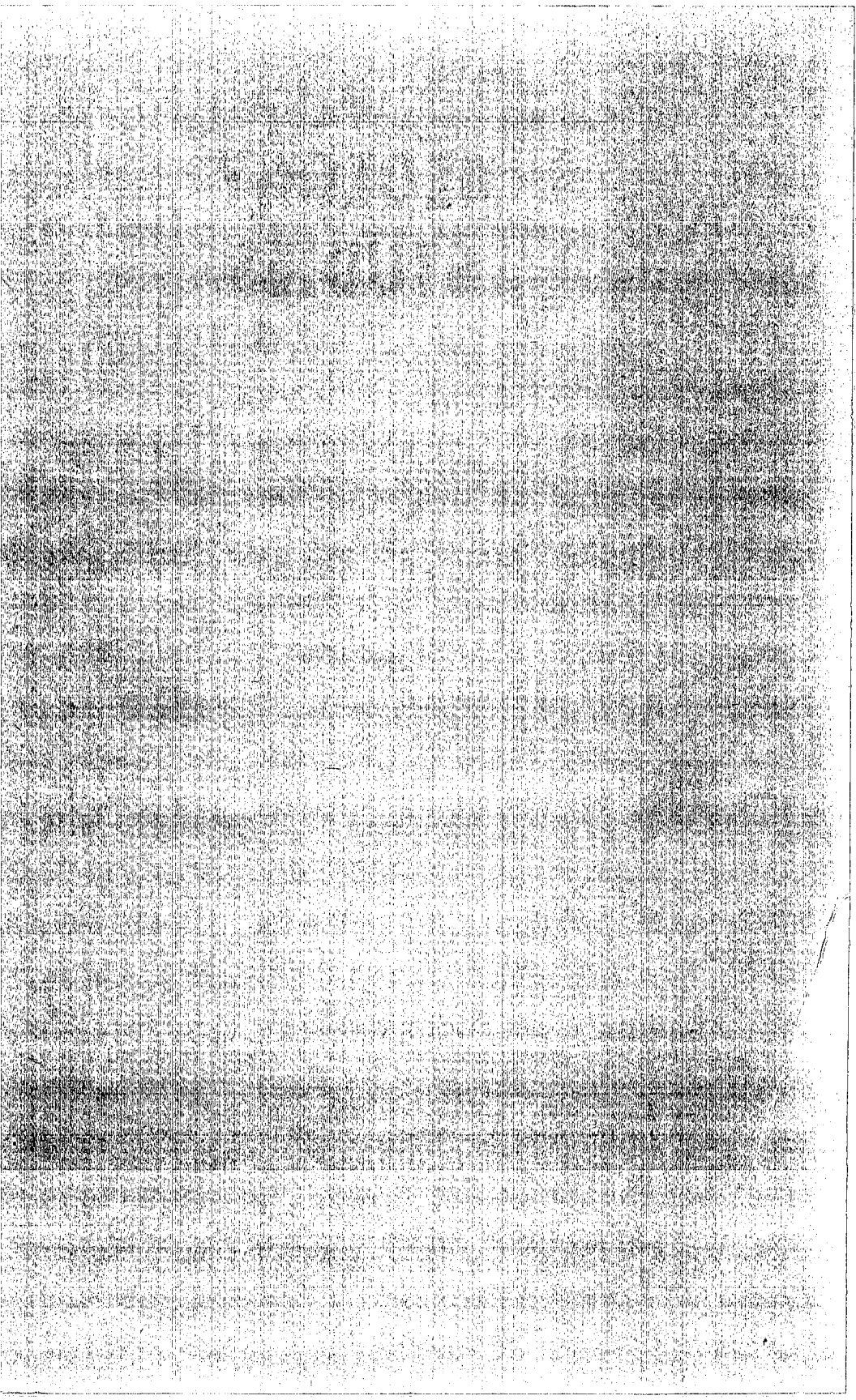
# **GEOLOGY STUDIES**

**Volume 14**

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# *Astralopteris*, A New Cretaceous Fern Genus From Utah and Colorado

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ABSTRACT.—*Astralopteris*, a new fern genus from the Cretaceous Dakota Sandstone of extreme east-central Utah and southwestern Colorado is proposed. The genus, which includes one species, *A. coloradica*, based on *Bolbitis coloradica* Brown, is seemingly most closely related to *Drynaria* (Polypodiaceae) of southeastern Asia.

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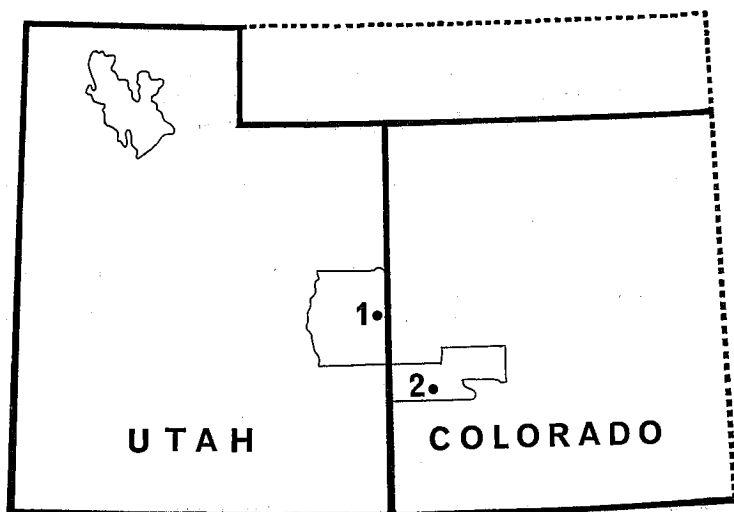
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## INTRODUCTION

In reporting on a Cretaceous flora from the Dakota Sandstone of southwestern Colorado, Brown (1950) included a description of a portion of a sterile fern frond which had been found near Naturita in Montrose County. On the basis of its vegetative characteristics, Brown placed this fern in the modern genus *Bolbitis* Schott (Aspidaceae). From his limited material, the genus *Bolbitis*, as defined from living species, could well have been the proper genus for the fossil fern. In fact, some extant species of *Bolbitis* resemble this fossil, particularly in the basic venation pattern and pinnule shape (Plate 1). Nevertheless, it is difficult to accurately assign any sterile fern specimen to a modern genus without some reservations.

In 1964, James A. Jensen, curator of the Earth Science Museum at Brigham Young University, brought to the attention of one of the authors (Tidwell) a set of fossil plants from eastern Utah. In this collection was a fern pinnule of the fern described by Brown as *Bolbitis coloradica*. During 1967, the authors returned several times to the sites discovered by Jensen and his associates, and uncovered additional fertile specimens as well as abundant sterile material of this fern. The fertile specimens have small, round, soral impressions regularly disposed between the major secondary veins of the pinnule. The sori of this fern are compital, being fed by small anastomosing veinlets which originate from both the midveins and the secondary veins (Plate 5, fig. 2).

The sori of the extant genus *Bolbitis* is considerably different from that described above, as the sori are numerous and spread in a stratum over the entire undersurface of the pinnule with the sori not restricted to the



TEXT-FIGURE 1.—Index map to localities from which *Astralopteris* has been collected from the Dakota Sandstone: 1, near Westwater, Grand County, Utah; 2, near Naturita, Montrose County, Colorado.

veins (Plate 2, fig. 2). In the light of this new evidence, it is clear that the fern in question cannot be assigned to the genus *Bolbitis*, and in fact cannot be placed with any of the Aspidaceae currently known. With this being the case, extant genera having compital sori were examined by Dr. David B. Lellinger of the United States National Herbarium. Lellinger (personal communication, 1967) suggested that our fossil fern most closely resembles species of the extant genus *Drynaria* (Bory) Gaudichaud (Polypodiaceae). The genus *Drynaria* exhibits several characteristics similar to our fossil fern. Most striking in both is the presence of progressively finer series of anastomosing veinlets, and as previously mentioned the truly compital sori. In referring to modern species of this genus, Lellinger indicated that "most of them have deeply pinnatifid fronds with broad fully adnate lobes." However, he pointed out that our fern resembles *D. rigidula* (Schwartz) Bebb in pinna shape, which is a species now found throughout Asia and the Pacific Islands. Nevertheless, the venation patterns are not the same. Lellinger noted that the venation of our fossil material was somewhat (but no exactly) similar to that found in *D. sinica* Diels. However, *D. sinica* lacks pinnate fronds.

The name *Drynaria* has been applied to fossil fern material by Bayer (1899) who described three new species of *Drynaria* and transferred the monotypic *Lambertiaphyllum durum* Velen. to this genus. Harris (1961) has questionably placed all of these *Drynaria* species under *Phlebopteris dunkeri* (Schenk) Schenk. He thus suggests that these species described by Bayer under *Drynaria* do not appear to be drynariad, but rather exhibit the features of Matoniaceae. Whether this placement is specifically valid will be discussed at a later time.

Upon consideration of the above, the authors propose the following new genus.

ASTRALOPTERIS Reveal, Tidwell & Rushforth, gen. nov.

*Description*.—Fronde pinnata ambitu ovata; rachis crassa; pinnulae infirmae longae, superiores semisim breviores, lamina coriaceis, linearo-lanceolatis, basi rotundis, apices acutis, margine integris; venae numerosum, venis divaricatis, bis bifurcatis (raro trifurcatis) ad apicibus, venulis anastomosis; sori serialis, interveni, sori non de principalis venis, pinnulae cicatricibus sori rotundis et parvulus. Typus: *Astralopteris coloradica* (Brown) Reveal, Tidwell & Rushforth.

*Discussion*.—The name *Astralopteris* is derived from the Greek "astralos" which means spotted with stars or speckled and "pteris" which means fern, in allusion to the spotted characteristic of the sori as opposed to the soral disposition of the genus *Bolbitis* where the species had previously been placed.

ASTRALOPTERIS COLORADICA (Brown)

Reveal, Tidwell & Rushforth, comb. nov.

Pl. 2, fig. 1; Pl. 3, figs. 1-3; Pl. 4, figs. 1-4; Pl. 5, figs. 1-3; Pl. 6.

1950 *Bolbitis coloradica* BROWN—U. S. Geol. Surv. Prof. Paper 231-D, p. 49, pl. 12, figs. 6, 7.

*Description*.—Pinnae incomplete, large, ovate, tapering to rather acute apices; pinnules coriaceous, pinnate, alternate to opposite on rather stout rachises, the large lower pinnules linear-lanceolate, about 7-12 times as long as broad, with entire margins tapering to acute or acutely rounded apices, margins constricted at the base with sessile to short-stalked attachments, the small upper pinnules similar to the lower ones, only 4 to 5 times as long as broad, complete basal attachments and rounded sinuses in the uppermost pinnules; midveins prominent, arising decurrently from the rachis, extending to the pinnule apices; lateral veins numerous, arising acutely and then becoming nearly at right angles to the midvein (or divaricate) for nearly their entire length, simple for  $\frac{1}{2}$  to  $\frac{3}{4}$  or more of their length then usually bifurcating two or three times (or rarely trifurcating at the first fork), ultimate veins finer; veinlets anastomosing, extremely fine and often obscure; sori compital, round, arranged in a linear row on both sides of the midvein between the main lateral veins, located about  $\frac{1}{5}$  to  $\frac{1}{4}$  the distance from the midvein to the margin; spores not known.

*Occurrence*.—Known from near Naturita, Montrose County, Colorado, and from near Westwater, Grand County, Utah.

*Repository*.—Brigham Young University, BYU 1415-1422.

#### Acknowledgments

The authors would like to acknowledge the assistance of Dr. David B. Lellinger, Division of Ferns, Department of Botany, United States National Herbarium of the Smithsonian Institution in Washington, D.C., who provided critical loan material of the extant *Bolbitis* and made several helpful suggestions on the placement of the genus *Astralopteris*. The illustrations were prepared by Twila D. Bird, illustrator for the Department of Botany, Brigham Young University. Partial support for this study was obtained from Brigham Young University Research Grant 115-77-482 to Dr. William D. Tidwell.

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 Harris, T. M., 1961, The Yorkshire Jurassic Flora I. Thallophyta-Pteridophyta: British Museum (Natural History), London, p. ix-212.

Manuscript received November 1, 1967.

## EXPLANATION OF PLATE 1

REPRESENTATIVE SPECIMEN OF THE EXTANT *BOLBITIS*

*Bolbitis maerophylla* (Kunze) Maxon & Morton. Fertile pinnae (ca. 1/3x).

## EXPLANATION OF PLATE 2

SHAPE AND VENATION OF *ASTRALOPTERIS* AND *BOLBITIS*

- FIG. 1.—*Astralopteris coloradica* (Brown) Reveal, Tidwell & Rushforth. Sterile pinnae (1x). BYU 1415.  
 FIG. 2.—*Bolbitis maerophylla* (Kunze) Maxon & Morton. Fertile pinnule. Note the scattered sori (1x).

## EXPLANATION OF PLATE 3

STERILE AND FERTILE PORTIONS OF *ASTRALOPTERIS*

- FIGS. 1-3.—*Astralopteris coloradica* (Brown) Reveal, Tidwell & Rushforth. 1. Portion of sterile pinnae. Note the opposite pinnule attachment (1x). 2. Portion of sterile pinnule (4x). BYU 1417. 3. Portion of fertile pinnule (4x). BYU 1418.

## EXPLANATION OF PLATE 4

STERILE PORTIONS OF *ASTRALOPTERIS*

- FIGS. 1-4.—*Astralopteris coloradica* (Brown) Reveal, Tidwell & Rushforth. 1. Portion of sterile pinnule. Note the progressively finer anastomosing veinlets (10x). BYU 1419. 2. Pinnae apex (1x). BYU 1420. 3. Portion of sterile pinnae (1x). 4. Portion of sterile pinnae. Note the pinnule shape (1x). BYU 1422.

## EXPLANATION OF PLATE 5

ILLUSTRATIONS OF THE APEX AND SORATION OF *ASTRALOPTERIS*

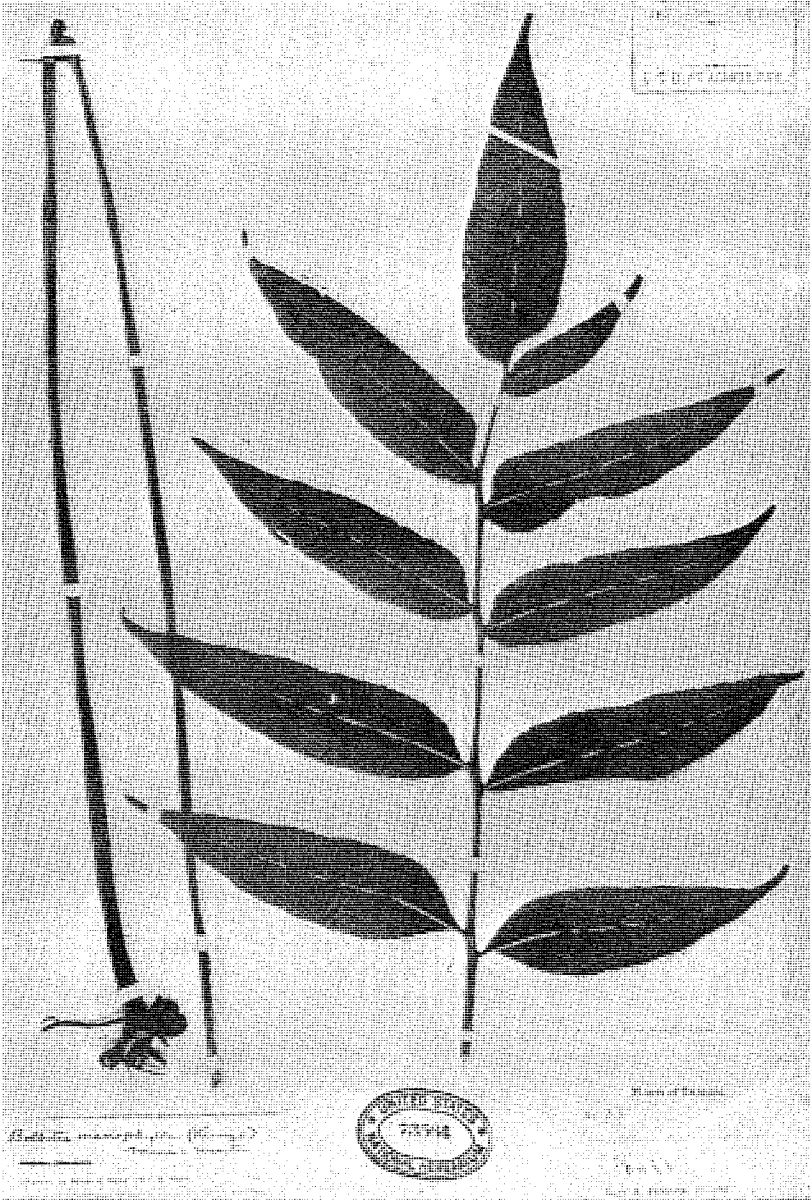
- FIGS. 1-3.—*Astralopteris coloradica* (Brown) Reveal, Tidwell & Rushforth. 1. Drawing of pinnae apex. Note the rounded sinuses of the upper pinnules and the gradation from opposite to alternate pinnule attachment (1x). 2. Enlarged drawing illustrating the compital soriation. Redrawn from a sketch prepared by Mrs. G. B. Threckeld of the United States National Herbarium (10x). 3. Enlarged drawing illustrating sori position on the pinnule (2x).

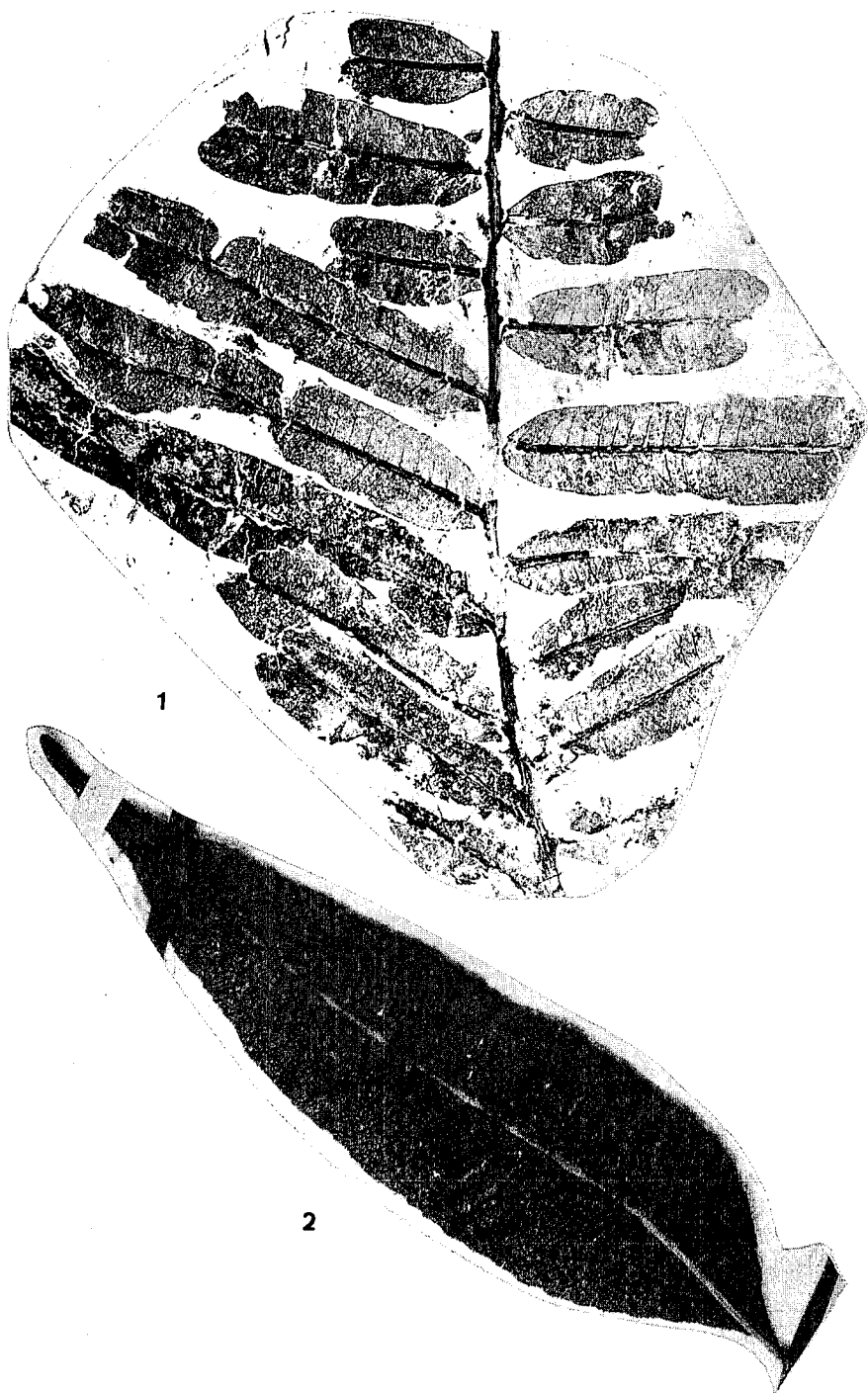
## EXPLANATION OF PLATE 6

ILLUSTRATION OF STERILE PINNAE OF *ASTRALOPTERIS*

- Astralopteris coloradica* (Brown) Reveal, Tidwell & Rushforth. Drawing of sterile pinnae illustrating shape and attachment of pinnules (1x).

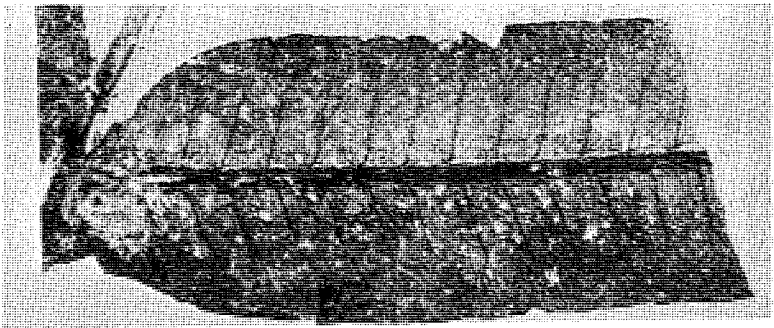




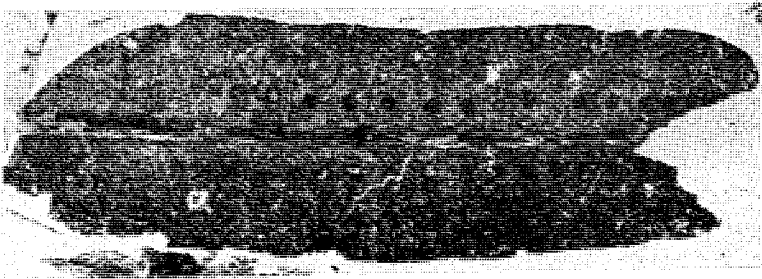


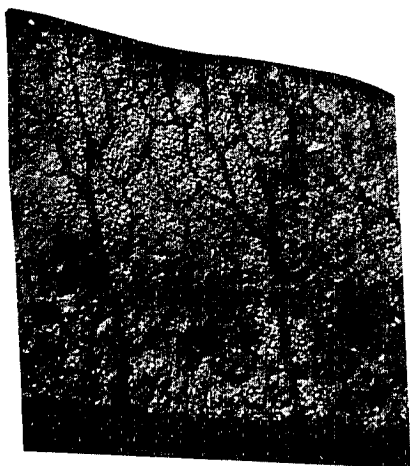


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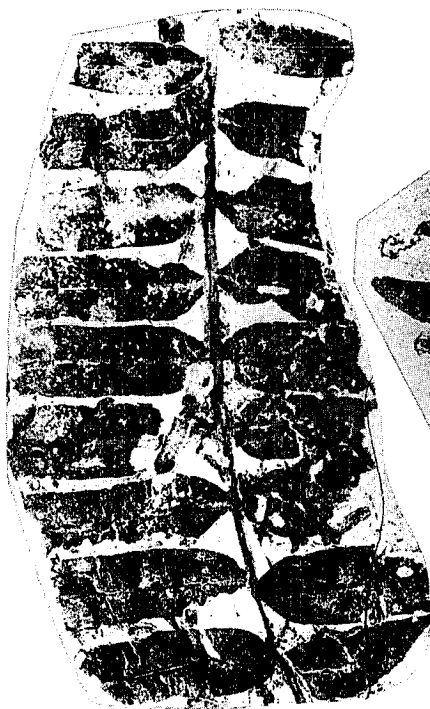




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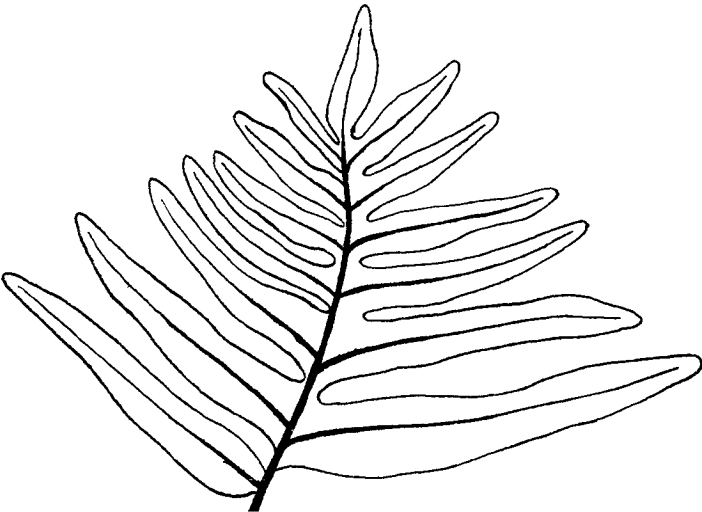
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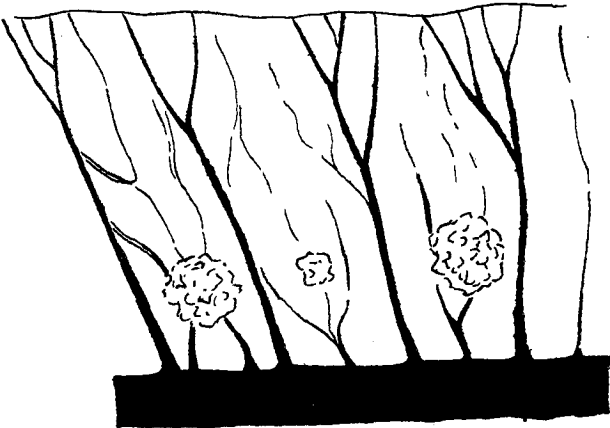
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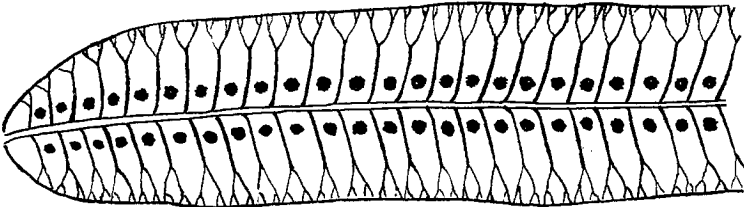
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