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EARLY PENNSYLVANIAN PALEOGEOGRAPHY OF AN UPLAND AREA WESTERN ILLINOIS USA

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RÉSUMÉ. — An exposure of the Devonian-Pennsylvanian unconformity on the northwest edge of the Illinois Basin allows study of both the stratigraphy and paleobotany. Quarries and subsurface data in the Rock Island, Illinois, area reveal an essentially flat erosional surface developed on Devonian limestone and overlain by lower Pennsylvanian rocks. In one quarry a channel eroded in the limestone and filled with fossil-bearing shale was exposed. More than 25 genera of plants have been collected, providing data on the plants growing on the uplands during early Pennsylvanian time.

ACKNOWLEDGEMENTS

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PREVIOUS WORK

Local occurrences of plant fossils in western Illinois have been known since the late 1800's (WORTHEN, 1873). In 1907, D. WHITE examined several localities in this area and, in a brief report, published a list of 14 fossil plant genera observed (Table 1) (WHITE, 1908). Later he stated that these plants represent an upland environment (WHITE, 1931).

WANLESS (1932) discussed the basal Pennsylvanian sedimentation in the Rock Island region. However, most studies have concentrated on the deeper part of the Illinois Basin whereas the pre-Pennsylvanian surface of the margin has only been occasionally mapped as part of general studies of the basin (SMITH, 1941; WANLESS, 1955).

TABLE 1

Archaeopteris stricta.
Alethopteris lonchitica var.
Sphenopteris sp.
Lesleya grandis.
Danaeites sp.
Neuropteris neuropteroides.
Lacoeia sp.
Cardiocarpon n. sp.
Cheilanthites Cheathami var.
Mariopteris inflata.
Aloiopteris gracillima.
Megalopteris Southwelli.
Asterophyllites erectifolius.
Whittleseya elegans.

Early Pennsylvanian flora of western Illinois as given by D. WHITE (1908, p. 269). Spellings are those of WHITE.

In 1966 a small exposure of plant-fossil-bearing strata was discovered in Brown County, Illinois, and represents a lower Pennsylvanian Namurian C - Westphalian A) upland flora (LEARY, 1973, in press; LEARY and PFEFFERKORN, in preparation). This flora is preserved in shale, siltstone and sandstone which fills a ravine eroded in Mississippian limestone.

During the summer of 1973, quarry operations exposed a lower Pennsylvanian upland

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Fig. 1. — Tectonic map showing the relation of the report area to regional structural features. Base map from Illinois State Geological Survey.

flora in Rock Island County, Illinois, 150 km. north of Brown County. The flora and the encompassing geology of this exposure are the subjects of this report.

LOCATION

The site is located in the quarry of the Allied Stone Company on Vandruff Island in the Rock River between Milan and Rock Island, Illinois (SE 1/4 Sec 15, T17N, R2W). It is situated on the northwestern edge of the Illinois Basin and the eastern flank of the Mississippi River Arch (Fig. 1).

GEOLOGY

In the American midcontinent, Pennsylvanian strata overlie rocks ranging in age from Mississippian to Ordovician. In the Illinois Basin the underlying rocks are predominantly Chesterian (Mississippian = upper Visean — lower Namurian). Along the western margin of the basin Pennsylvanian rocks overlie Mississippian (lower Visean) rocks in the central part and Devonian rocks to the north. In Rock Island County the Pennsylvanian Caseyville Fm. (upper Namurian—lower Westphalian) overlies the Cedar Valley Limestone (Devonian) (Fig. 2).

Several limestone quarries in the Rock Island area reveal a relatively flat erosional surface developed on Devonian limestone (Figs. 3, 4). The limestone strata are essentially horizontal, dipping only slightly south-

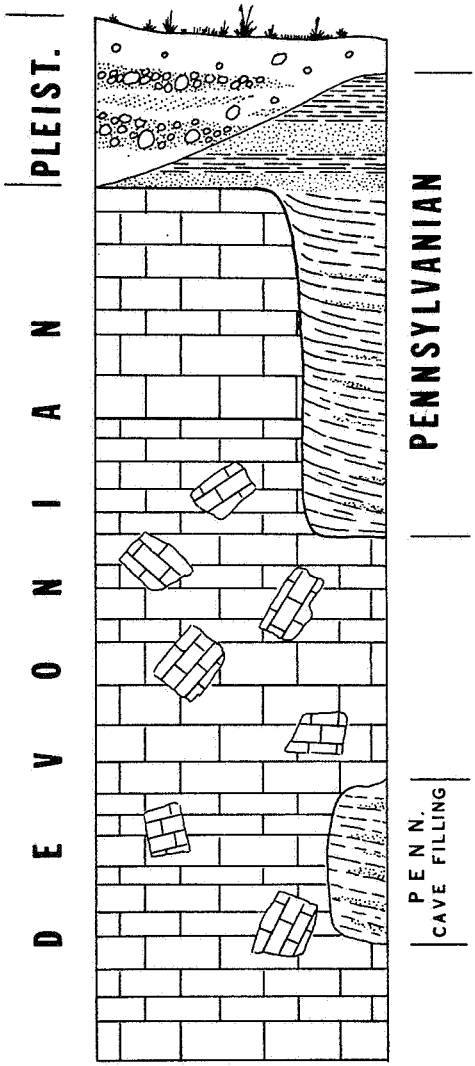

Fig. 2. — Stratigraphic section exposed in the Allied Stone Company quarry.

east, although some minor structures are present (Fig. 4). Exposed in several quarries are steep-sided channels cut into the limestone. These are 6 to 12 meters wide and 3.5 to 6 meters deep. In general, the bottoms of the channels are flat (Fig. 5).

The channels are filled with gray mudstone/shale with irregular lenses and thin beds of clean white quartz sandstone. The bedding of the shale is usually even but sometimes irregular, especially where associated with sand lenses. Scour and fill structures are present but not common. Sole markings are present on some bedding surfaces. Occasional layers with rounded masses of green glauconitic clay are present. Neither mud cracks nor organic disturbances (worm burrows, etc.) have been observed.

Along the edges of the channel the shale is often deformed and slickensides are present. This may indicate shearing as a result of compaction and settling of the clay in the channel. In one area distortion and slickensides were observed in the deep part of the channel; which may indicate collapse due to solution of the underlying limestone.

Both exposures and drilling records are limited, but the available evidence seems to indicate that the divides between the streams were essentially flat surfaces (SEARIGHT and SMITH, 1969). In the deeper part of the basin where valleys up to 120 meters deep are known, the relief on the plateaus was less than 30 meters (SIEVER, 1951).

Caves also developed in the limestone and filled with mud and sand during early Pennsylvanian time. Carbonaceous material is present in some places but no identifiable plant fossils have been found in the cave fill.

THE FLORA

The sediments filling the channel contain beautifully preserved plant fossils. Impressions, carbon films and even cuticle provide detailed information about a variety of plants. Twenty-seven genera of foliage, fructifications and stems have been identified (Table 2).

Apparently the plant material was not transported far before burial as there is little indication of damage; the fragmentary condition of most specimens is due to rock breakage during removal. The presence of *Lepidodendron, Lepidostrobus* and *Lepidophylloides* in close proximity indicates that the tree was buried soon after it fell into the channel. The *Lepidostrobus* are large, one incomplete cone is 19 cm long and 3 cm wide; another fragment is nearly 4 cm wide. One segment of *Lepidodendron* has foliage attached, as does a *Cordaites* branch tip.

The presence of large, intact *Megalopteris* fronds indicates that these, too, were not tran-

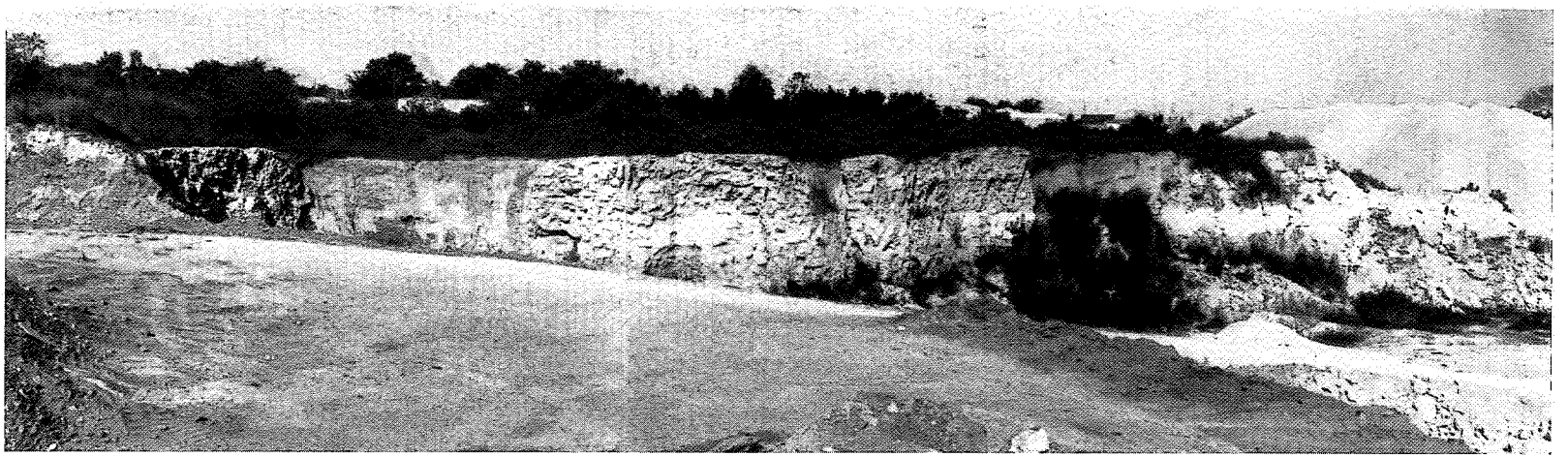

Fig. 3 — Quarry face showing Devonian — Pennsylvanian unconformity and three channels filled with lower Pennsylvanian shale and sandstone.

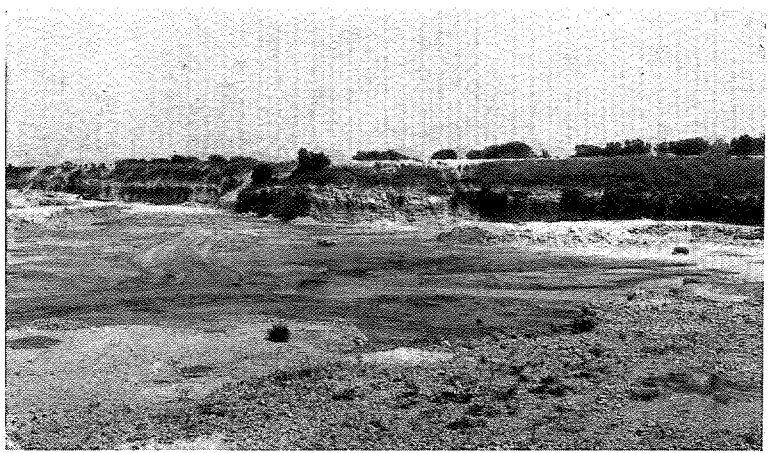

Fig. 4. — Southeast wall, Allied Stone Co. quarry, showing small syncline in Devonian limestone (center) and the flat erosional surface

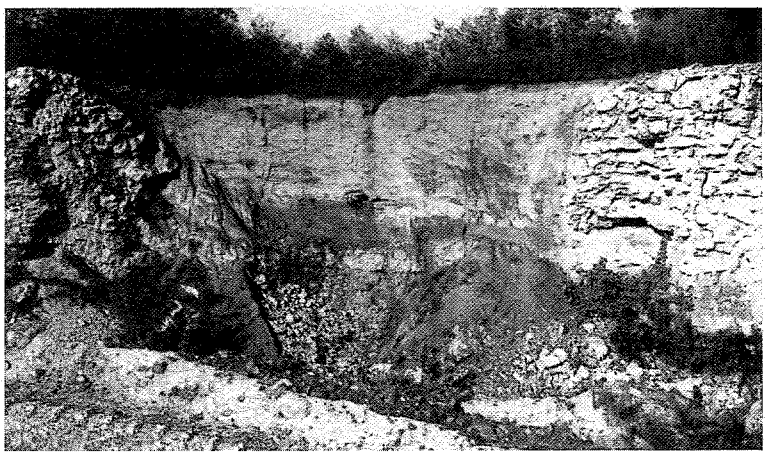

Fig. 5. — Close-up of the channel shown in Fig. 3 (left).

sported far. However, only a few specimens appear attached to stem fragments. The *Megalopteris* leaves are greater than 37 cm long and 5 cm wide; the bases are at least 9 cm long. The leaves of *Lesleya* are also very large. An incomplete *Lesleya* is greater than 30 cm long and 5 cm wide; a tip fragment is 10 cm wide.

TABLE 2

Lycopods

Lepidodendron
Lepidophylloides
Lepidostrobus
Stigmaria *

Sphenopsids

Calamites
Asterophyllites
Calamostachys
Sphenophyllum *

Filicinae (Ferns)

Sphenopteris
Rhodea *
Alloiopteris *

Pteridosperms

Megalopteris **
Lesleya **
Alethopteris
Mariopteris ? *
« *seeds* » *
Samaropsis **
Sphenopteris (*Diplothmema*)
Neuropteris ? *
Telangium ? *
Whittlesleya ? *

Cordaites

Cordaites **
Cordaianthus *
Cordaicarpus **
Artisia *

Noeggerathiales

Lacoea
Gulpenia
Palaeopteridium ? *

Genera collected at the Allied Stone Company quarry, Rock Island County, Illinois. **=common, *=rare.

Although a variety of branching stems have been found, ranging from less than one cm to more than 27 cm wide, most preserve no structure. Some stem compressions have transverse ridges and probably represent *Artisia*. Other stems bear fine longitudinal striations and in this respect resemble the leaf base of *Megalopteris*.

At least two species of *Cordaicarpus* and two species of *Samaropsis* plus two other seed forms have been found. All are unattached but the largest *Samaropsis* (*S. newberryi*) is consistently found near *Megalopteris*.

Megalopteris, Cordaites and *Lesleya* are by far the most common plants in the Rock Island flora. The seeds *Samaropsis* and *Cordaicarpus* are correspondingly common. Also common are *Alethopteris, Mariopteris, Sphenopteris, Lacoea, Gulpenia, Calamites* and *Lepidodendron/Lepidophylloides*.

In general, this floral composition is characteristic of an upland or xerophilous flora (PEPPERS and PFEFFERKORN, 1970; HAVLENA, 1970, 1971). However, the presence of a large number of specimens of Lycopods (*Lepidodendron/Lepidophylloides*) and Sphenopsids (*Calamites*) is generally considered indicative of a moist environment. The plants preserved here apparently grew along a water-filled channel and perhaps the presence of a permanent body of water permitted the growth of hygrophilous plants on an otherwise dry upland. Whether the vegetation was restricted to a narrow area along the channel or whether it also covered the intervening plain is not known.

EPILOGUE

Research in only two areas, Brown and Rock Island counties, has brought to light much information on the early Pennsylvanian paleogeography of the upland along the western edge of the Illinois Basin. Knowledge of the plants growing in this environment allows us to make comparisons with the floras of the lowlands, deltas and swamps. We begin to see a more accurate picture of the diversity of plant life during the Pennsylvanian.

There are other areas along the western margin of the Illinois Basin where similar fossil-bearing strata have been reported or might be expected. It is hoped that continued fieldwork will locate additional examples of upland floras and data on the nature of the basal Pennsylvanian sedimentation.

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EXPLANATION OF PLATES

PLATE I

Fig. 1. — *Lesleya.* ×1/2.

Fig. 2. — *Megalopteris.* ×1.

Figs. 3, 4. — *Samaropsis newberryi.* ×1.


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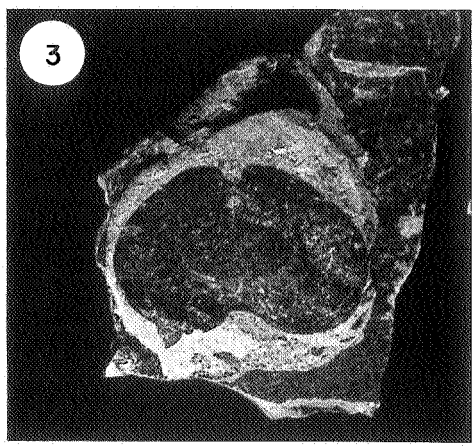
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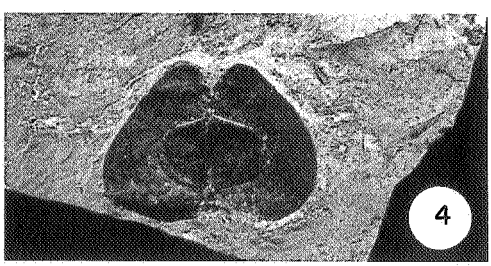
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PLATE II

Fig. 1. — *Megalopteris.* $\times^1/_2$.

Fig. 2. — *Lesleya.* $\times^1/_2$.

Fig. 3. — *Cordaicarpus* sp. B. $\times 1$.

Fig. 4. — *Cordaicarpus* sp. A. $\times 1$.

Fig. 5. — Same as Fig. 4. $\times 2$.

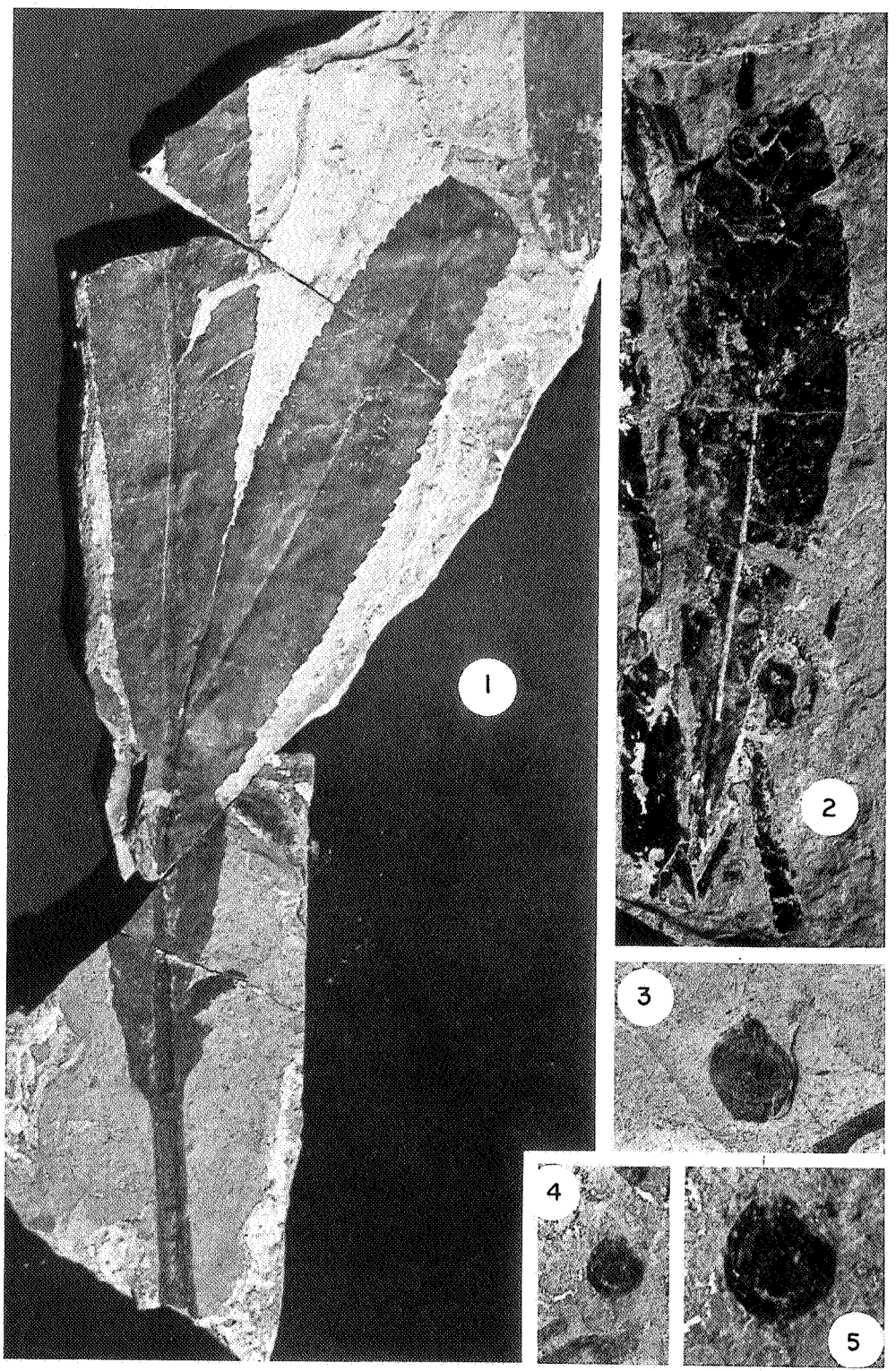
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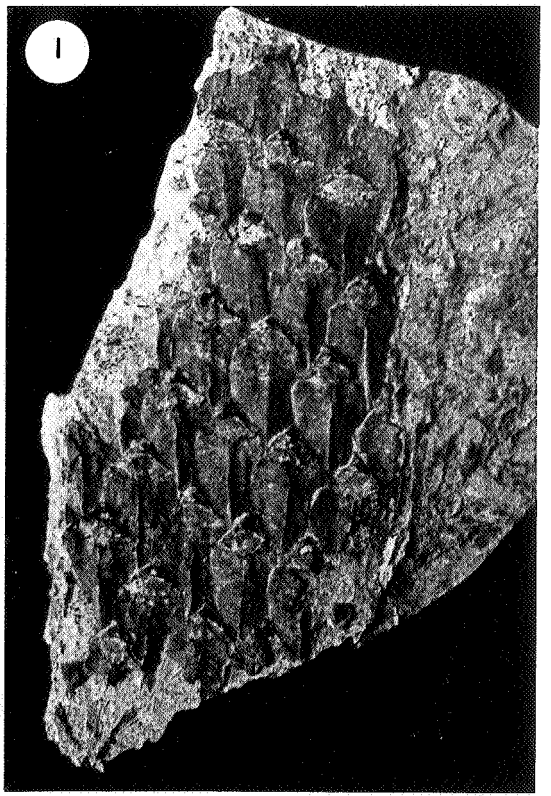
PLATE III

Fig. 1. — *Lepidodendron.* ×1.

Fig. 2. — *Lepidostrobus.* ×1.

Fig. 3. — *Sphenopteris.* ×1.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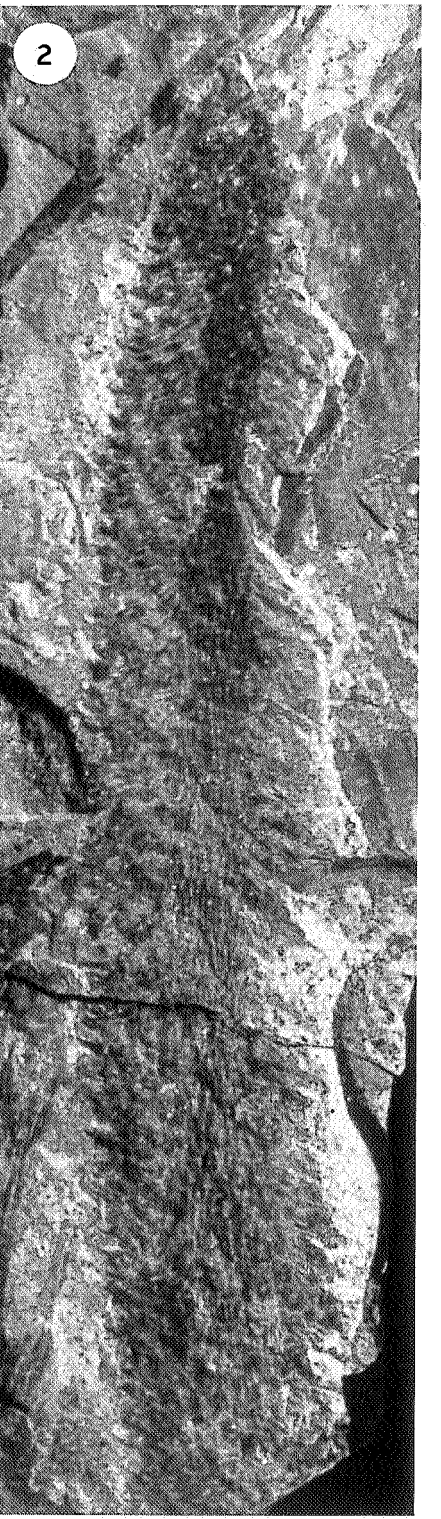
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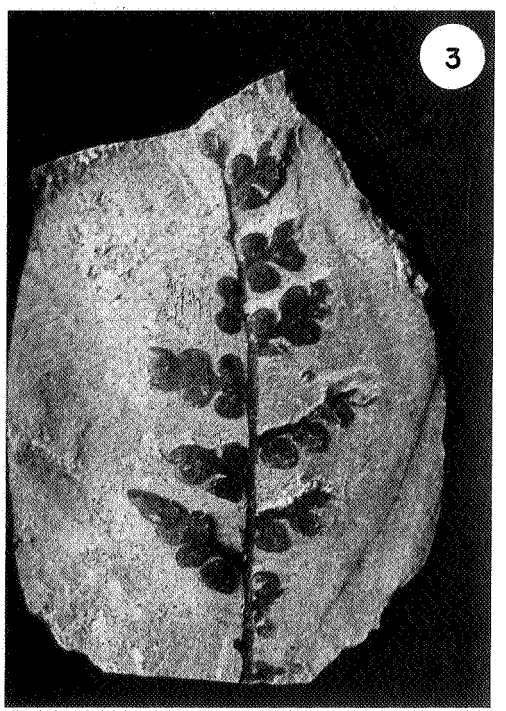
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