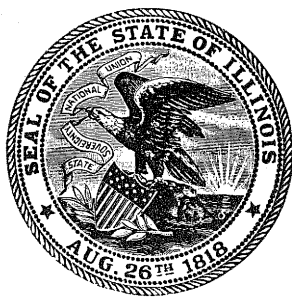


STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
A. M. SHELTON, *Director*
DIVISION OF THE
STATE GEOLOGICAL SURVEY
M. M. LEIGHTON, *Chief*

BULLETIN No. 52

**PENNSYLVANIAN FLORA OF NORTHERN
ILLINOIS**

BY
A. C. NOÉ



PRINTED BY AUTHORITY OF THE STATE OF ILLINOIS

URBANA, ILLINOIS
1925

STATE OF ILLINOIS
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PREFACE

During parts of the field seasons of 1905, 1906, and 1907, the Illinois Geological Survey had the valued services of America's dean of Carboniferous paleobotany, Dr. David White, in a general reconnaissance of the Upper Coal Measures, now precisely referred to as the Pennsylvanian system. Previous to that time but little work had been done, chiefly by Leo Lesquereux from collections by A. H. Worthen and associates. White's work led to a general correlation of the strata of the Illinois coal field with the eastern field, and to a division of the Pennsylvanian system into three series: the Pottsville (lowest), the Carbondale, and the McLeansboro.

In 1921, in connection with an intensive study of the coal resources of Illinois, the State Geological Survey undertook a program of a more detailed study of the plant forms found in strata associated with the coal beds, fully realizing that the facts to be uncovered by such an investigation would likely be of inestimable value to a proper correlation of the coal beds in different parts of our State and to our knowledge of their extent and relationships. The work is being conducted by Dr. A. C. Noé, Associate Professor of Paleobotany of the University of Chicago, and has already reached an advanced stage.

The study is far-reaching in its relations to the functions of the Geological Survey, to the proper identification of coal beds which the Survey uses in determining the existence of favorable structures for the commercial occurrence of oil and gas, to the estimates made of the State's coal resources, to the scientific contributions which the Survey is in position to make on both the character of the vegetation, climatic environment, and physiographic conditions of the Pennsylvanian period, and on the life history of the plant kingdom, and finally, with unneglected attention, to providing secondary schools and colleges of the State with desirable educational material.

It is designed eventually to publish a comprehensive monograph on the flora of the Pennsylvanian system of Illinois, properly illustrated and containing descriptions of both old and new species, and the conclusions to be drawn regarding coal correlations. The field, however, is very extensive, and, in order that advantage may be taken of data obtained in the course of the study, short bulletins covering sub-units of the State will be issued. The present bulletin is an account of the Pennsylvanian flora of northern Illinois, marking the completion of the work of one of the sub-units. Its treatment is feasilby popular, and such technical descriptions as new and old species may require are left for the monograph.

M. M. LEIGHTON, *Chief*,
State Geological Survey.

PENNSYLVANIAN FLORA OF NORTHERN ILLINOIS

By A. C. Noé

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PART I.—TEXT

INTRODUCTION

GENERAL STATEMENT

The Coal Measures, or the Pennsylvanian system, of Illinois lie in the heart of the Eastern Interior Coal Field which extends from southeastern Iowa on the northwest to western Indiana on the east, and from upper Illinois River on the north, to western Kentucky on the south. By far the greater part of this great coal field is in Illinois. The strata reach a maximum thickness of about 2,000 feet in southern Illinois, and contain at least five distinct commercial "veins" or beds of coal of varying extent, besides a number of local beds. As these are largely covered by later Coal Measures strata and glacial drift, the number of exposures are relatively small. Consequently, the question of the areal extent and relationships of these beds rests upon the identification of the beds by certain characteristics, one of which, and a very important one, is the different species and genera of fossil plants associated with each coal bed.

LOCATION AND BRIEF DESCRIPTION OF LOCALITIES

The fossil flora herein set forth was collected from the so-called No. 2 coal bed of District 1 in northern Illinois. One of the main localities where such plants have been collected are the mine dumps northeast of Braidwood in Will County. The majority of plants from concretions and all the Braidwood plants from shale were collected at the Skinner No. 2 mine two miles northeast of the Chicago and Alton Railroad station at Braidwood in the NW. $\frac{1}{4}$ of Sec. 4, T. 32 N., R. 9 E. in Will County.

Two other localities where only concretions are found at present are at the so-called Ox Bow of the Mazon River, seven and ten miles southeast of Morris, located in the NW. $\frac{1}{4}$ of Sec. 30 and the NE. $\frac{1}{4}$ of Sec. 24, T. 33 N., R. 7 E. of Grundy County. Formerly considerable quantities of fossil plants were also collected in the shale above the coal in various small mines north of Morris, but almost all these mines are now shut down. The Wilmington Star No. 7 mine in the NE. $\frac{1}{4}$ of Sec. 5, T. 33 N., R. 8 E., $2\frac{1}{4}$ miles west of the Santa Fé depot in Coal City, also supplied some fossils. Another locality which still produces fossil plants from the shale above the coal is the No. 1 mine of the Spring Valley Coal Company at Spring Valley, in the SW. $\frac{1}{4}$ of Sec. 35, T. 16 N., R. 11 E. in Bureau County.

The Skinner No. 2 mine shaft is 60 feet deep to the coal. The fossils are contained in concretions extending through about six feet of shale above the coal and excellent impressions are found directly in the shale, not more than twelve inches from the coal. No concretions were observed in the coal in Wilmington Star No. 7 and in the Spring Valley No. 1 mines. The fossils there are found only in the shale. The coal lies in the Wilming-

ton Star mine at an average of 135 feet below the surface, except near the main shaft, where it is 185 feet deep. At Spring Valley the coal lies 360 feet below the surface.

The coal seams associated with shales carrying fossil plants are commonly called No. 2 coal in Illinois, with the local name of the "Third Vein" at La Salle and Spring Valley. For the sake of convenience, the No. 2 designation will be kept in this bulletin, although a later correlation of coal seams on the basis of fossil plants in Illinois may suggest a different number. The flora which is described from these localities is somewhat analogous to the flora of the Stephanian of Germany and France, which would indicate a stratigraphic position much higher than that of the lower Carbondale.

COLLECTIONS

The material which is described in this bulletin was collected partly by the author and his students, and part of it is in other existing collections. The most prominent collectors during the latter part of the nineteenth century and of the present time were C. D. Young, J. C. Carr, and L. E. Daniels, all of Morris, Illinois; W. J. Knoblock, of Quincy, Illinois, and George Condie, of Spring Valley. The mine management of the Wilmington Star No. 2 mine also contributed a valuable specimen for this description.

Mr. C. D. Young of Morris has donated his extremely valuable collection to the University of Chicago. The Carr and Daniels collections were acquired by the University of Illinois and are kept in the Museum of Natural History, Urbana, Illinois. Mr. Knoblock's collection is in his home at Quincy, but a portion of it was generously lent to the University of Chicago for a period of time in order to be described. The collection of Mr. Condie is in his home in Spring Valley. The author wishes to express his appreciation of the assistance which he has received from Mr. F. C. Baker, Curator of the Natural History Museum, University of Illinois, who not only facilitated the study of the collection at the Museum but lent a portion of it for a specified time to the University of Chicago.

HISTORICAL REVIEW

The literature describing the fossil flora of northern Illinois belongs to the later decades of the nineteenth and the first of the twentieth century. Volume 2 (1866) and Volume 4 (1870) of the first Geological Survey of Illinois contain numerous descriptions of fossil plants by Leo Lesquereux, the Swiss naturalist who arrived in the United States as the companion of Louis Agassiz. He was destined to become the father of paleobotany in this country, while Sir William Dawson inaugurated the same science in Canada. Lesquereux collected all available information on fossil plants of the American Carboniferous formation for Report P of the Second Geological Survey of Pennsylvania published under the title, *Coal Flora of the Carboniferous Formation in Pennsylvania and Throughout the United States*. An atlas was published in 1879, Volumes 1 and 2 of the text in 1880, and

Volume 3, containing text and some plates, in 1884. A great many of Lesquereux's fossil plants were described again and in a few instances augmented by other species in a *Dictionary of the Fossils of Pennsylvania and Neighboring States*, compiled by J. P. Lesley (Geological Survey of Pennsylvania Report P 4, 1889-1890). Another publication which contains illustrations and descriptions of Carboniferous plants of North America based upon determinations by Lesquereux is *North American Geology and Paleontology for the Use of Amateurs, Students and Scientists*, by S. A. Miller, Cincinnati, 1889.

These books contain the earlier investigations of fossil plants of the Pennsylvanian in Illinois and nothing more was done along these lines until the years 1906, 1907, and 1908, when a new era of Paleozoic plant studies was inaugurated in Illinois by David White, Geologist of the United States Geological Survey, upon instigation of the State Geological Survey of Illinois. Dr. White's observations are given in Bulletins 4, 8, and 14 of the Illinois State Geological Survey. He restricted himself to a preliminary report of the distribution of Pennsylvanian plants in Illinois. It was on the basis of his observations that the subdivisions of the Pennsylvanian system in Illinois—Pottsville, Carbondale, and McLeansboro—were made.

A new and third period in the study of fossil plants in Illinois began when the State Geological Survey engaged the services of the author for extensive collecting of Pennsylvanian plants throughout the State. These collections will be described in a series of reports of which this one is the first.

METHOD OF DETERMINATION

All specimens of the collection were first checked against the figures of Lesquereux's *Atlas of the Coal Flora of Pennsylvania*. They were also compared with the Carboniferous specimens described and illustrated in the works of David White, R. Zeiller, A. Renier, C. Grand'Eury, B. Renault, H. Potonié, W. Gothan, and W. J. Jongmans.

Lesquereux's nomenclature is obsolete and needs frequent corrections so that many of the species have now been relegated to the class of synonyms. His nomenclature was, therefore, corrected with the help of the above-mentioned authors and by comparing them with the species' names and synonyms listed in the catalogue of the Paleozoic plants in the Department of Geology and Paleobotany of the British Museum, by R. Kidston, London, 1886, and in the manuscript catalog of David White.

ORGANIZATION OF THE MATERIAL

The organization of paleobotanic material is not as simple a matter as would be the arrangement of a living flora. The taxonomic and the biologic points of view for the classification of fossil plants frequently do not agree, and yet a purely artificial system of plants cannot be considered the ideal basis for organizing such material. Therefore, the author

has kept in mind the biologic considerations as they are expounded in the most recent general paleobotanic textbooks such as the following:

Seward, A. C.: *Fossil Plants*, 4 vol., London, 1898-1919.

Berry, E. W.: *Paleobotany, a Sketch of the Origin and Evolution of Floras*, Washington, 1920.

Potonié, H. and W. Gothan: *Lehrbuch der Paleobotanik*, 2nd edition, Berlin, 1921.

Scott, D. H.: *Studies in Fossil Plants*, 3rd edition, London, 1921-23.

Gothan, W.: *Leitfossilien-Karbon und Perm. Pflanzen*, Berlin, 1923.

Scott, D. H.: *Extinct Plants and Problems of Evolution*, London, 1924.

ACKNOWLEDGMENTS

The author wishes to express his sincere thanks to D. C. Young, the donor of a beautiful collection of fossil plants from the Mazon Creek deposits to the University of Chicago; to Ed. Carr, son of the collector, J. C. Carr, for many courtesies and numerous fossils given to the University of Chicago; to F. C. Baker, Curator of the Natural History Museum, University of Illinois, for his great kindness in facilitating the study of the Carr and Daniels collections; to W. J. Knoblock in Quincy and George Condie in Spring Valley for the loan of valuable fossils; to Dr. W. E. Walsh in Morris for specimens and valuable assistance; and to W. Oswald of Braidwood for his courtesy and help.

The deepest gratitude of the author is felt toward the State Geological Survey of Illinois which has facilitated and published these studies. Special thanks are also due to the former Chief of the Survey, Mr. F. W. DeWolf, and to the present Chief, Dr. M. M. Leighton, who authorized and generously supported these investigations. The author is much indebted to Dr. Harold E. Culver, who was in charge of the coal investigations of the Illinois State Geological Survey and who gave invaluable aid throughout the investigation. To Dr. David White, who has critically read this report and offered most valuable suggestions, the author wishes to express his sincere appreciation.

IDENTIFICATION OF FOSSIL PLANTS

DEFINITION OF A FOSSIL PLANT SPECIES

In order to identify and classify fossil plants, it is important to have in mind what a fossil species is. It is more difficult to distinguish fossil plant species which are fragmentary than to recognize living plant species where complete specimens are available. It has occurred frequently that two fossil leaf forms have been described as representing two distinct species and similar forms were later found connected on one single branch. Such fossils as show characteristic differences and have never been found to have grown on one and the same plant should be considered as different species.

If we keep in mind the pronounced polymorphism of many organs in living plants, and assume that similar conditions prevailed in the Paleozoic era, we must conclude that our species distinctions of fossil plants are only approximately true and subject to constant revision upon the discovery of more complete material. It also follows that the better known species present a wider range of variations than those of which we know little. Furthermore, we know most fossil plant species only from impressions and

must base our species descriptions on few and often secondary characters. We have form types of this case—such as, stem types, leaf types, and fructification types. Only in comparatively few instances do we possess petrefacts with well preserved tissues and, under favorable circumstances, can we establish phylogenetic, that is, evolutionary relations and distinctions. Under such favorable but rare circumstances we actually have biological species types of the same value as offered by living plants.

The plants that are figured in this report fall under the following general groups:

1. Equisetales
2. Sphenophyllales
3. Lycopodiales
4. Filicales
5. Cycadofilicales
6. Cordaitales

Groups 1 to 4 inclusive belong to the general phylum of Pteridophytes, while groups 5 and 6 belong to the Gymnosperms of the Spermatophytes. No Angiosperm impressions were recognized in the Paleozoic era, although they probably existed, because Angiosperm-like structures were found in coal balls from the Pennsylvanian of Illinois¹.

The six groups mentioned above, with the exception of the Filicales, represent truly phylogenetic divisions of the plant kingdom. Originally all fern-like fossil leaves were classed as true ferns until many of them were found connected with Gymnosperm-like seeds. Early in the twentieth century the Cycadofilicales or seed fern group was established and was joined to the Gymnosperms. Since in most cases we deal with fern-like leaf impressions which may phylogenetically belong either to Pteridophytes or Gymnosperms, the most convenient form of classification may be Filicales or, as Potonié had suggested, Pteridophylls. As the latter name has not yet been introduced in this country, we may still be permitted to call the group Filicales, but it must be kept in mind that the fossils classified under this name are only a form group, an assemblage of leaf types, which may belong to true ferns or to seed ferns or, in some instances, to both.

LIST OF FIGURED SPECIES

The following forms, classified according to the various groups, were found in northern Illinois and are illustrated in Plates I to XLV:

Equisetales:

- Calamites suckowi Brongniart
- Annularia stellata (Schlotheim) Wood
- A. radiata (Brongniart) Sternberg
- A. sphenophylloides (Zenker) Gutbier
- Calamocladus equisetiformis (Schlotheim) Schimper
- Calamostachys solmsi (Weiss) Weiss
- C. germanica Weiss
- C. magna Lesquereux

¹Hoskins, J. H., A Paleozoic Angiosperm from an American coal ball; Botanical Gazette: pp. 390-397, 1923
Noé, A. C., A Paleozoic Angiosperm; Journal of Geology: Vol. xxi, No. 4, pp. 344-347, 1923.

Sphenophyllales:

- Sphenophyllum emarginatum* (Brongniart) Koenig
S. majus (Bronn) Bronn

Lycopodiales:

- Lepidodendron lanceolatum* Lesquereux
L. latifolium Lesquereux
L. wortheni Lesquereux
L. rigens Lesquereux
Lepidophyllum majus Brongniart
Lepidostrobus communis Lindley and Hutton
Lepidostrobus ovatifolius Lesquereux
Lepidophloios protuberans Lesquereux
Lycopodites meekii Lesquereux
Syringodendron porteri Lesquereux
Sigillaria camptotoenia (Wood) Wood
Stigmaria ficoides (Sternberg) Brongniart

Filicales:

1. *Sphenopteridae*:
Sphenopteris gracilis (Brongniart) Presl
S. capitata White
S. chaerophylloides (Brongniart) Presl
Palmatopteris furcata (Brongniart) Potonié
2. *Megalopteridae*:
Megalopteris southwellii Lesquereux
3. *Mariopteridae*:
Mariopteris muricata (Schlotheim) Zeiller
Mariopteris muricata var. *nervosa* (Schlotheim) Zeiller
Mariopteris mazoniana (Lesquereux) White
4. *Neuropteridae*:
Neuropteris rarinervis Bunbery
Cyclopteris orbicularis Brongniart
Neuropteris flexuosa Sternberg
N. clarksoni Lesquereux
N. ovata Hoffmann
N. crenulata Brongniart
N. capitata Lesquereux
N. oblongifolia Gutbier
N. vermicularis Lesquereux
N. decipiens Lesquereux
5. *Linopteridae*:
Linopteris neuropteroides (Gutbier) Potonié
6. *Pecopteridae*:
Pecopteris vestita Lesquereux
P. pseudovestita White
P. miltoni Artis
P. squamosa Lesquereux

- P. arborescens (Brongniart) Sternberg
- P. pennaeformis (Brongniart) Sternberg
- P. dentata Brongniart
- P. unita Brongniart
- Ptychocarpus unita (Brongniart) Weiss
- 7. Odontopteridae:
 - Odontopteris subcuneata Bunbery
 - O. wortheni Lesquereux
- 8. Alethopteridae:
 - Alethopteris serlii (Brongniart) Goeppert
 - A. davreuxi (Brongniart) Goeppert
 - A. grandini (Brongniart) Goeppert
- 9. Callipteridae:
 - Callipteridium sullivanti (Lesquereux) Weiss
- 10. Fern stems:
 - Megaphyton spec.
 - Ptychopteris spec.

Cycadofilicales and Cordaitales:

- Staphylopteris sagittatus Lesquereux
- Codonothea caduca Sellards
- Codonospermum anomalum Brongniart
- Tripterispermum rostratum Brongniart
- Trigonocarpum noeggerathi Sternberg
- Pachytesta incrassata Brongniart
- Cardiocarpus orbicularis Ettingshausen

Cordaitales:

- Cordaite grandifolius Lesquereux
- Cordaianthus gemmifer Grand ' Eury

DISCUSSION OF FIGURED ORDERS AND GENERA

EQUISETALES

The Paleozoic Equisetales, remnants of which are preserved, must have been arborescent forms. Undoubtedly, herbaceous species, from which our modern Equisetum descended, must also have existed. The name, Calamites, always designates a stem form. Independently, leaves and smaller branches were found which were called Annularia or Calamocladus and fructifications, which were named Calamostachys. These are, therefore, not biological genus names but form types, because a Calamites, an Annularia, and a Calamostachys grew on the same individual plant. However, it is not known, except in very few instances, which species of these genera belonged together. For practical purposes, particularly for use as stratigraphic index fossils, it is immaterial to know how they were combined. The biological paleobotanist or, better called, fossil plant morphologist would, of course, like to know more of these combinations in order to explain the phylogeny of the Paleozoic Equisetales, but in order to study this aspect with hope of success it will be necessary to obtain a great deal more material, especially petrified or coal ball specimens.

SPHENOPHYLLALES

This order contains only one genus, *Sphenophyllum*, and that is now extinct. We know nothing about any relation of the Paleozoic Sphenophyllales with living plants.

Sphenophyllum was an aquatic and herbaceous plant, had jointed stems with whirls of triangular leaves that always appeared in multiples of three. At the end of the branches were the long and narrow strobili.

LYCOPODIALES

Probably most of the known genera and species of fossil Lycopodiales were arborescent, with the exception of the genus *Lycopodites*, which was herbaceous. There must have been numerous herbaceous Lycopodiales in the Paleozoic era from which our living Lycopodiales descended. The large tree forms died out almost entirely at the end of the Paleozoic era, but a few medium-sized Mesozoic tree types persisted for a short time.

The two principal genera of the Paleozoic era are *Lepidodendron* and *Sigillaria*, both of which reached a height of about one hundred feet.

Lepidodendron is the generic name for a stem type that had spirally arranged rhomboidal leaf scars, whereas *Sigillaria* had its leaf scars vertically arranged. *Syringodendron* was a *Sigillaria* whose cortex had been removed before fossilization. *Lepidostrobus* is the generic name for the strobilus or cone of *Lepidodendron*. *Lepidophyllum* is the scale of *Lepidostrobus*, and *Stigmaria* designates a root form that might have belonged to a *Lepidodendron* or a *Sigillaria* stem. The different species of *Lepidodendron* and *Sigillaria* are distinguished by the shape of their leaf cushions. Leaves seem to have been born only on the youngest branches of these trees, but the leaf cushions continued to grow on the stem and on the older branches after the leaves had fallen off and formed a sort of armor around the tree similar in function to the armor of some living Cycads but differing in the shape of their leaf scars. The leaf scars of *Lepidophloios* were more broad than long, whereas those of *Lepidodendron* were more long than broad. *Lycopodites* was a herbaceous type, similar to the modern genera *Selaginella* and *Lycopodium*.

The root form of *Lepidodendron* and *Sigillaria*, *Stigmaria ficoides*, was covered with small rootlets of which the circular scars are still visible.

FILICALES

The most numerous and stratigraphically most useful plant fossils of the Paleozoic sediments are impressions of fern-like leaves. A large number, perhaps the majority of them, did not belong to true ferns but were parts of trees that had the habitus of tree ferns and the fructifications of Gymnosperms. This extinct group which seemed to have sprung from the same origin as the true ferns has been discovered only during the early twentieth century and in America is called Cycadofilicales. English paleobotanists use the name Pteridosperms, a Greek translation for seed-ferns. The fructifications of these Cycadofilicales will be discussed later.

As mentioned in an earlier chapter, the group name Filicales is still used in this report for the fern-like impressions.

For two very characteristic fern stem types the generic names of Megaphyton and Ptychopteris are used. They are marked by very large leaf scars which were produced after the leaf stems or petioles had fallen off.

The fern-like leaves are divided into genera according to the following characters:

- a. The form of attachment of the smallest leaf units (pinnules) to the stem that bears them.
- b. The general shape of the pinnules and their arrangement and development in the fronds.
- c. The venation of the pinnules.

On the basis of these distinctions we have arranged our material into the following genera:

1. *Sphenopteris*. The pinnule is contracted at its base and is lobed or dissected. Some *Sphenopteris* species were *Cycadofilicales*.

2. *Palmatopteris*. This genus resembles *Sphenopteris* but has very deeply dissected pinnules. It is a *Cycadofilicales*.

3. *Megalopteris*. This is a large-leaved fern type with a simple pinnate frond and was probably herbaceous. It is rarely found and occurs only in the Pottsville formation. It is present in the Rock Island district. It is a *Cycadofilicales*.

4. *Mariopteris*. This genus has a large frond that is divided many times. Its pinnules have a broad base and arch-shaped secondary veins projecting from the base of the pinnule. Frequently no midrib is visible. It is a *Cycadofilicales*.

5. *Neuropteris*. Pinnules have a narrow base from which arch-shaped veins emerge. There is usually a midrib. The veins fork dichotomously from one to several times but are not connected. At the base of the composite frond are rounded leaves with a radiating venation. These leaves were originally called *Cyclopteris* and were considered as belonging to a distinct genus. For the sake of convenience, this name has been retained to characterize such types of leaves.

6. *Linopteris*. The shape of the pinnule is exactly like that of *Neuropteris*, but the veins are anastomosed and form a net. It is a *Cycadofilicales*.

7. *Pecopteris*. A large number of species belong to this genus which is especially well represented in the higher strata of the Pennsylvanian. The pinnules are generally small and possess a distinct midrib usually with few secondary veins and a broad base. The name *Asterotheca* and *Ptychocarpus* are used for certain *Pecopteris* forms which show spore capsules.

8. *Odontopteris*. This genus has a pinnule like *Pecopteris* except that there is no midrib and the veins enter parallel from the base. It is a *Cycadofilicales*.

9. *Alethopteris*. The pinnules also have a broad attachment, but their bases are decurrent. The midrib is always very distinct and the secondary veins numerous. It is a *Cycadofilicales*.

10. *Callipteridium*. This differs primarily by its broad, bluntly ending pinnules from *Alethopteris*. In Europe *Callipteridium* is an index fossil of Permian and Sub-Permian strata. It is a *Cycadofilicales*.

Some basal leaves of fern-like fronds are called *Aphlebiae*. Sometimes young leaves which are still coiled are found. Although the generic name, *Spiropteris*, is well suited to these forms, it seems rather useless to distinguish species, for every individual fossil of this kind would have to receive a species name.

The only true ferns (*Filicales*) among the leaf impressions found at Mazon Creek and Braidwood belong to the genera *Sphenopteris* and *Pecopteris*.

CYCADOFILICALES

Numerous seeds of gymnospermic character but associated with fern-like leaves, such as *Codonospermum*, *Tripterosperrum*, *Pachytesta*, *Stephanospermum*, *Trigonocarpum* are known. *Codonothea*, which was first found by E. H. Sellards in Illinois and described by him, is probably a microspore-bearing organ of *Neuropteris*. *Staphylopteris* may have had the same function but was associated with *Sphenopteris*.

CORDAITALES

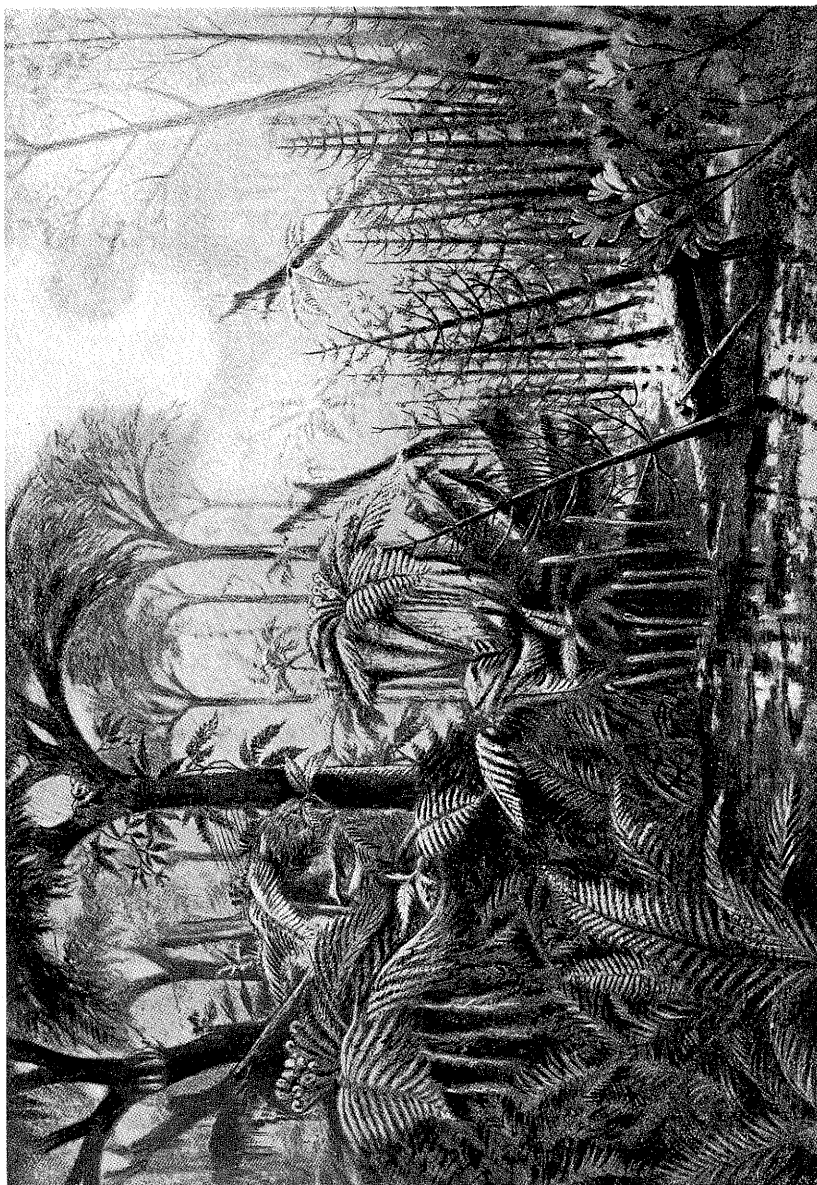
These were gymnospermic trees with tall shafts whose branches bore tufts of very large ribbon-shaped leaves. The male reproductive organs of this order received the generic name of *Cordaianthus*, the female, that of *Cardiocarpus*, and the leaves that of *Cordaites*.

PART II.—EXPLANATION OF PLATES

Note: Objects are reproduced in natural size except where otherwise indicated.

ABBREVIATIONS FOR COLLECTIONS

- | | |
|------------|---|
| U C Coll.- | Collection in Walker Museum of the University of Chicago |
| U I Coll.- | Collection in the Museum of Natural History, University of Illinois |
| K Coll.- | Collection of Wilbur T. Knoblock, 1901 Ohio St., Quincy, Illinois |
| C Coll.- | Collection of George Condie, 320 E. Erie St., Spring Valley, Illinois |



Reconstruction of swamp forest in Pennsylvanian time. After H. Potonié.

PLATE II. EQUISETALES

The surviving genus of this great Paleozoic order is *Equisetum*, a herbaceous plant growing along creeks and in damp meadows. It is commonly called Horse Tail or Scouring Rush. In Pennsylvanian times tree forms of this order grew. Their stems are called *Calamites*, their leaves *Annularia*, or if smaller and more numerous *Calamocladus*, their fructifications *Calamostachys*. (See Plates II to V.)

1. *CALAMITES SUCKOWI* Brongniart, from *La Salle*, x $1/5$, U C Coll. No. 32000.
2. *CALAMOSTACHYS SOLMSI* (WEISS) Weiss, from *Braidwood*, U C Coll. No. 32001.
3. *CALAMITES SUCKOWI* Brongniart, from *Braidwood*, x $2/3$ U C Coll. No. 32002.

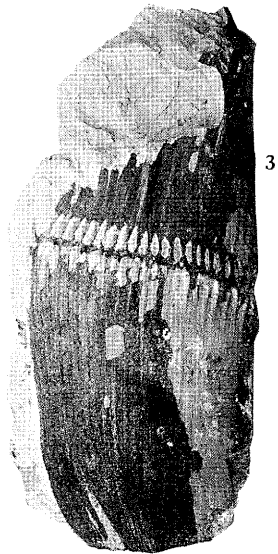
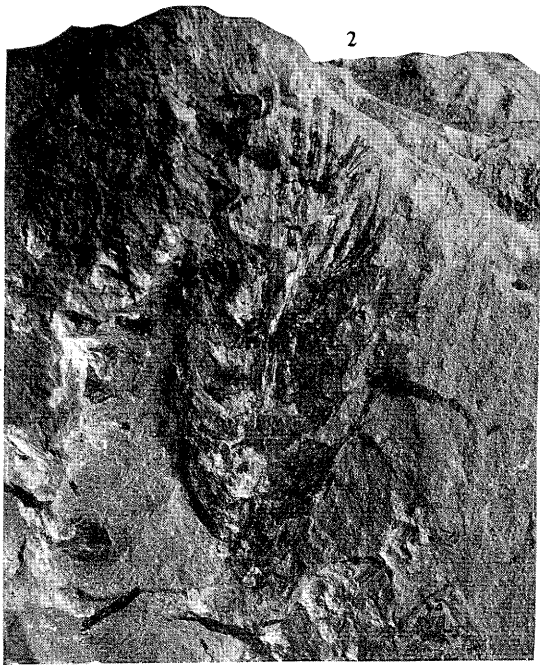
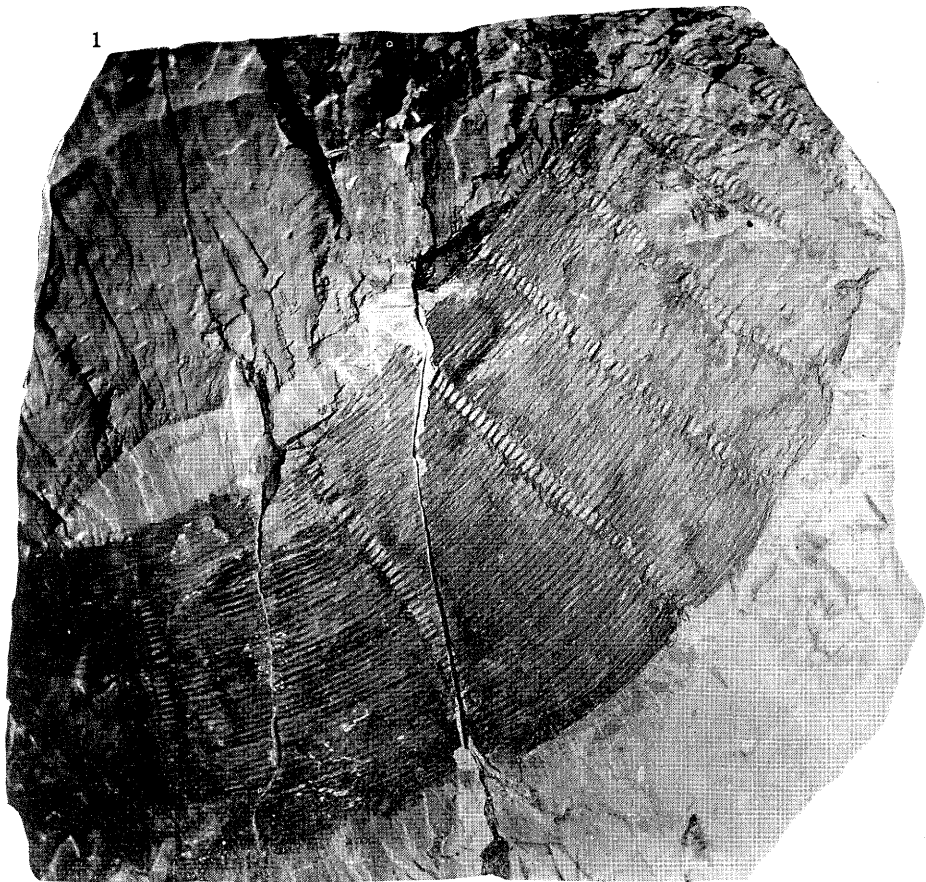
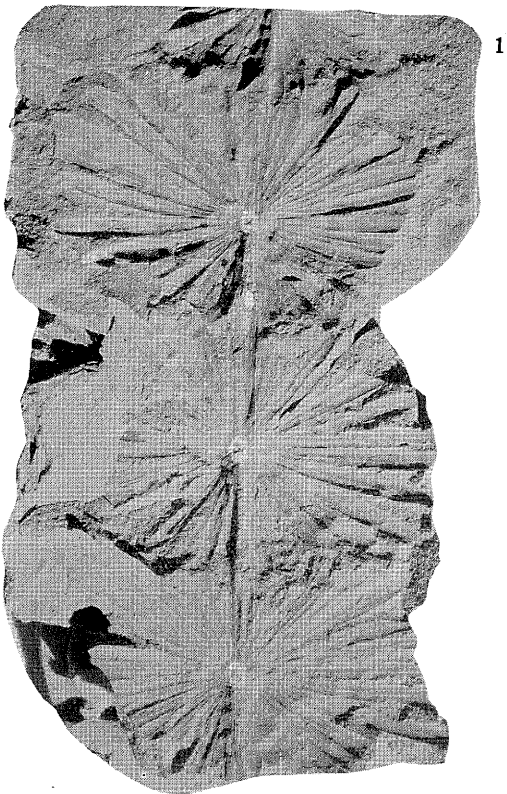


PLATE III. EQUIRETALES

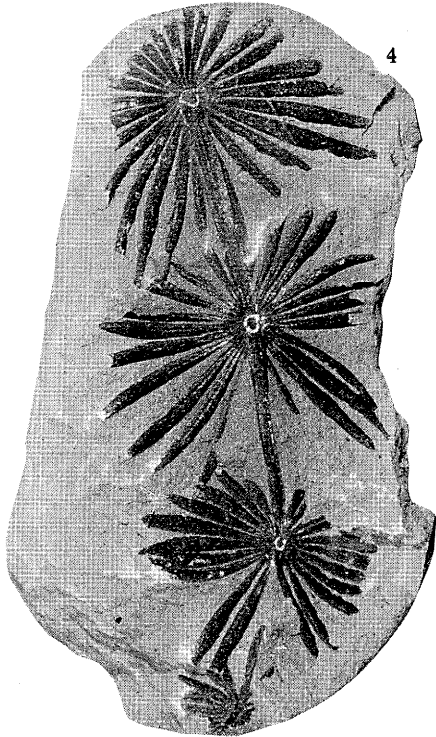
1-5. ANNULARIA STELLATA (Schlotheim) Wood.

1,2, and 4. From *Mazon Creek*, U. C. Coll. No. 32003.

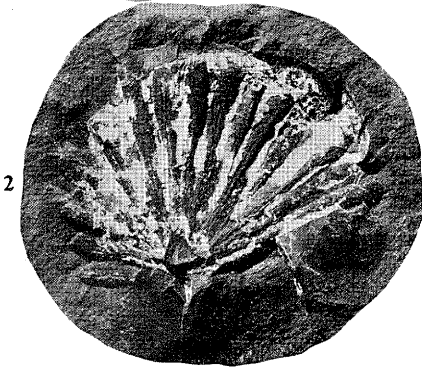
3 and 5. From *Braidwood*, U I Coll. No. P 1281.



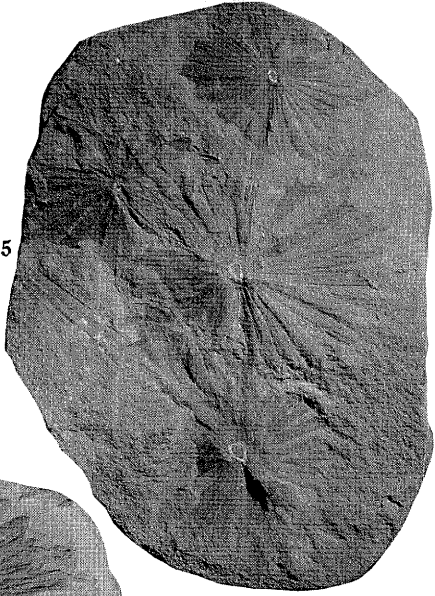
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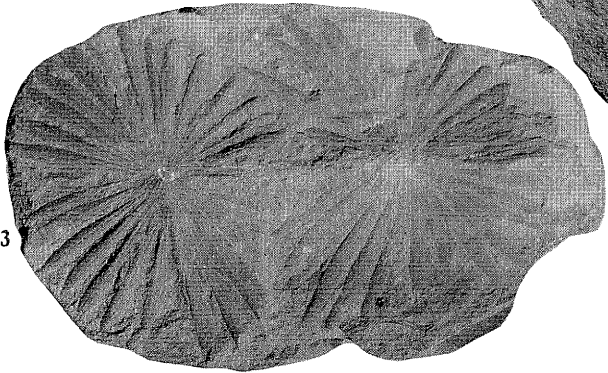
4



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5



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PLATE IV. EUISETALES

1. CALAMOCCLADUS EUISETIFORMIS [™](Schlotheim) [¶]Schimper, from *Morris, Ill.*, x 2/3, U I Coll. No. P 1282.
2. ANNULARIA RADIATA (Brongniart) Sternberg. On branches of a *Calamites* stem, from *Mazon Creek*, x 2/3, U I Coll. No. P 1283.

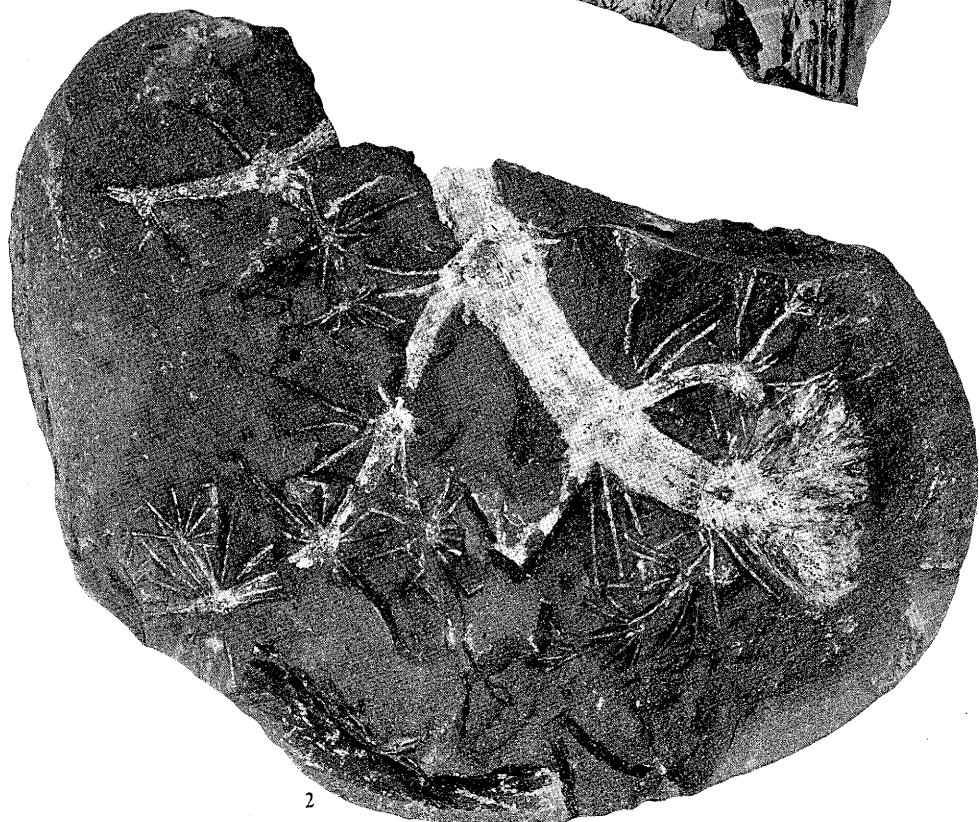
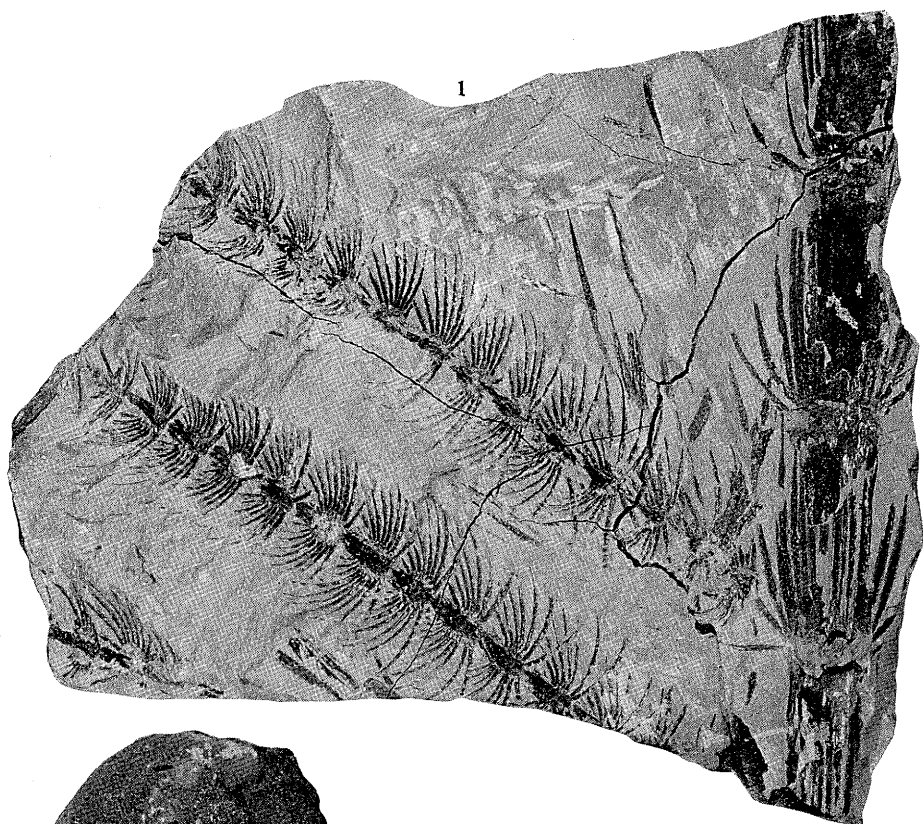


PLATE V. EQUISETALES

1. ANNULARIA RADIATA (Brongniart) Sternberg, from *Mazon Creek*, U C Coll. No. 32004.
2. ANNULARIA SPHENOPHYLLOIDES (Zenker) Gutbier, from *Mazon Creek*, U C Coll. No. 32005.
3. ANNULARIA SPHENOPHYLLOIDES (Zenker) Gutbier, from *Braidwood*, U C Coll. No. 32006.
4. CALAMOSTACHYS GERMANICA Weiss (The strobilus of *Calamocladus equisetiformis* Schl.), from *Braidwood*, U C Coll. No. 32007.
5. CALAMOSTACHYS MAGNA Lesquereux, from *Mazon Creek*, x 2/3 U I Coll. No. P 1284.

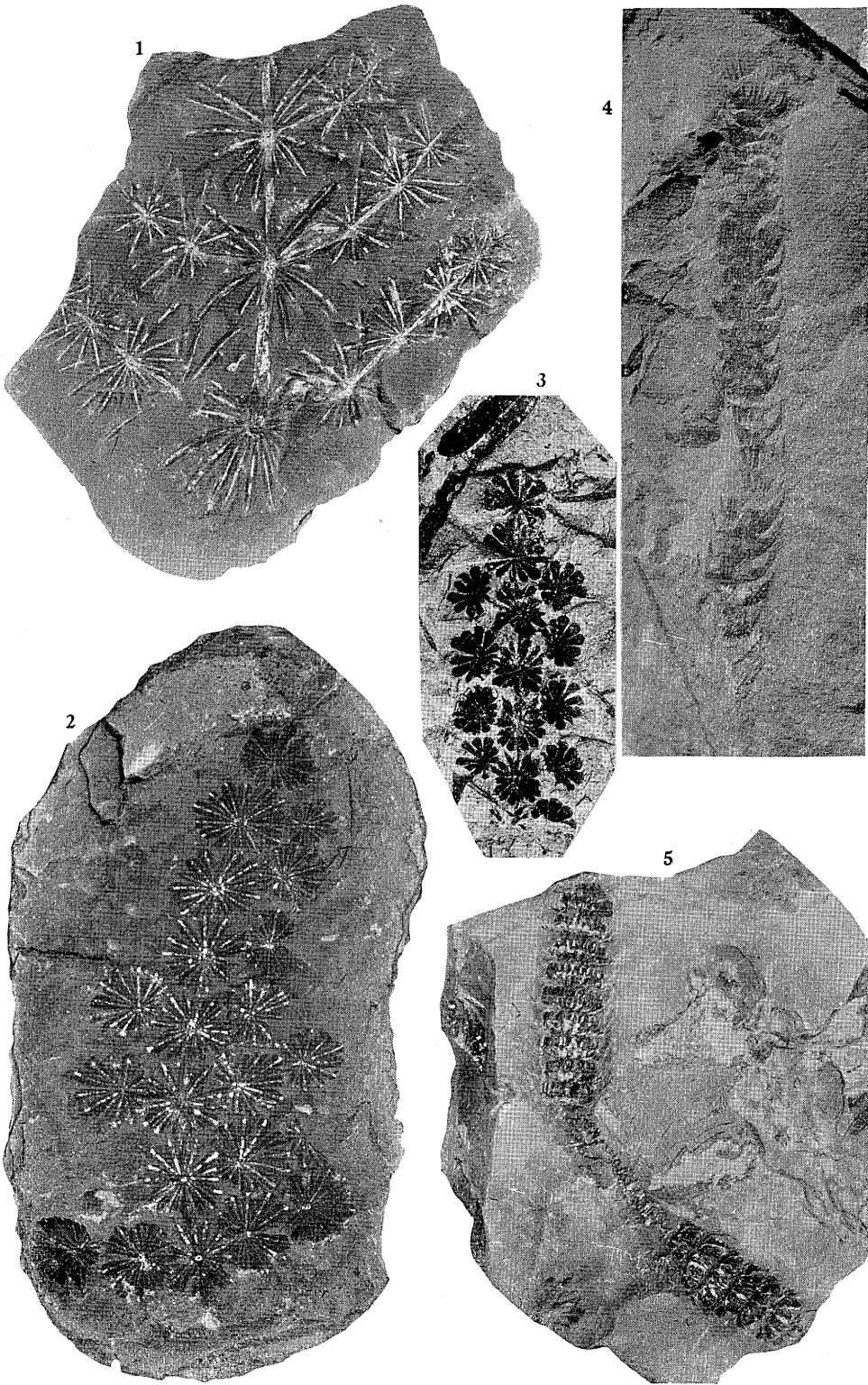


PLATE VI. SPHENOPHYLLALES

These grew in brooklets and had floating stems and wedge-shaped leaves as denoted by the Greek name Sphenophyllum. No living relatives of this Paleozoic plant order are known.

1. SPHENOPHYLLUM MAJUS (Bronn) Bronn, from *Mazon Creek*, U C Coll. No. 32008.
2. SPHENOPHYLLUM STEM, from *Braidwood*, x 2/3, U C Coll. No. 32009.
- 3-6. SPHENOPHYLLUM EMARGINATUM (Brongniart) Koenig, from *Braidwood*, U C Coll. No. 32074, No. 32089, and No. 32090.

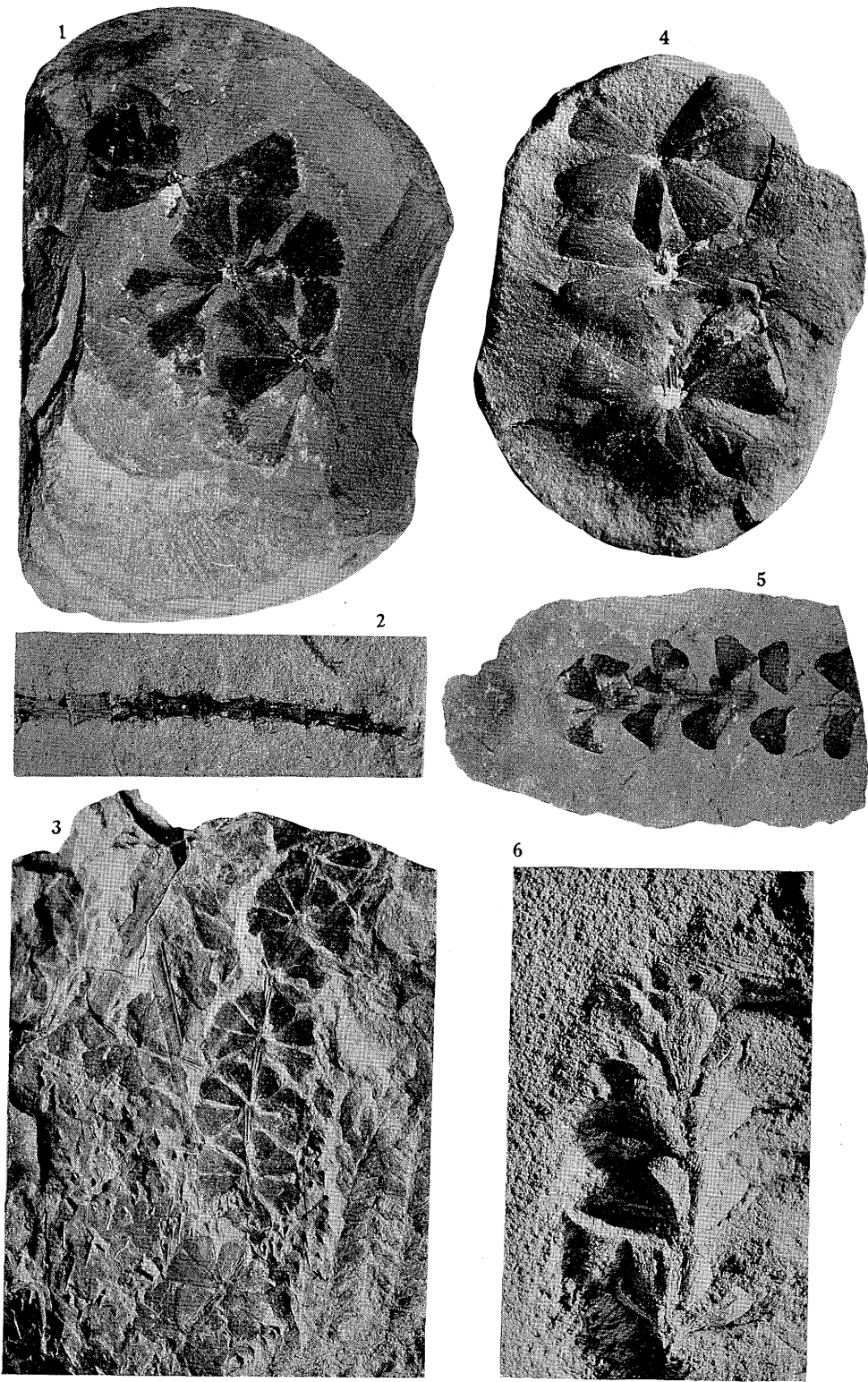


PLATE VII. LYCOPODIALES

The surviving genera of this order are our present day club mosses *Lycopodium* and *Selaginella*. From the Pennsylvanian are known tree forms *Lepidodendron*, *Lepidophloios*, and *Sigillaria*, and a herbaceous type *Lycopodites*. *Syringodendron* is the name for a *Sigillaria* type which had lost its characteristic bark before fossilization. *Lepidostrobus* is the fructification of *Lepidodendron*. *Stigmara* is the name for the roots of *Lepidodendron* and *Sigillaria*. (See Plates VII to XII.)

1. *LEPIDOSTROBUS OVATIFOLIUS* Lesquereux (cone of *Lepidodendron*).
2. *LEPIDODENDRON LANCEOLATUM* Lesquereux.
3. *LEPIDOSTROBUS COMMUNIS* Lindley and Hutton.
4. *LEPIDODENDRON LATIFOLIUM* Lesquereux.

All are from *Mazon Creek*, K Coll.

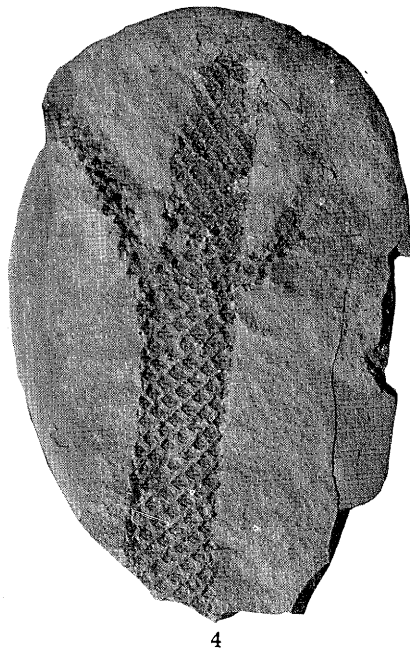
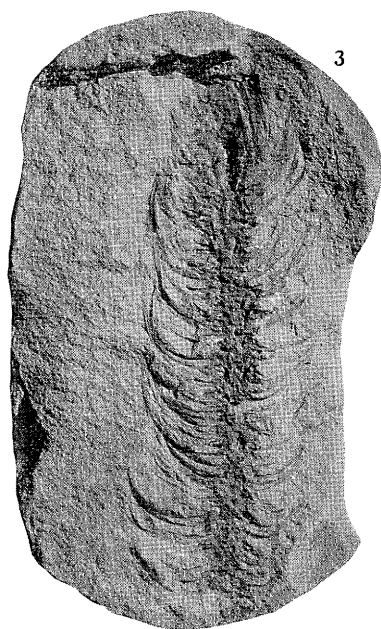
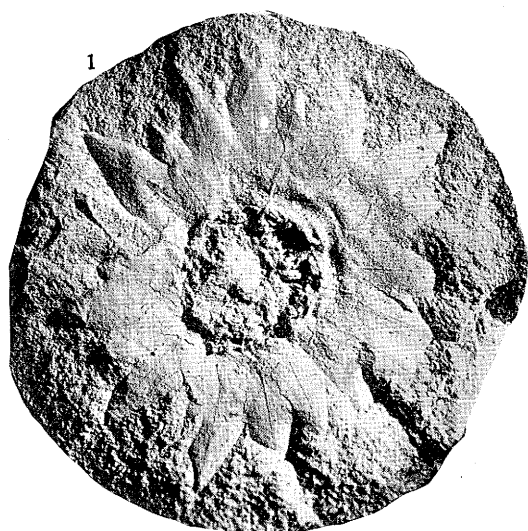


PLATE VIII. LYCOPODIALES

1. LEPIDOPHLOIOS PROTUBERANS Lesquereux, from *Braidwood*, U C
Coll. No. 32010.
2. LEPIDODENDRON Wortheni Lesquereux, from *Mazon Creek*, U C
Coll. No. 32011.
3. LEPIDODENDRON LATIFOLIUM Lesquereux, from *Mazon Creek*, U C
Coll. No. 32012.

1

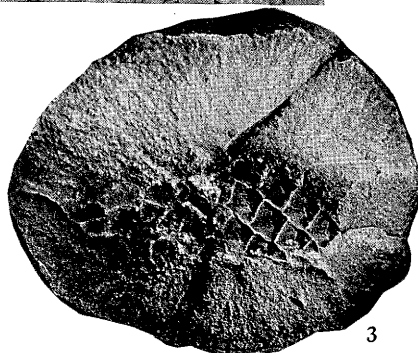
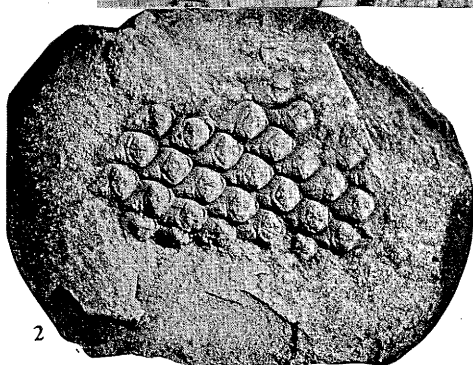


PLATE IX. LYCOPODIALES

LEPIDODENDRON RIGENS Lesquereux, from *Mazon Creek*, U C Coll.
No. 32013.

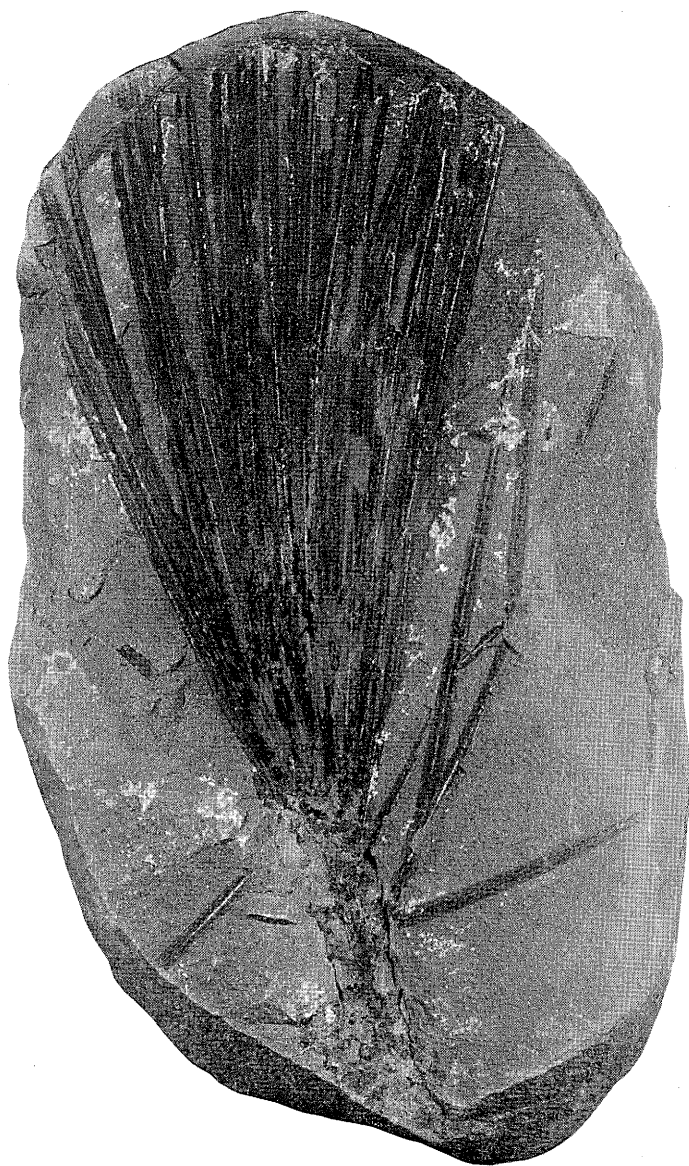


PLATE X. LYCOPODIALES

1. LYCOPODITES MEEKII Lesquereux, from *Mazon Creek*, U I Coll.
No. P 1285.
- 2-3. LEPIDOPHYLLUM MAJUS Brongniart, from *Mazon Creek*, x 2/1,
U C Coll. No. 32014.
4. LYCOPODITES MEEKII Lesquereux, from *Mazon Creek*, x 2/3,
U C Coll. No. 32015.

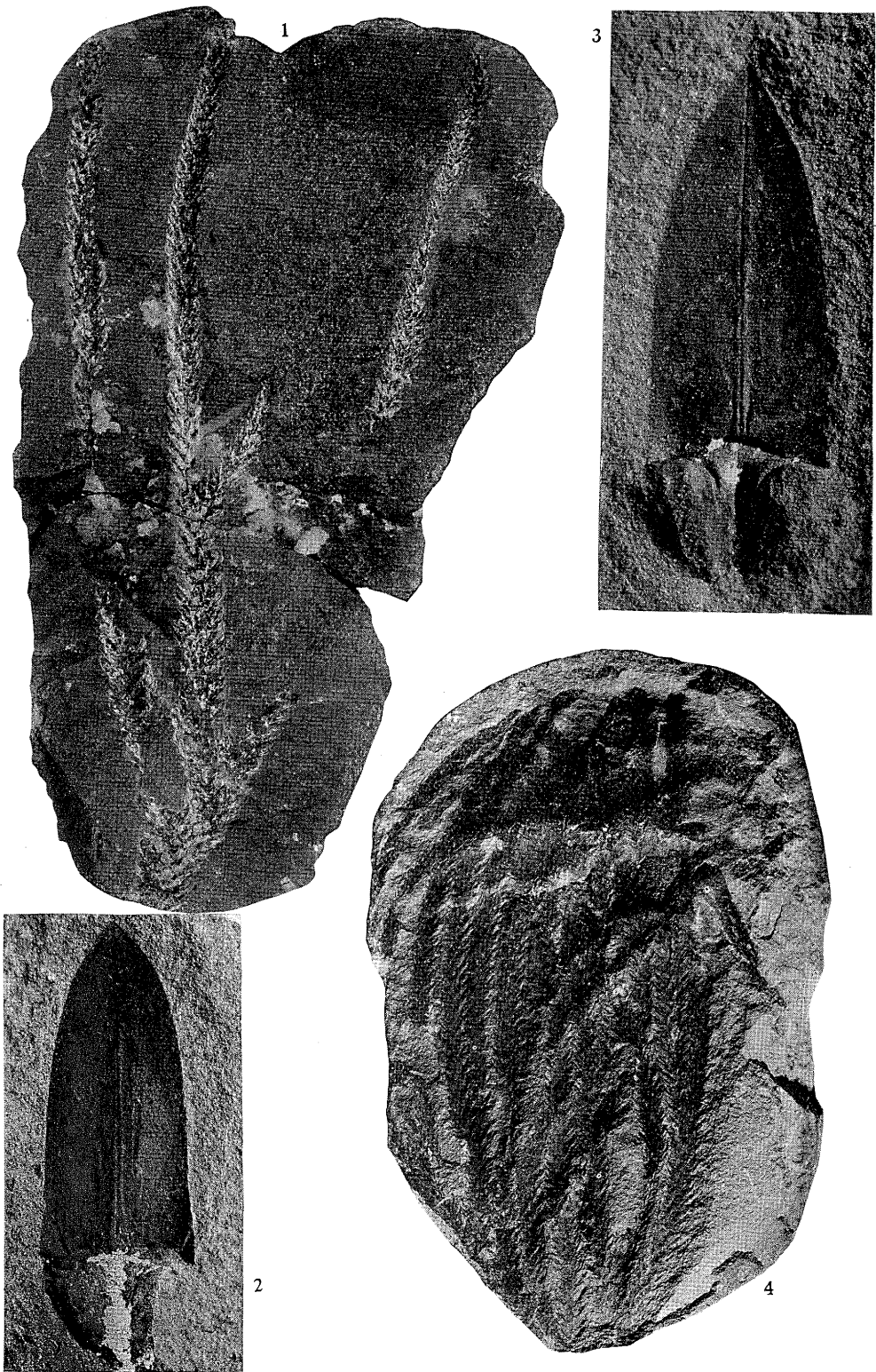


PLATE XI. LYCOPODIALES

1. SIGILLARIA CAMPTOTAENIA (Wood) Wood, from *Braidwood*, U C Coll. No. 32016.
2. SYRINGODENDRON PORTERI Lesquereux, from *Braidwood*, x 1/2, U C Coll. No. 32017.
3. SIGILLARIA CAMPTOTAENIA (Wood) Wood, from *Braidwood*, U C Coll. No. 32018.



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2



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PLATE XII. LYCOPODIALES

- 1-3. STIGMARIA FICOIDES (Sternberg) Brongniart, from *Braidwood*, x
2/3, U C Coll. No. 32019, No. 32079, and No. 32080.

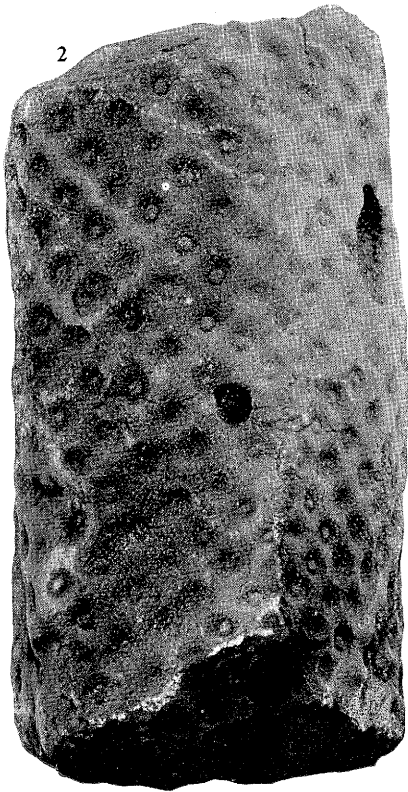
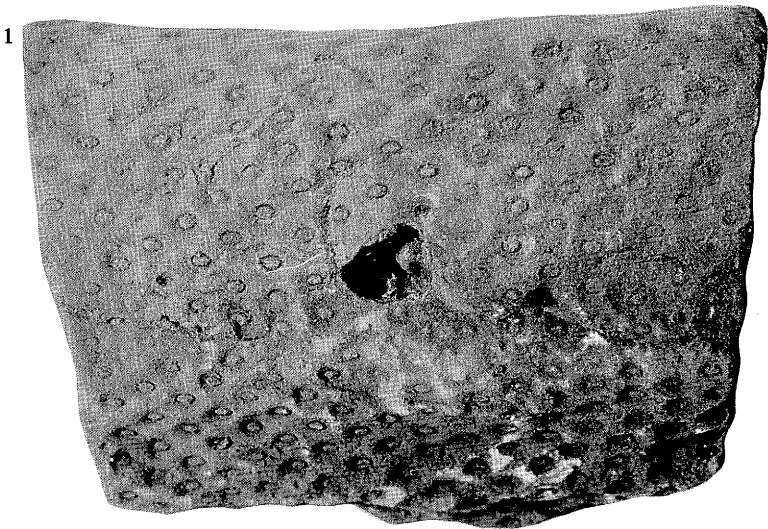


PLATE XIII. FILICALES: SPHENOPTERIDAE

Here belong such leaf impressions as might have grown on true herbaceous fern plants, on tree-ferns, and on so-called seed-ferns or Cycadofilicales. The latter are an extinct type of Gymnosperms with fern-like foliage and cycad-like fructifications. They formed a link between ferns and cycads in evolution. In this publication all fern-like leaves are listed under Filicales and all Cycadofilicales-seeds under Cycadofilicales. Stems of true ferns were found and are pictured in this bulletin under the generic names Megaphyton and Ptychopteris. (See Plates XIII to XIV.)

1. PALMATOPTERIS FURCATA (Brongniart) Potonié, from *Braidwood*, U C Coll. No. 32020.
2. SPHENOPTERIS GRACILIS Brongniart, from *Mazon Creek*, U C Coll. No. 32021.
3. SPHENOPTERIS CAPITATA White, from *Braidwood*, U C Coll. No. 32022.



PLATE XIV. FILICALES: SPHENOPTERIDAE

SPHENOPTERIS CHAEROPHYLLOIDES (Brongniart) Presl, from *Mazon Creek*, U C Coll. No. 32023.

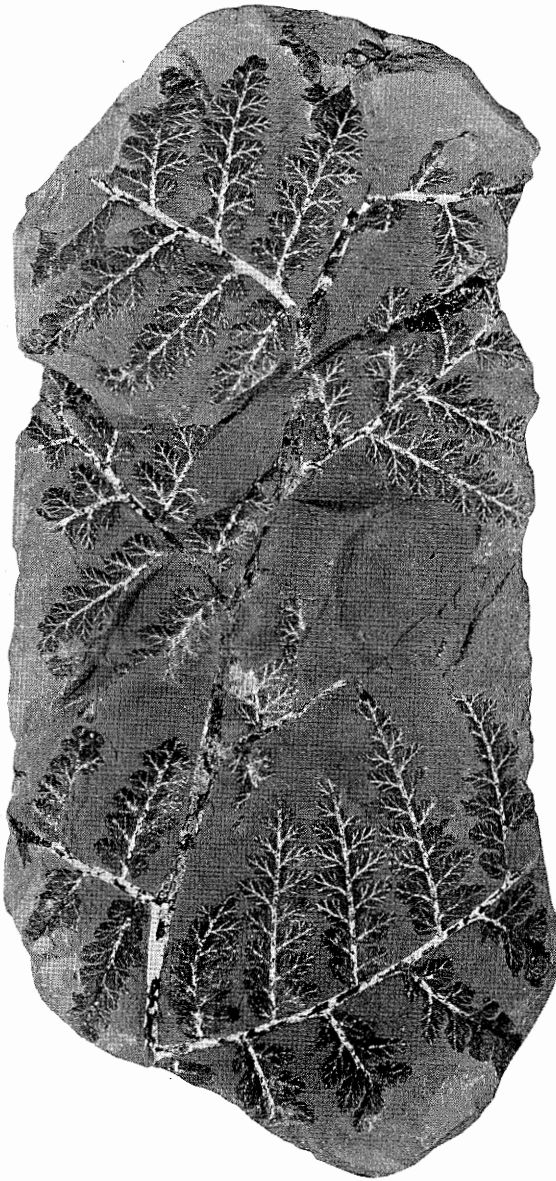


PLATE XV. FILICALES: MEGALOPTERIDAE

MEGALOPTERIS SOUTHWELLII Lesquereux, from *Port Byron*, Collection of Davenport (Iowa) Academy of Science.



PLATE XVI. FILICALES: MARIOPTERIDAE

1. MARIOPTERIS MURICATA VAR. NERVOSA (Schlotheim) Zeiller, from
Mazon Creek, U C Coll. No. 32024.
- 2-3. MARIOPTERIS MURICATA (Schlotheim) Zeiller, from *Mazon Creek*,
U I Coll. No. P 1286 and No. P 1317.
4. MARIOPTERIS MAZONIANA (Lesquereux) White, from *Braidwood*,
U C Coll. No. 32025.
5. MARIOPTERIS MURICATA VAR. NERVOSA (Schlotheim) Zeiller, from
Braidwood, U C Coll. No. 32081.

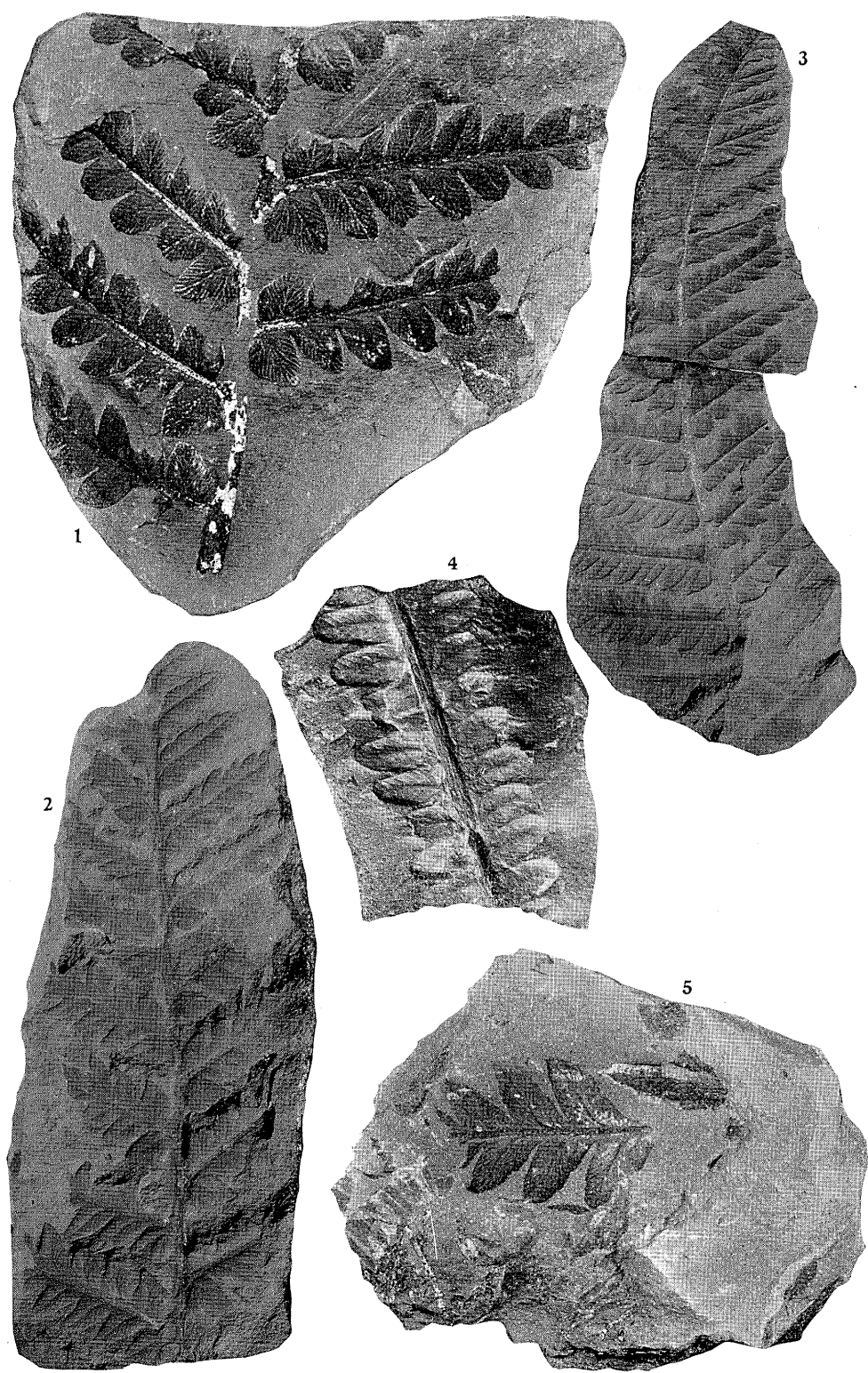
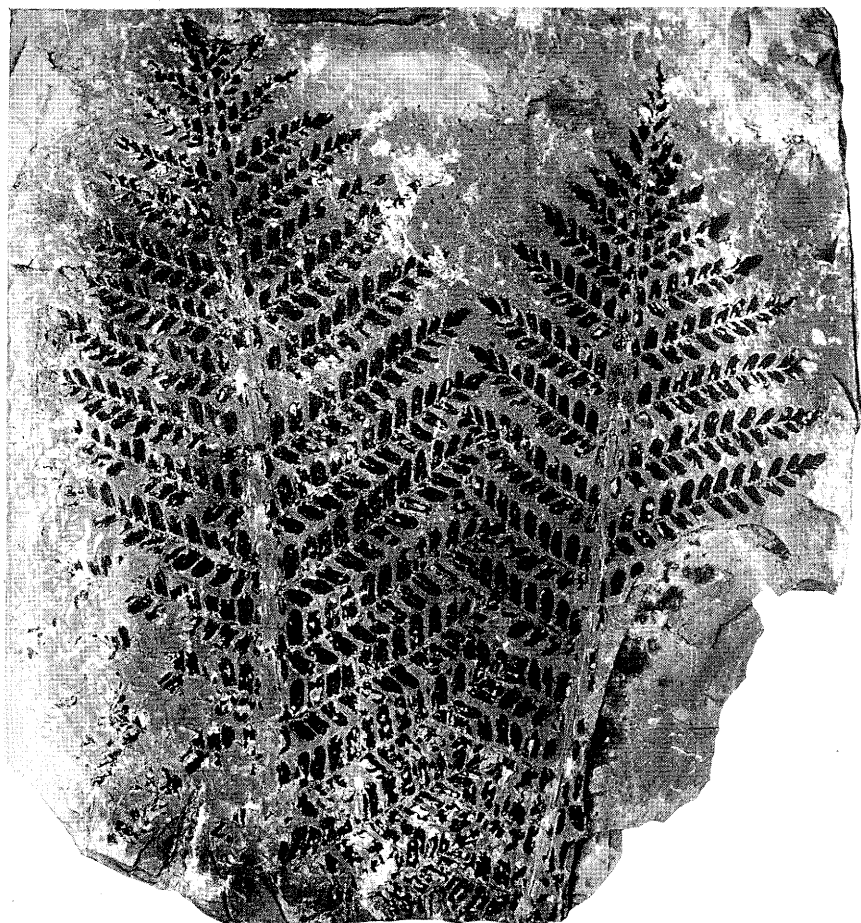


PLATE XVII. FILICALES: NEUROPTERIDAE

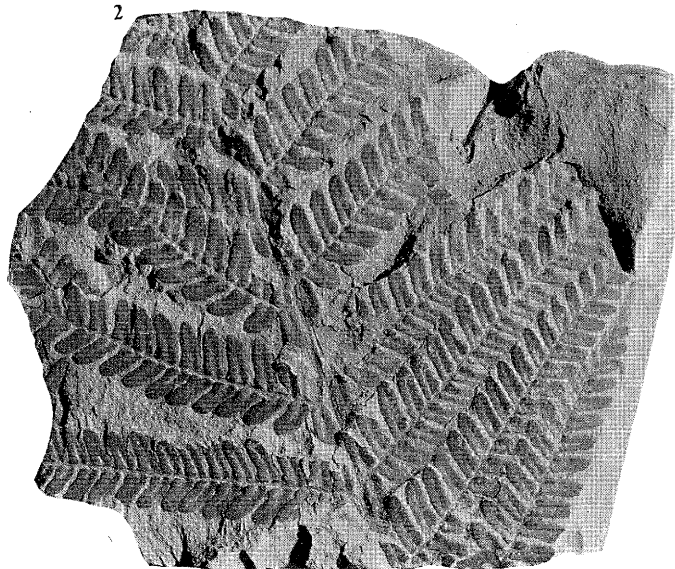
1-3. NEUROPTERIS RARINERVIS Bunbery.

1. From *Spring Valley*, x 1/2, C Coll.
2. From *Mazon Creek*, x 2/3, U I Coll. No. P 1287.
3. From *Spring Valley*, x 1/3, C Coll.

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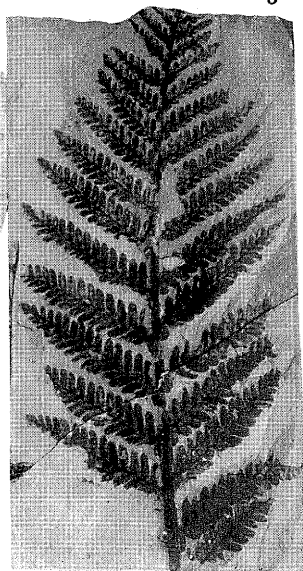


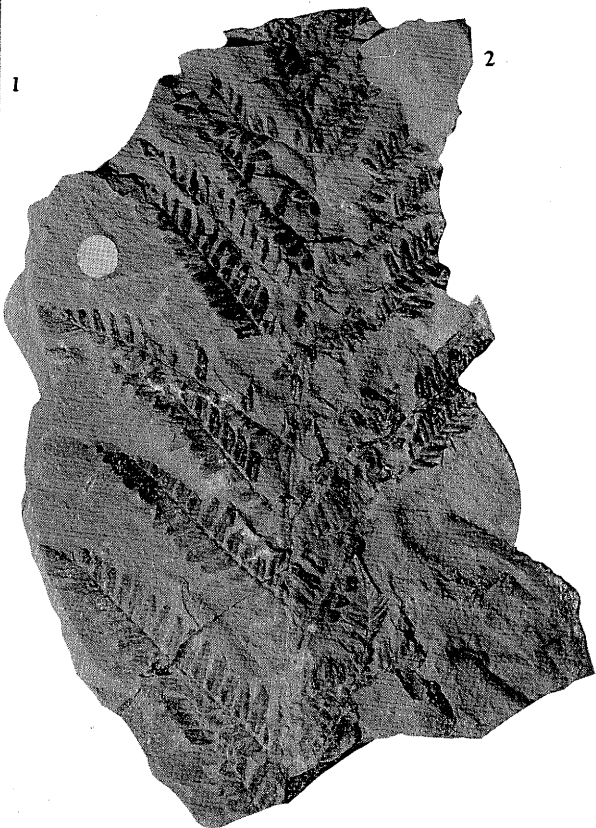
PLATE XVIII. FILICALES: NEUROPTERIDAE

1-3. NEUROPTERIS RARINERVIS Bunbery.

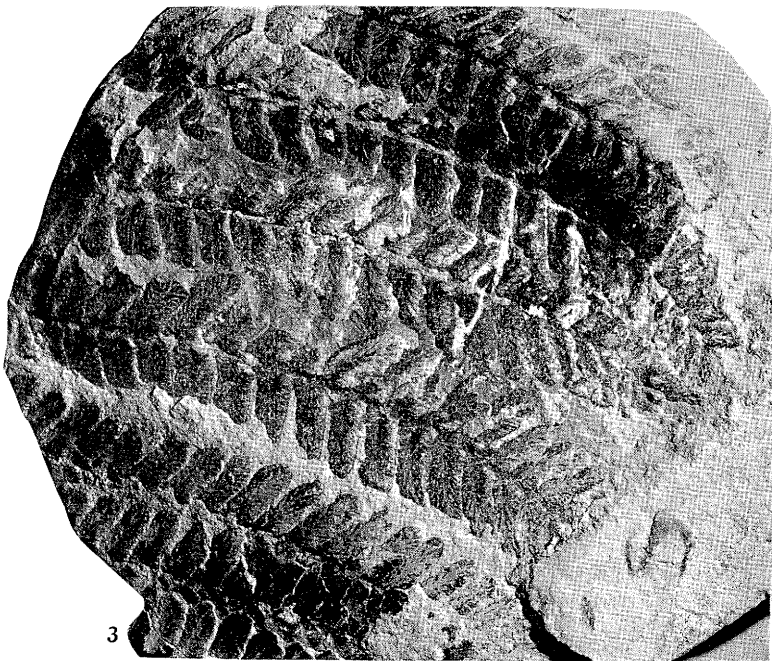
1. From *Mazon Creek*, U C Coll. No. 32088.
2. From *Mazon Creek*, x 1/2, U I Coll. No. P 1288.
3. From *Braidwood*, U C Coll. No. 32026.



1



2



3

PLATE XIX. FILICALES: NEUROPTERIDAE

- 1-2. CYCLOPTERIS ORBICULARIS Brongniart, from *Braidwood*, U C
Coll. No. 32027 and No. 32082.

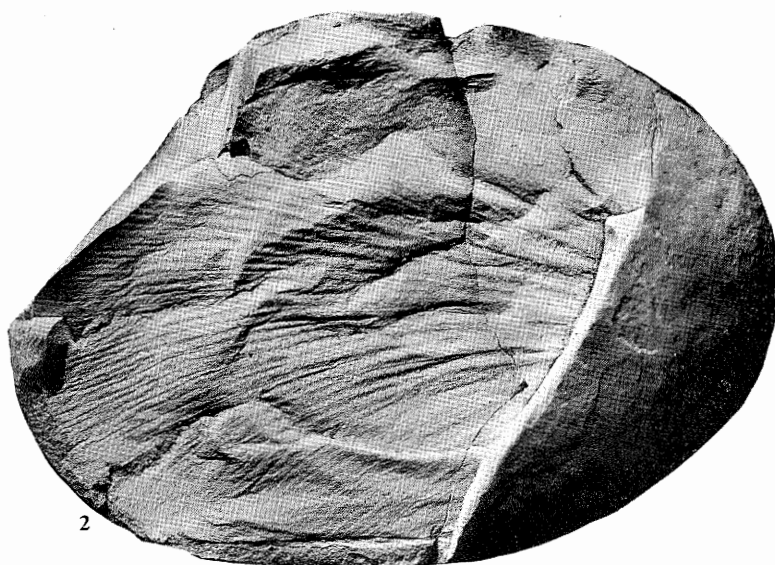
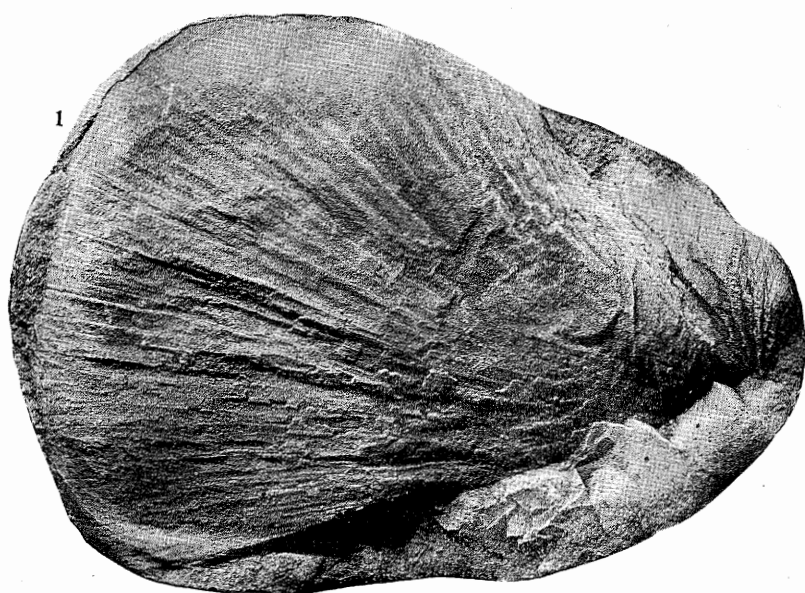


PLATE XX. FILICALES: NEUROPTERIDAE

1. NEUROPTERIS FLEXUOSA Sternberg, from *Mazon Creek*, U C Coll. No. 32028.
2. NEUROPTERIS CLARKSONI Lesquereux, from *Mazon Creek*, x 2/3, U C Coll. No. 32029.
3. NEUROPTERIS OVATA Hoffmann, from *Mazon Creek*, U C Coll. No. 32030.

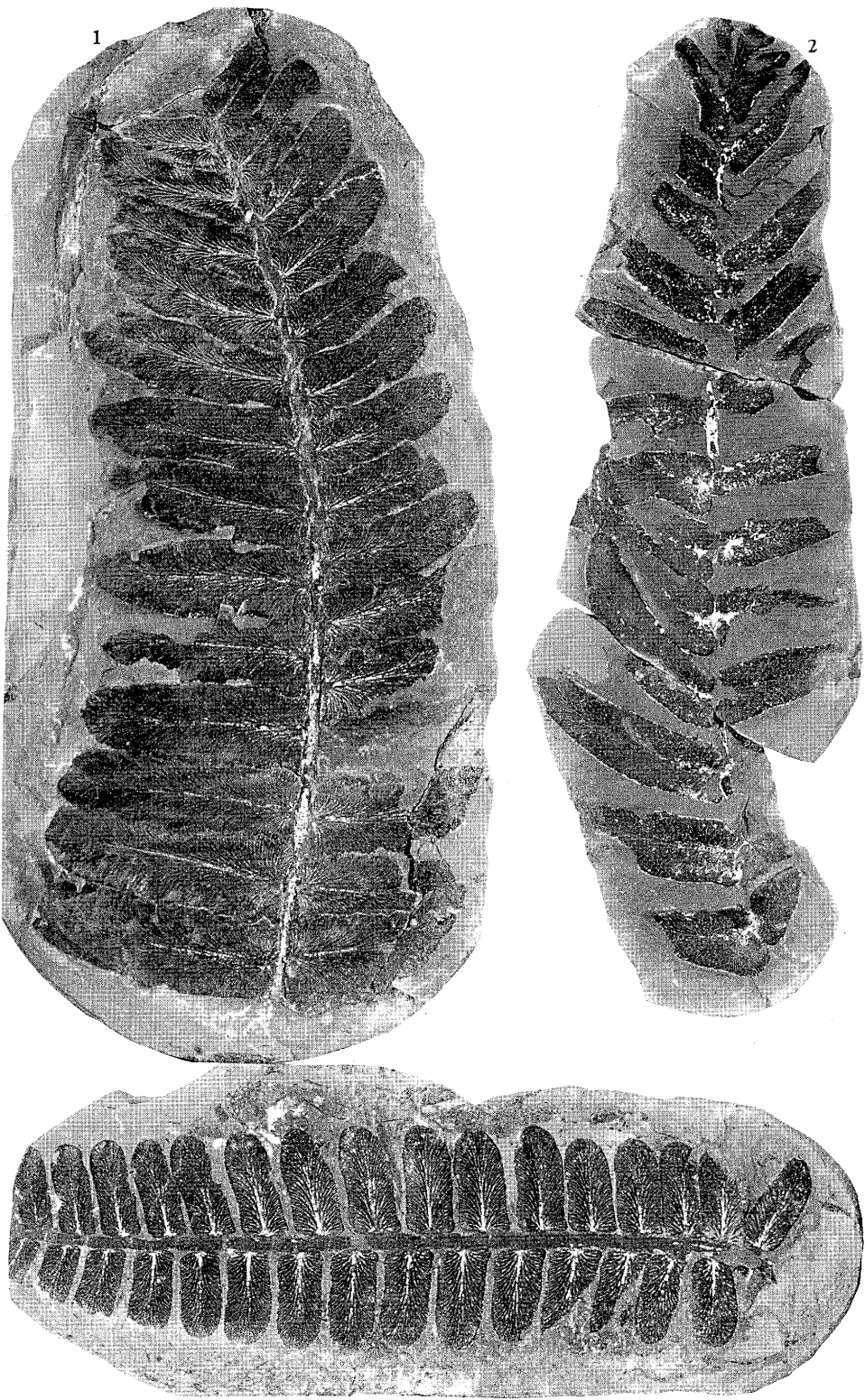


PLATE XXI. FILICALES: NEUROPTERIDAE

1. NEUROPTERIS CLARKSONI Lesquereux, from *Mazon Creek*, x 1/2,
U C Coll. No. 32031.
- 2-3. NEUROPTERIS FLEXUOSA Sternberg, from *Mazon Creek*, x 2/3, U
C Coll. No. 32032 and No. 32083.
4. NEUROPTERIS OVATA Hoffman, from *Mazon Creek*, x 2/3, U I
Coll. No. P 1289.
5. NEUROPTERIS CRENULATA Brongniart, from *Mazon Creek*, x 2/3,
U I Coll. No. P 1290.

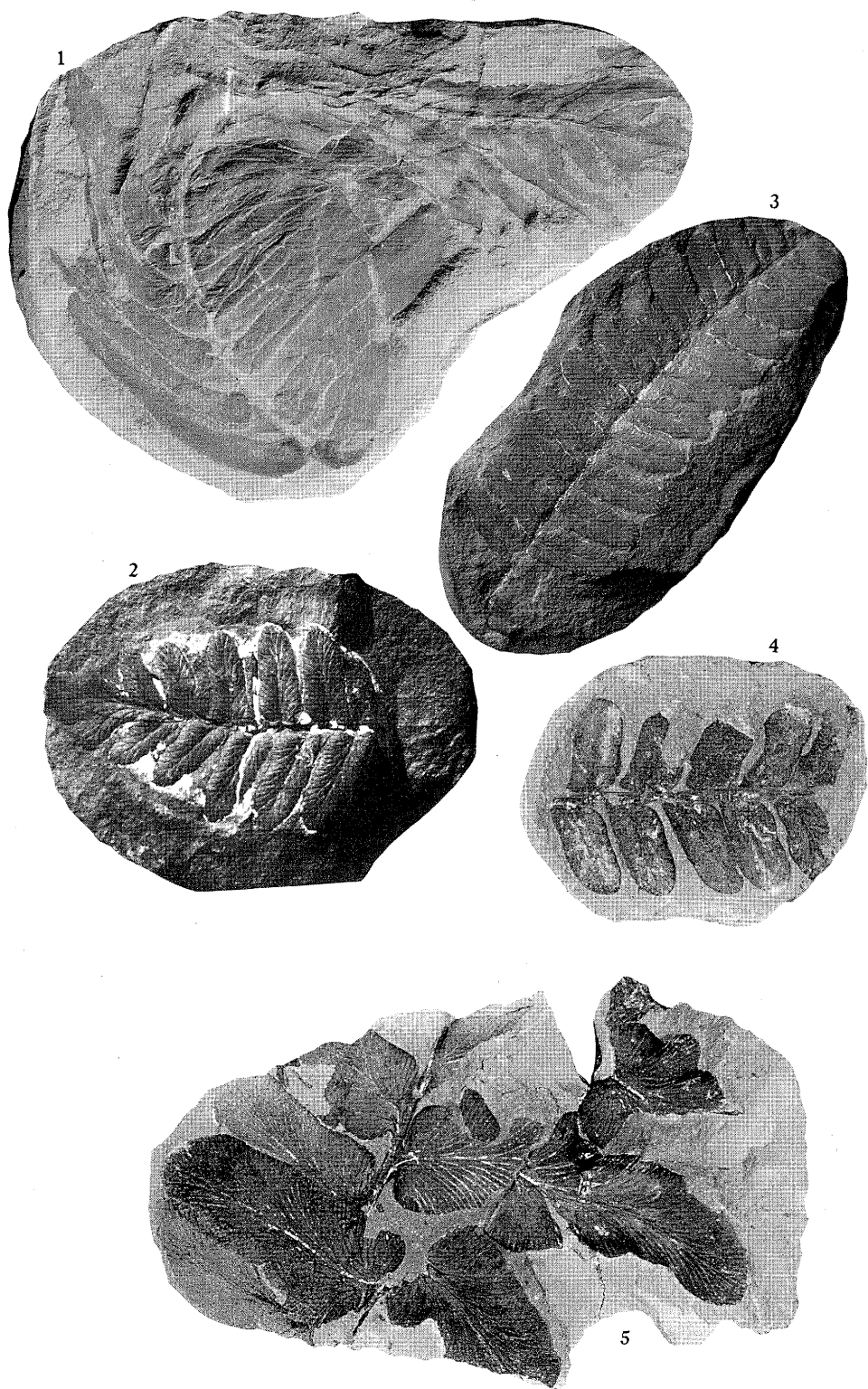


PLATE XXII. FILICALES: NEUROPTERIDAE
AND LINOPTERIDAE

1-3. NEUROPTERIS CAPITATA Lesquereux.

1. Ultimate pinnule from *Mazon Creek*, U I Coll. No. P 1291.

2-3. From *Mazon Creek*, U C Coll. No. 32033 and No. 32084.

4. LINOPTERIS NEUROPTEROIDES (Gutbier) Potonié, from *Mazon Creek*, U I Coll. No. P 1292.

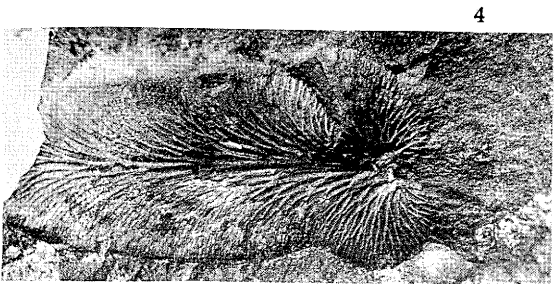
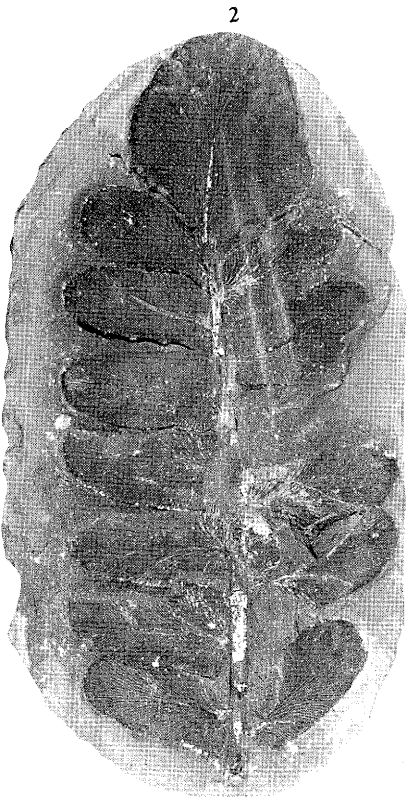
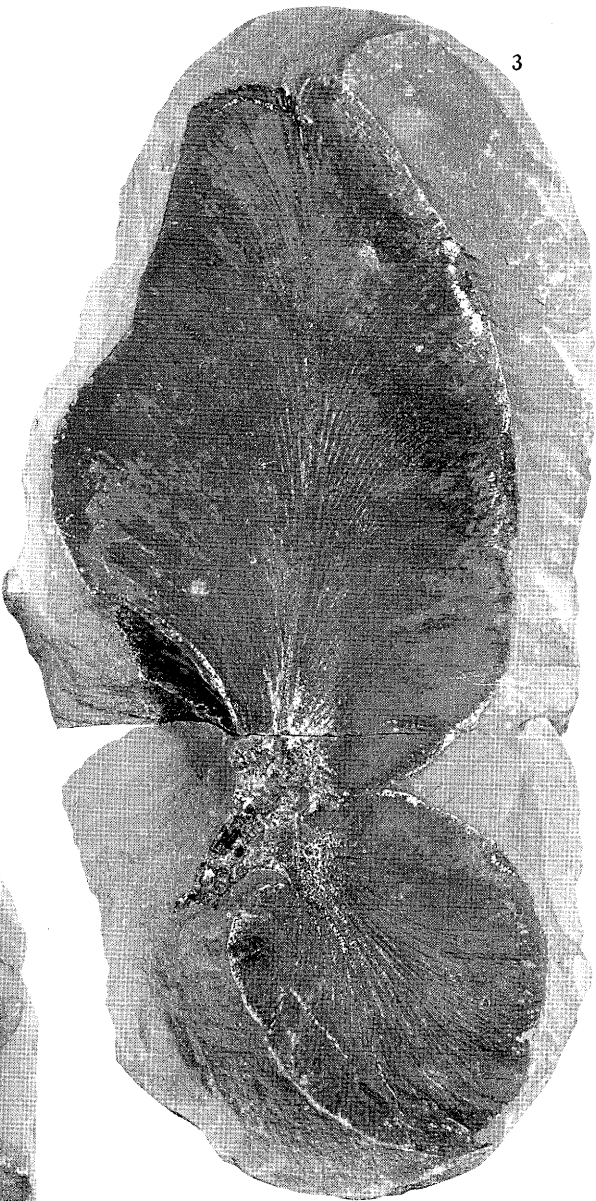
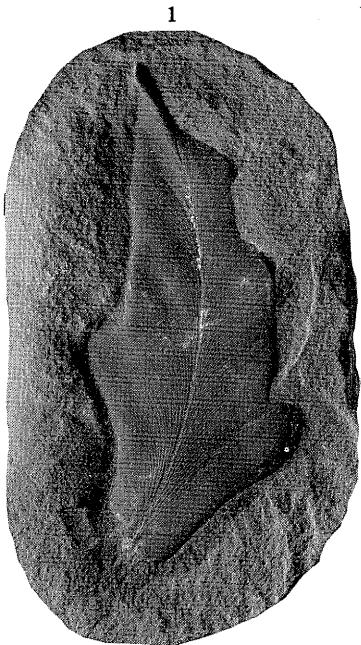
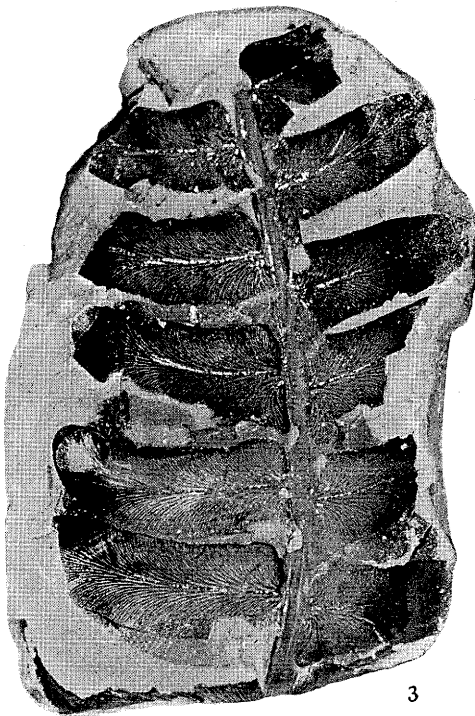
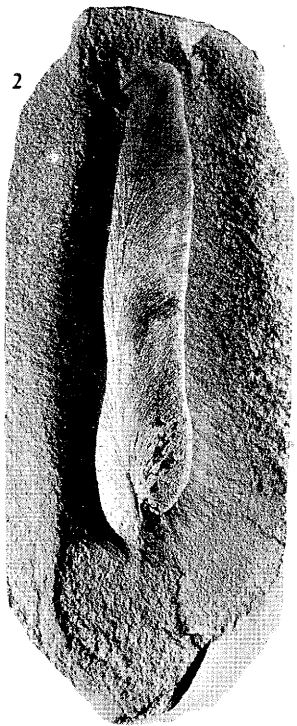
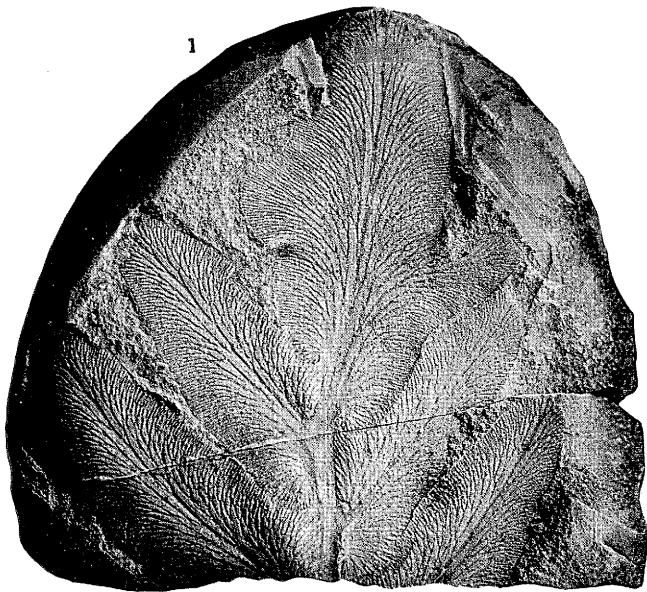


PLATE XXIII. FILICALES: NEUROPTERIDAE
AND LINOPTERIDAE

1. LINOPTERIS NEUROPTEROIDES (Gutbier) Potonié, from *Mazon Creek*,
U I Coll. No. P 1293.
2. NEUROPTERIS OBLONGIFOLIA Gutbier, from *Mazon Creek*, U I
Coll. No. P 1294.
3. NEUROPTERIS FLEXUOSA Sternberg, from *Mazon Creek*, K Coll.



3

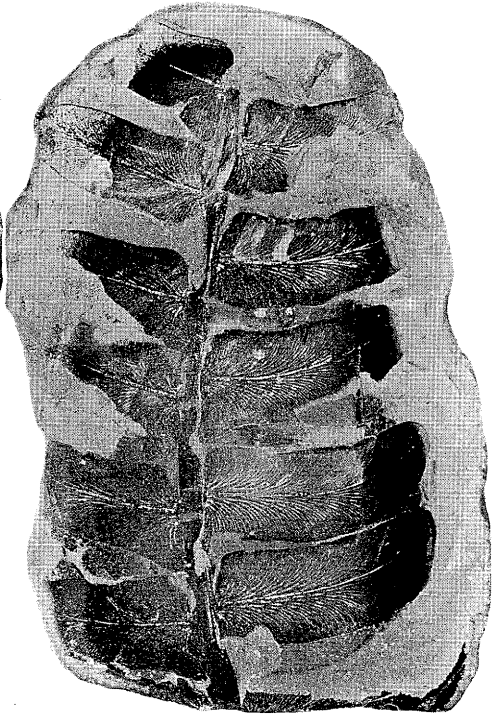


PLATE XXIV. FILICALES: NEUROPTERIDAE

1. NEUROPTERIS VERMICULARIS Lesquereux, from *Mazon Creek*, x 5/4, K Coll.
- 2-4. NEUROPTERIS DECIPIENS Lesquereux.
 2. From *Mazon Creek*, x 2/5, U I Coll. No. P 1296.
 3. From *Braidwood*, U C Coll. No. 32034.
 4. From *Mazon Creek*, x 3/2, U C Coll. No. 32035.

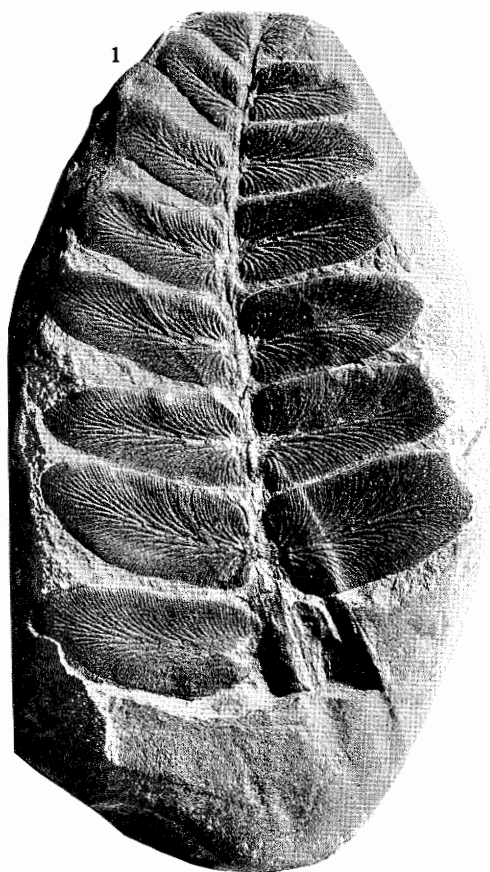


PLATE XXV. FILICALES: NEUROPTERIDAE

1-3. NEUROPTERIS DECIPIENS Lesquereux.

1. From *Braidwood*, U C Coll. No. 32035.

2-3. From *Mazon Creek*, x 2/5, K Coll.

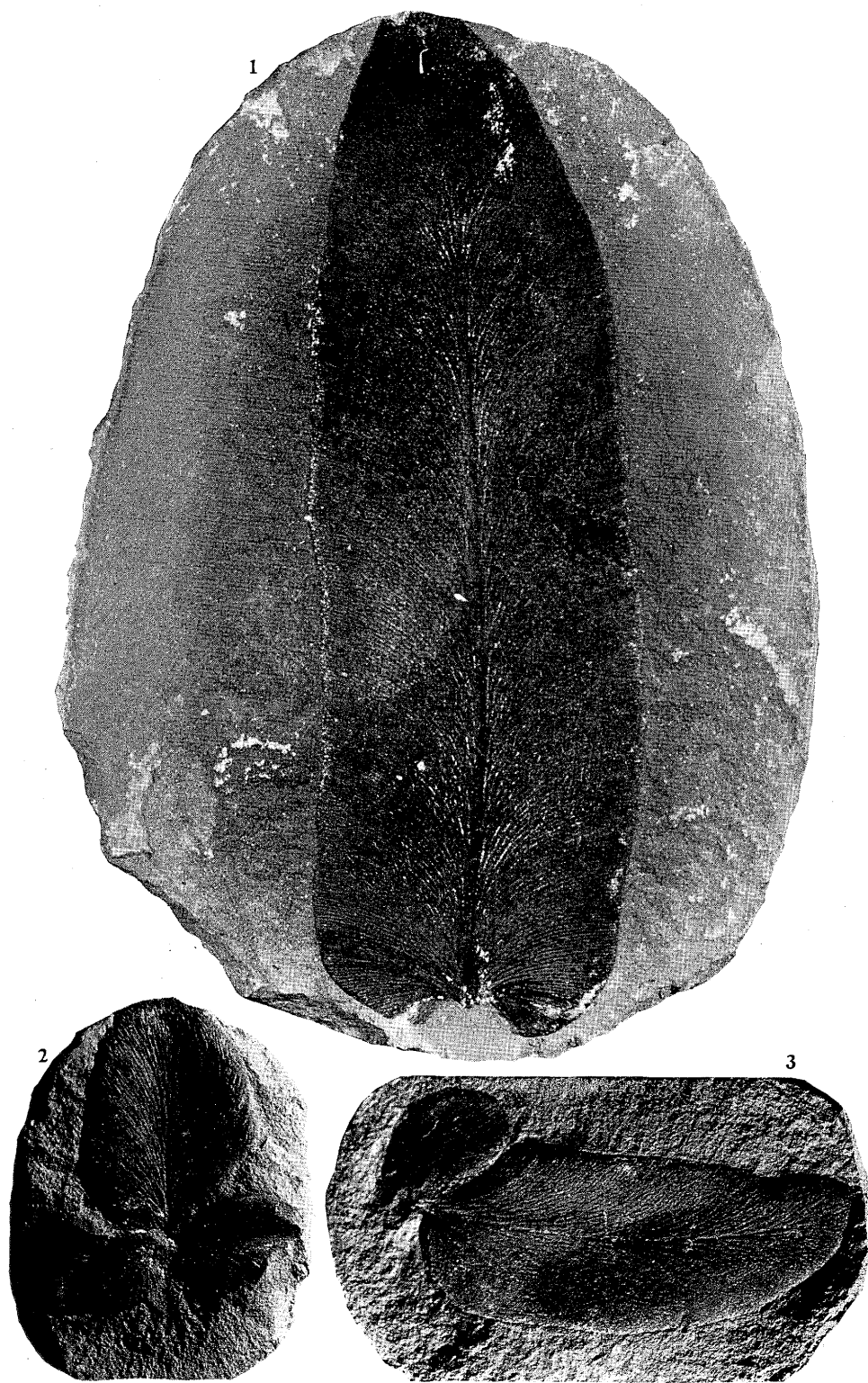


PLATE XXVI. FILICALES: NEUROPTERIDAE

1-4. NEUROPTERIS DECIPiens Lesquereux.

1. Cyclopteroid leaf, from *Mazon Creek*, x 6/5, U I Coll. No. P 1297.
2. From *Mazon Creek*, x 9/10, U I Coll. No. P 1298.
3. Cyclopteroid leaf, from *Mazon Creek*, U C Coll. No. 32036.
4. From *Mazon Creek*, U I Coll. No. P 1299.

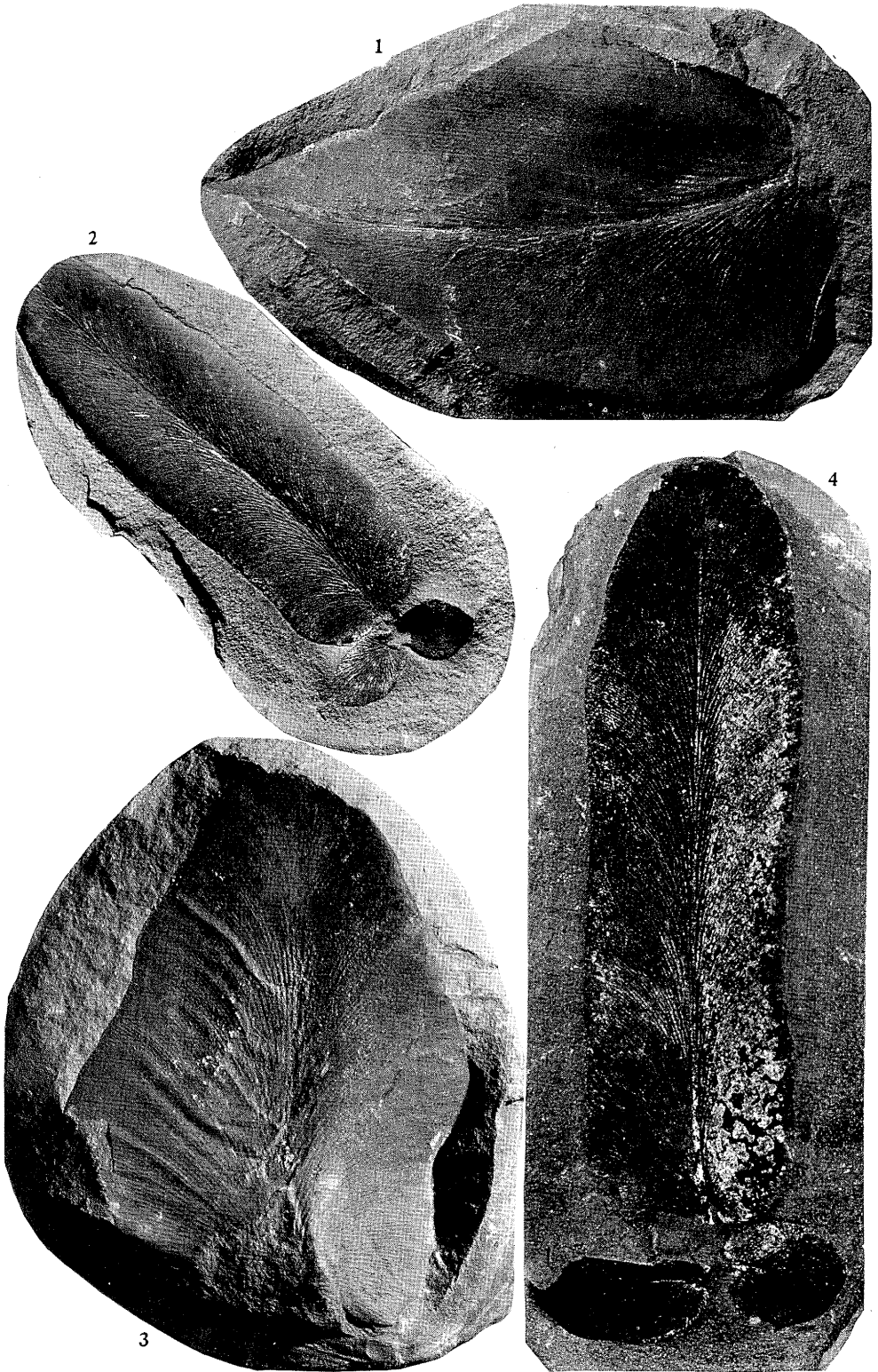


PLATE XXVII. FILICALES: NEUROPTERIDAE

- 1-2. NEUROPTERIS DECIPIENS Lesquereux.
 1. From *Mazon Creek*, K Coll.
 2. From *Mazon Creek*, x 3/2, K Coll.
3. NEUROPTERIS RARINERVIS Bunbery, Cycloperoid leaf, from *Braidwood*, x 6/5, U C Coll. No. 32037.

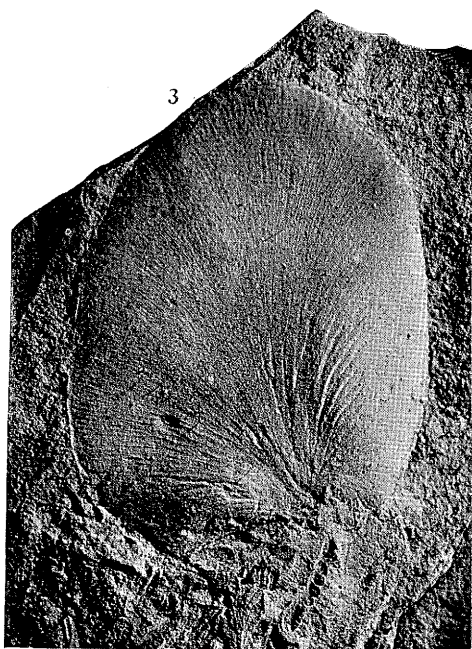
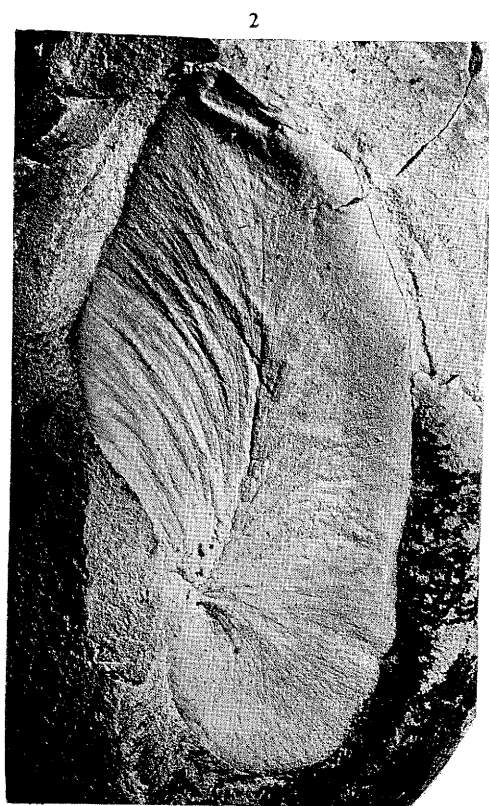
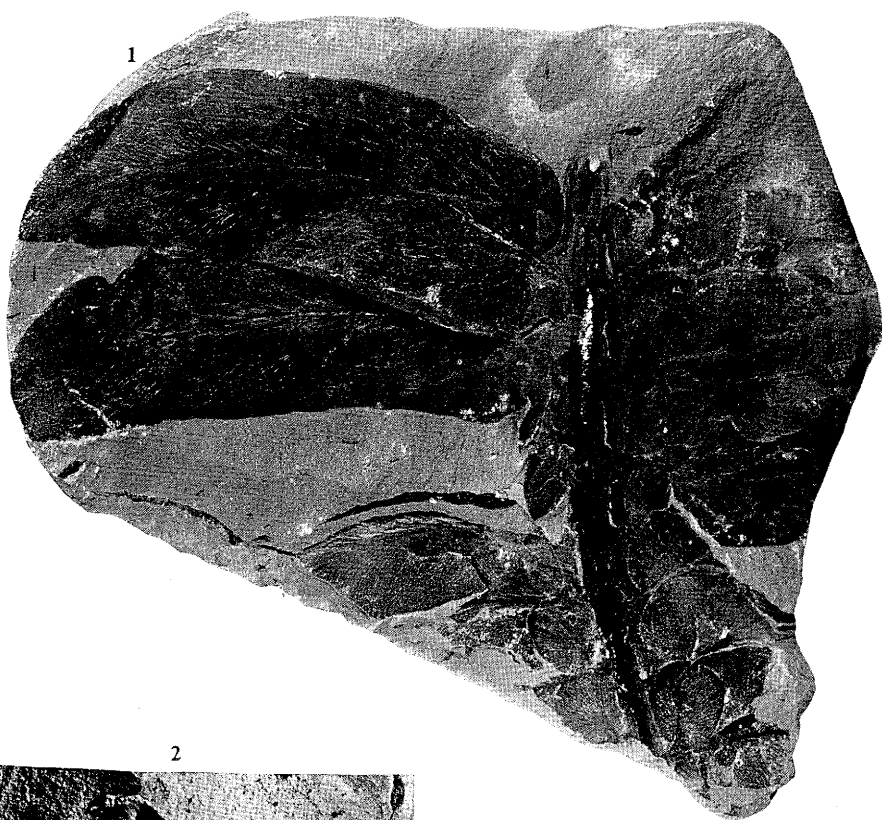


PLATE XXVIII. FILICALES: VARIOUS LEAF TYPES

1. Aphlebia leaf.
2. NEUROPTERIS DECIPIENS Lesquereux. Cyclopteroid leaf.
- 3-4. Spiropteris leaves, young and rolled leaves.
5. NEUROPTERIS DECIPIENS Lesquereux, Cyclopteroid leaf.

All from *Mazon Creek*, U C Coll. No. 32038-42.



PLATE XXIX. FILICALES: PECOPTERIDAE

1. PECOPTERIS PSEUDOVESTITA White, from *Mazon Creek*, U C Coll. No. 32043.
2. PECOPTERIS VESTITA Lesquereux, from *Mazon Creek*, U C Coll. No. 32044.
3. PECOPTERIS VESTITA Lesquereux, from *Mazon Creek*, x 1/2, U C Coll. No. 32045.

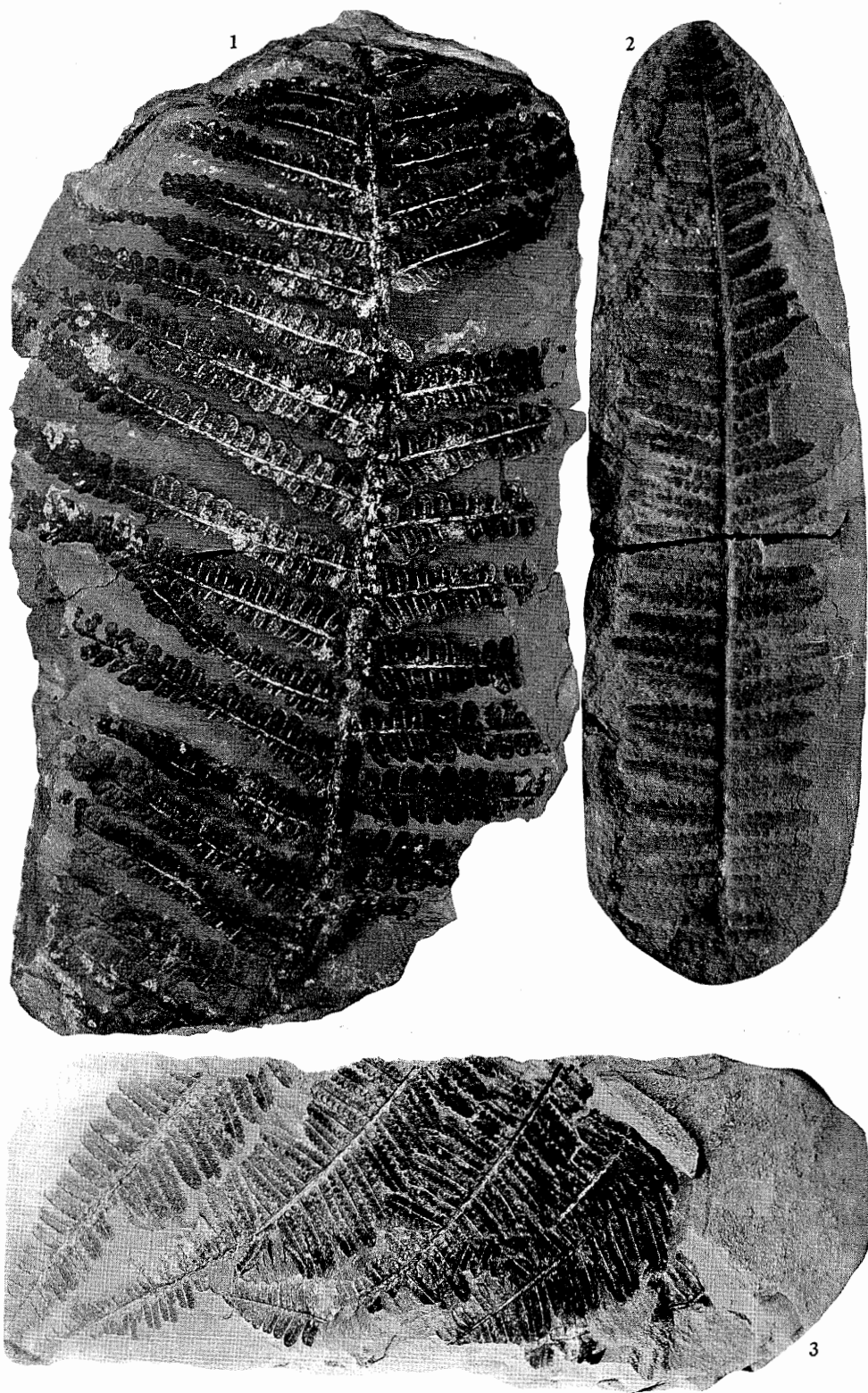


PLATE XXX. FILICALES: PECOPTERIDAE

1. PECOPTERIS MILTONI Artis, from *Mazon Creek*, U C Coll. No. 32047.
2. PECOPTERIS VESTITA Lesquereux, from *Mazon Creek*, U I Coll. No. P 1301.
3. PECOPTERIS SQUAMOSA Lesquereux, from *Mazon Creek*, U I Coll. No. P 1302.



PLATE XXXI. FILICALES: PECOPTERIDAE

- 1-2. PECOPTERIS ARBORESCENS (Brongniart) Sternberg from *Mazon Creek*, U I Coll. No. P 1303-4.



PLATE XXXII. FILICALES: PECOPTERIDAE

PECOPTERIS PENNAEFORMIS (Brongniart) Sternberg, from *Braidwood*,
U C Coll. No. 32048.

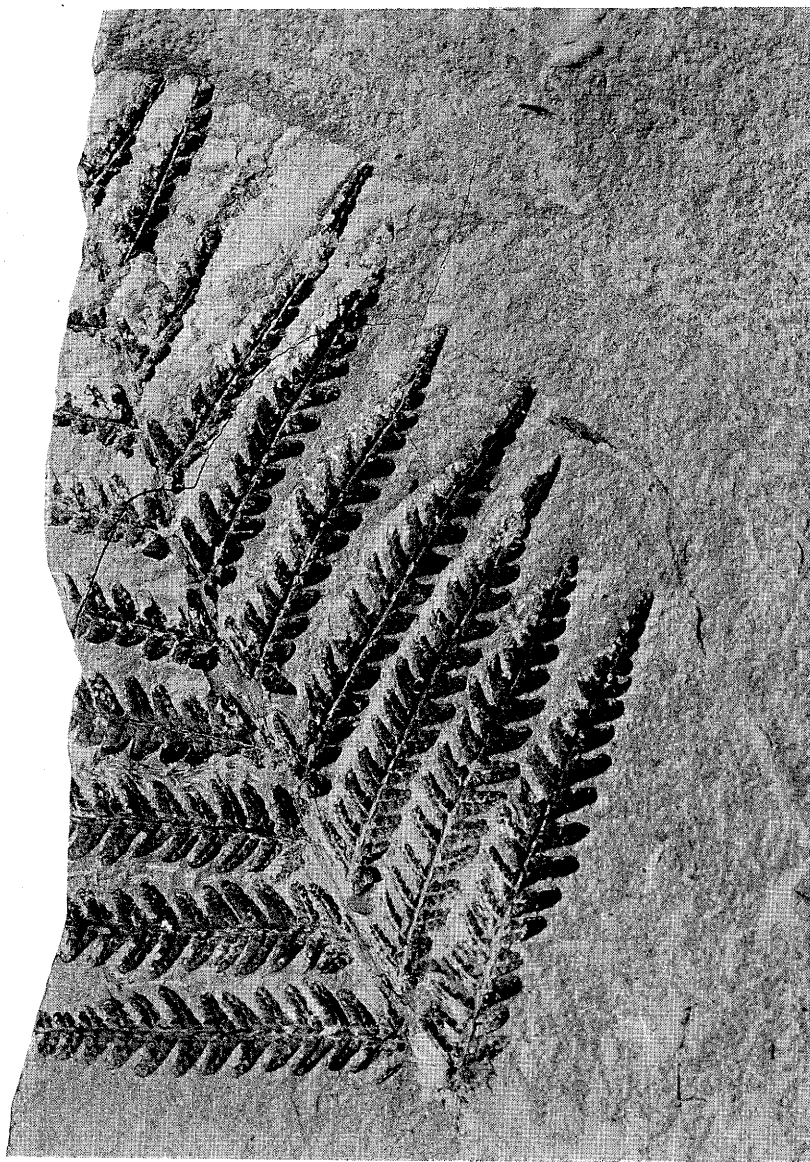


PLATE XXXIII. FILICALES: PECOPTERIDAE

PECOPTERIS DENTATA Brongniart, from *Morris*, x 2/1, U I Coll. No.
P 1305.

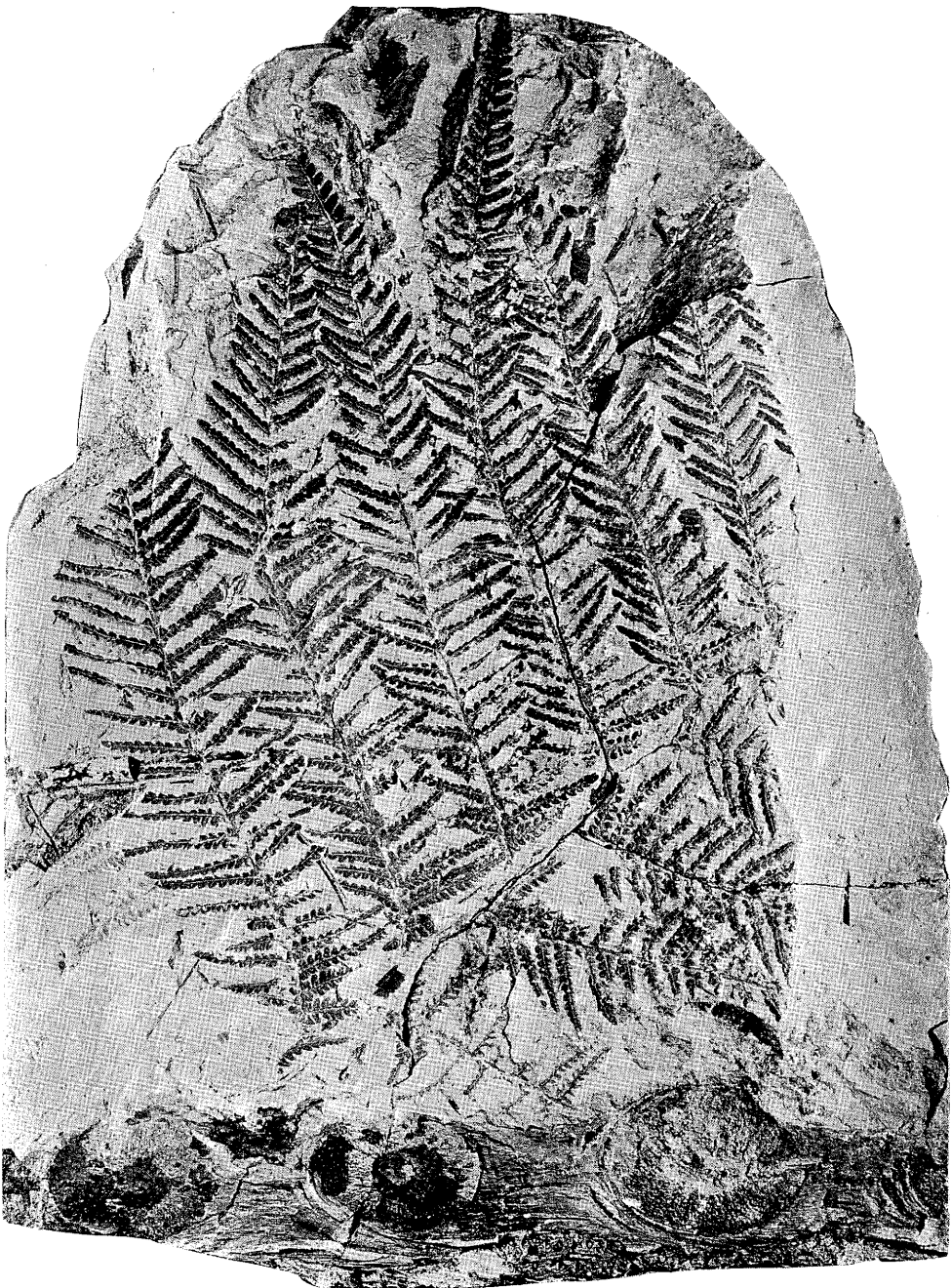


PLATE XXXIV. FILICALES: PECOPTERIDAE

1. PECOPTERIS UNITA Brongniart, from *Mazon Creek*, U I Coll. No. P 1300.
2. THE SAME, x 3/1.
3. PECOPTERIS MILTONI Artis, from *Mazon Creek*, K Coll.
4. PECOPTERIS MILTONI Artis, from *Mazon Creek*, U C Coll. No. 32046.

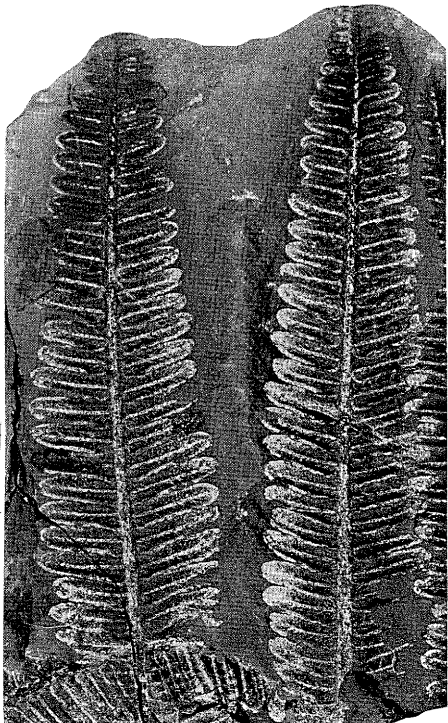
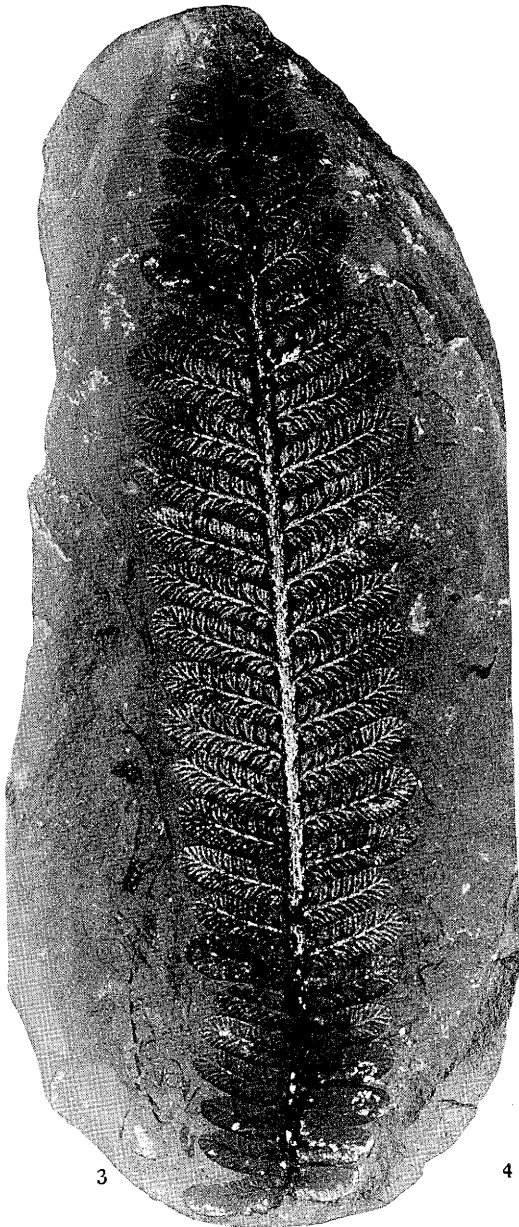
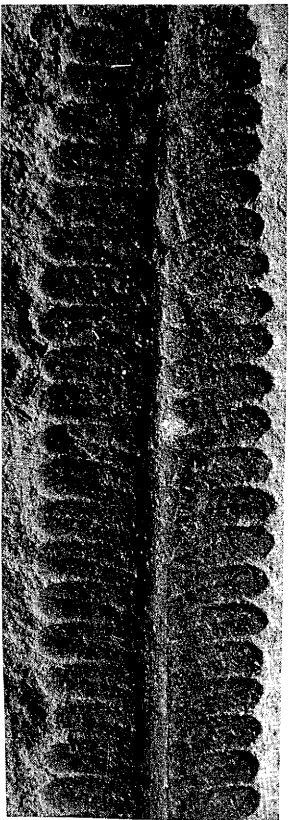


PLATE XXXV. FILICALES: PECOPTERIDAE

- 1-2. PECOPTERIS UNITA Brongniart, from *Mazon Creek*, U I Coll.
No. P 1306-7.



PLATE XXXVI. FILICALES: PECOPTERIDAE

1-4. PTYCHOCARPUS UNITA (Brongniart) Weiss, with sori.

Nos. 1, 3, and 4. From *Mazon Creek*, U C Coll. No. 32049-51.

No. 2. From *Mazon Creek*, x 2/1, U C Coll. No. 32087.

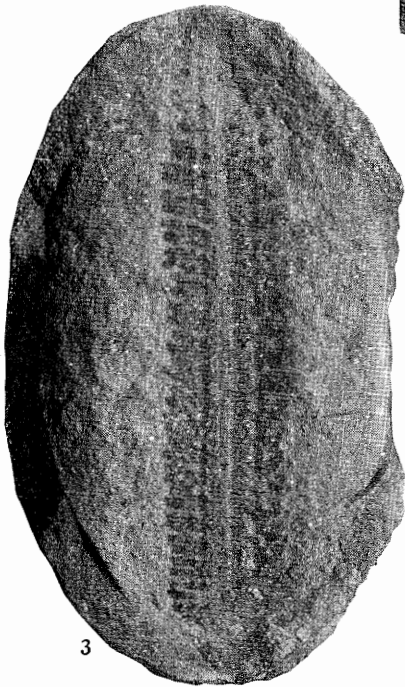
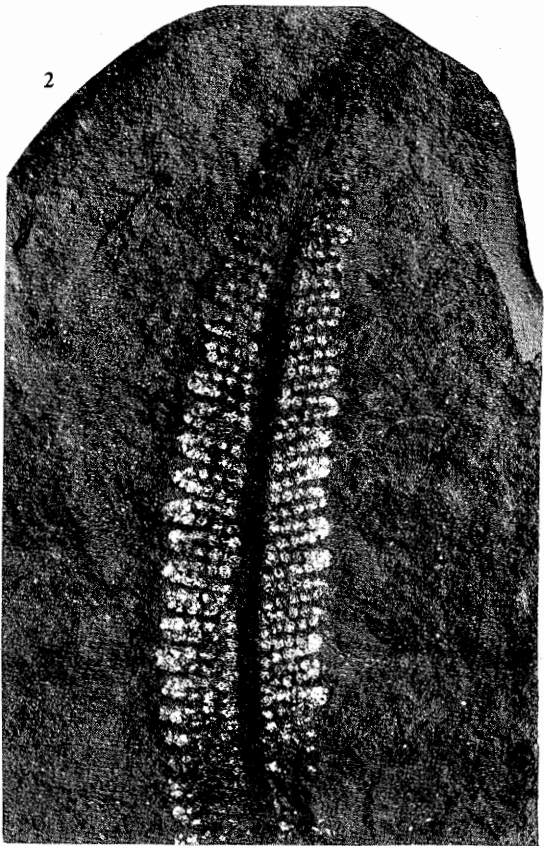
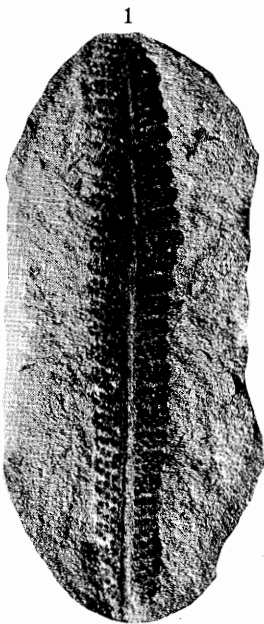


PLATE XXXVII. FILICALES: ODONTOPTERIDAE

- 1-2. ODONTOPTERIS SUBCUNEATA Bunbery, from *Mazon Creek*, U C
Coll. No. 32052-3.
- 3-4. ODONTOPTERIS WORTHENI Lesquereux, from *Mazon Creek*, U C
Coll. No. 32054-5.

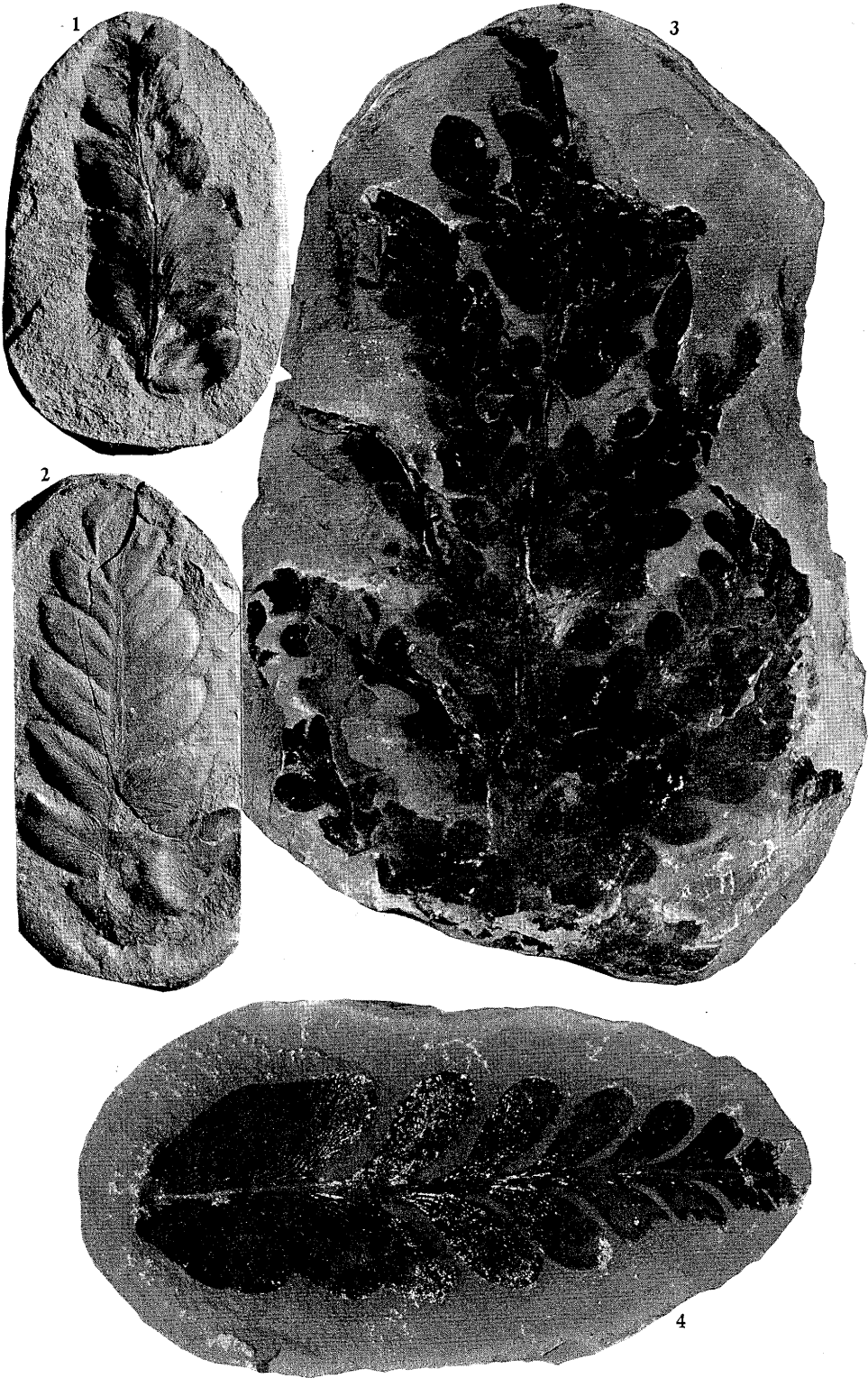


PLATE XXXVIII. FILICALES: ALETHOPTERIDAE

- 1-2. ALETHOPTERIS SERLII (Brongniart) Goeppert, from *Mazon Creek*,
U C Coll. No. 32056-7.
- 3-4. ALETHOPTERIS SERLII (Brongniart) Goeppert, from *Braidwood*,
U C Coll. No. 32058-9.



3



PLATE XXXIX. FILICALES: ALETHOPTERIDAE

1. ALETHOPTERIS DAVREUXI (Brongniart) Goeppert, from *Mazon Creek*, U I Coll. No. P 1308.
2. ALETHOPTERIS SERLII (Brongniart) Goeppert, from *Mazon Creek*, U C Coll. No. 32060.
- 3-4. ALETHOPTERIS SERLII (Brongniart) Goeppert, from *Mazon Creek*, K Coll.

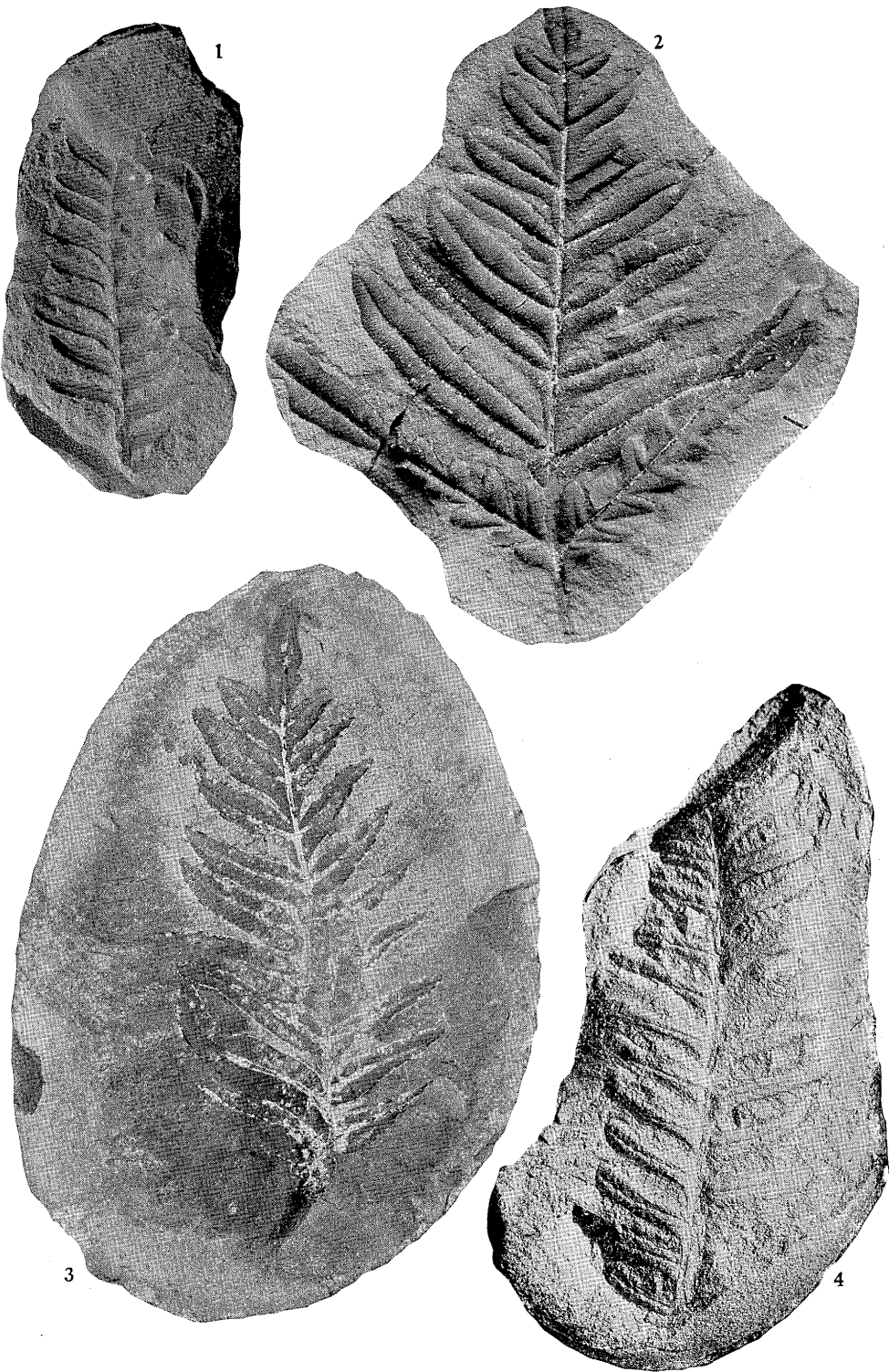


PLATE XL. FILICALES: ALETHOPTERIDAE

- 1-2. ALETHOPTERIS GRANDINI (Brongniart) Goeppert, from *Mazon Creek*, U I Coll. No. P 1309-10.

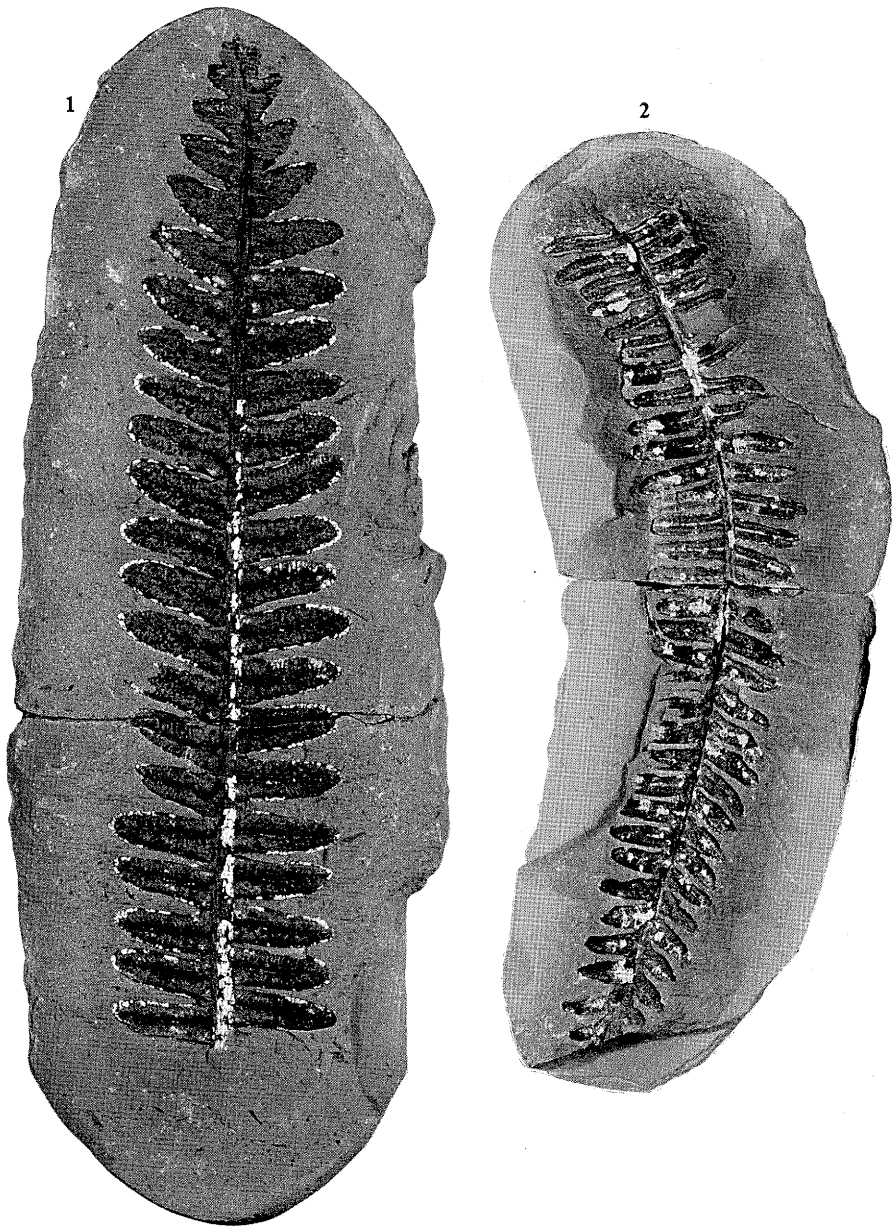


PLATE XLI. FILICALES: CALLIPTERIDAE

1-4. CALLIPTERIDIUM SULLIVANTI (Lesquereux) Weiss.

1, 4. From *Mazon Creek*, U I Coll. No. P 1311-12.

2, 3. From *Mazon Creek*, U C Coll. No. 32061-2.

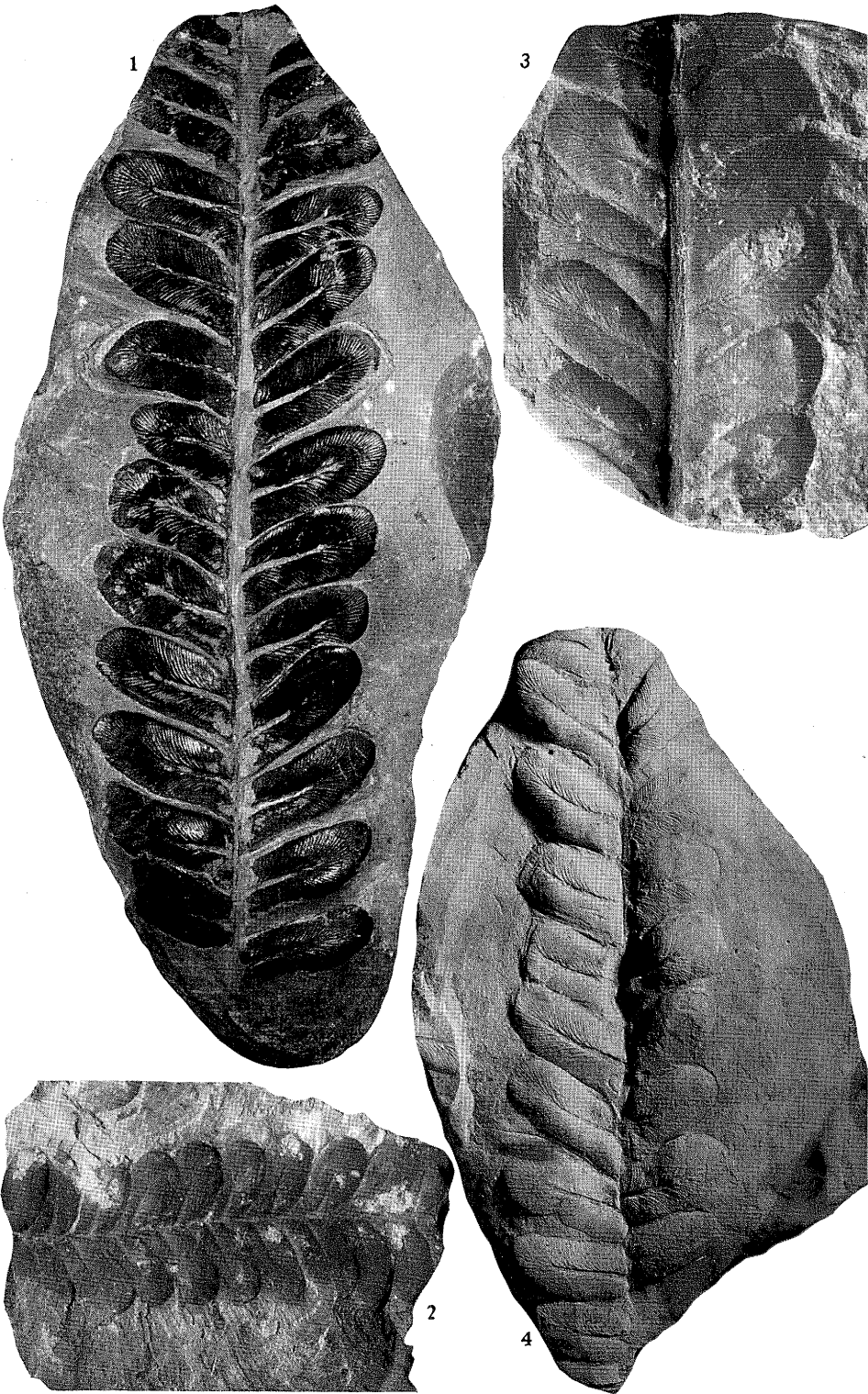


PLATE XLII. CYCADOFILICALES:
REPRODUCTIVE ORGANS

- 1-4. STAPHYLOPTERIS SAGITTATUS Lesquereux, from *Mazon Creek*,
U C Coll. No. 32063-6.

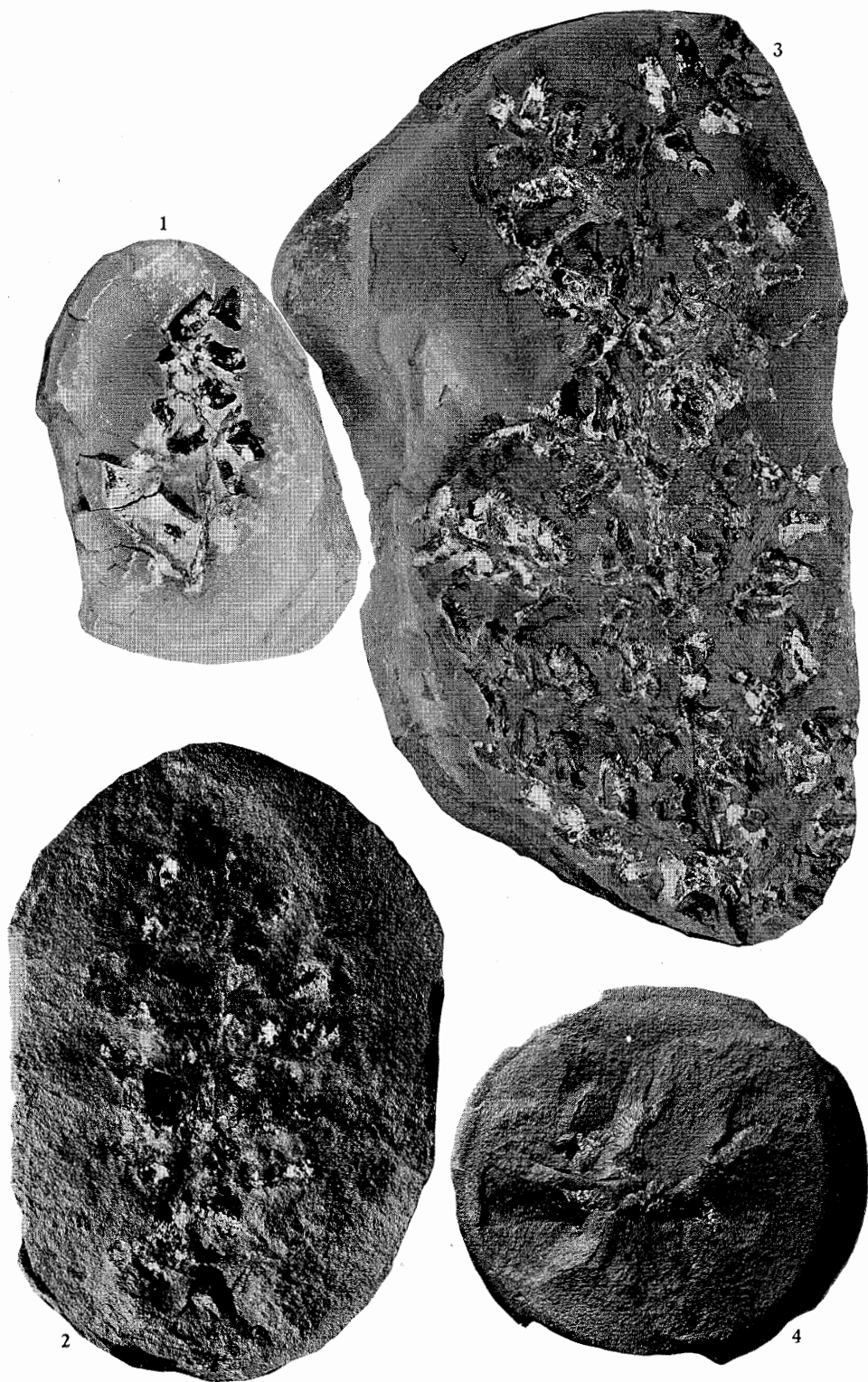


PLATE XLIII. CYCADOFILICALES:
REPRODUCTIVE ORGANS

- 1-3. CODONOTHECA CADUCA Sellards, from *Mazon Creek*, x 2/1, U 1
Coll. No. P 1313, P 1318, P 1319.
4. CODONOSPERMUM ANOMALUM Brongniart, from *Braidwood*, U C
Coll. No. 32067.
5. TRIPTEROSPERMUM ROSTRATUM Brongniart, from *Braidwood*
U C Coll. No. 32086.

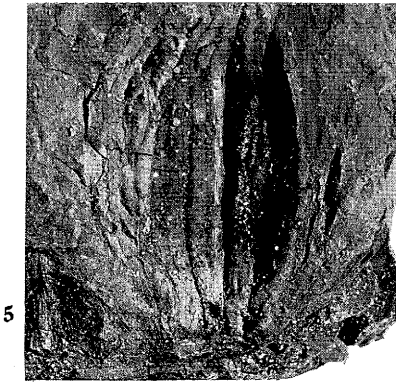
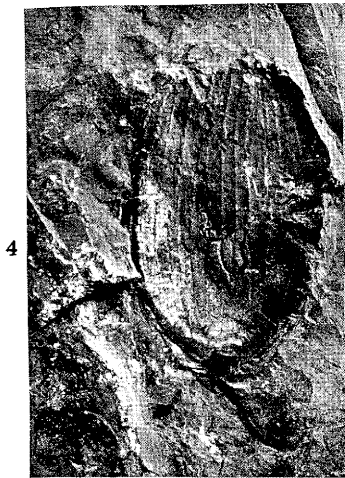
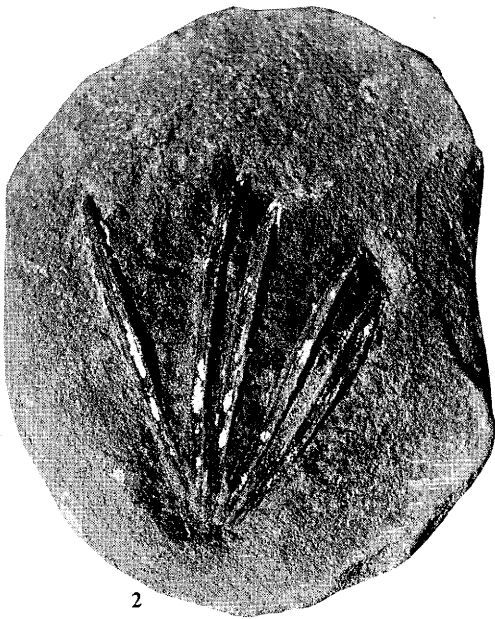
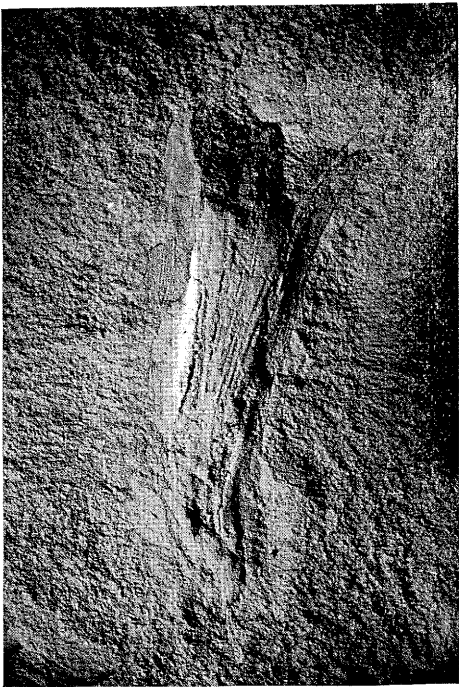
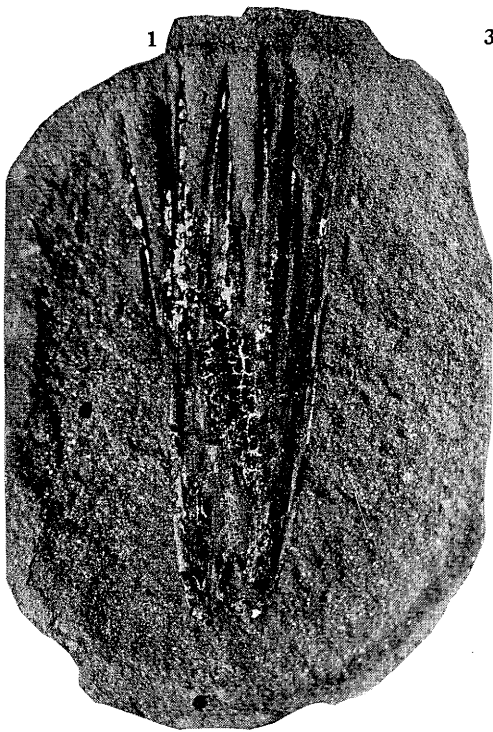


PLATE XLIV. CYCADOFILICALES AND
CORDAITALES:
REPRODUCTIVE ORGANS

- 1-2. TRIPTEROSPERMUM ROSTRATUM Brongniart, from *Braidwood*, U C Coll. No. 32068.
3. CARDIOCARPUS ORBICULARIS Ettingshausen, x 2/1, from *Mazon Creek*, K Coll.
4. PACHYTESTA INCRASSATA Brongniart, from *Braidwood*, U C Coll. No. 32069.
5. TRIGONOCARPUM NOEGGERATHI Sternberg, from *Mazon Creek*, x 2/1, K Coll.

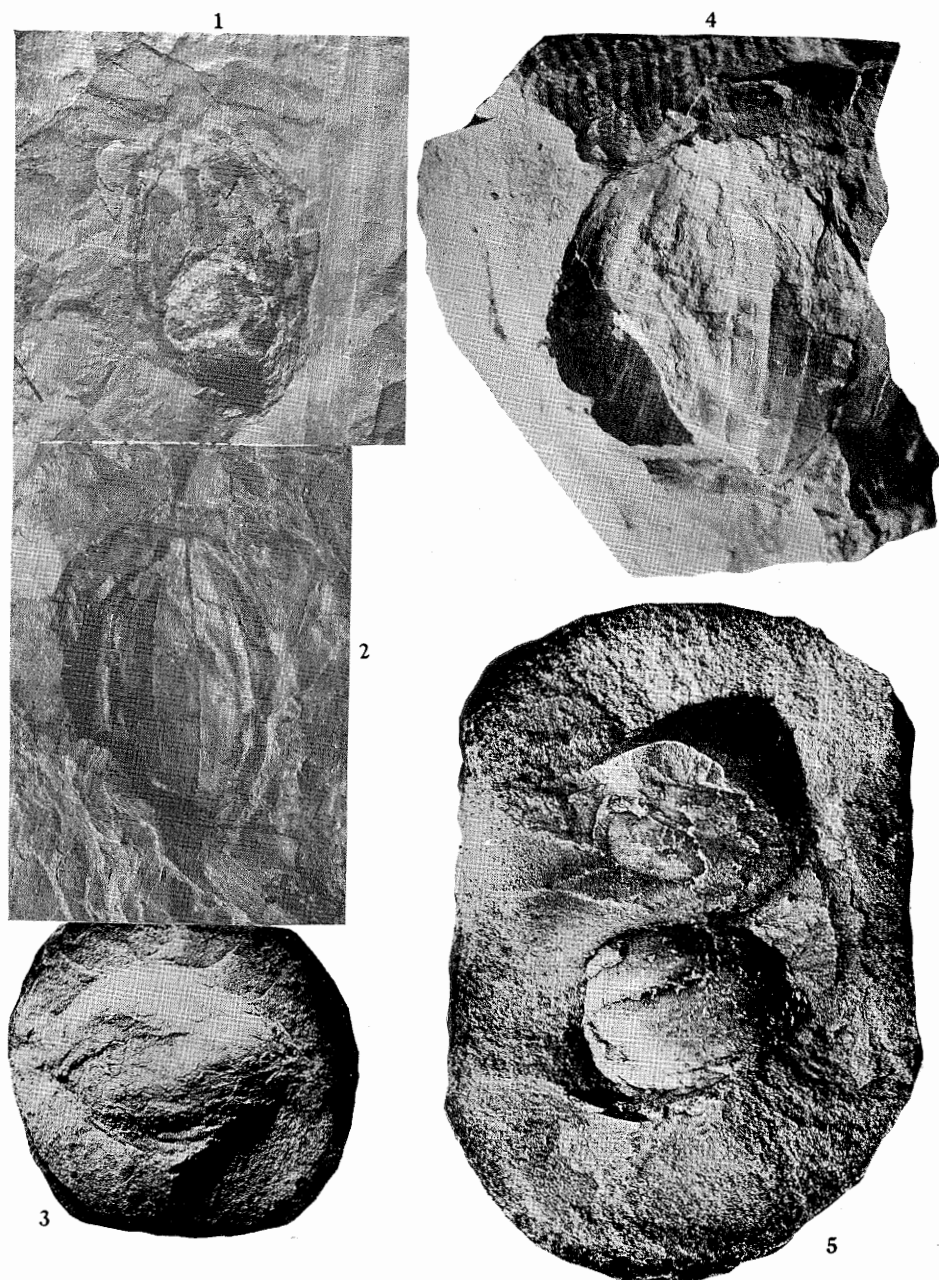
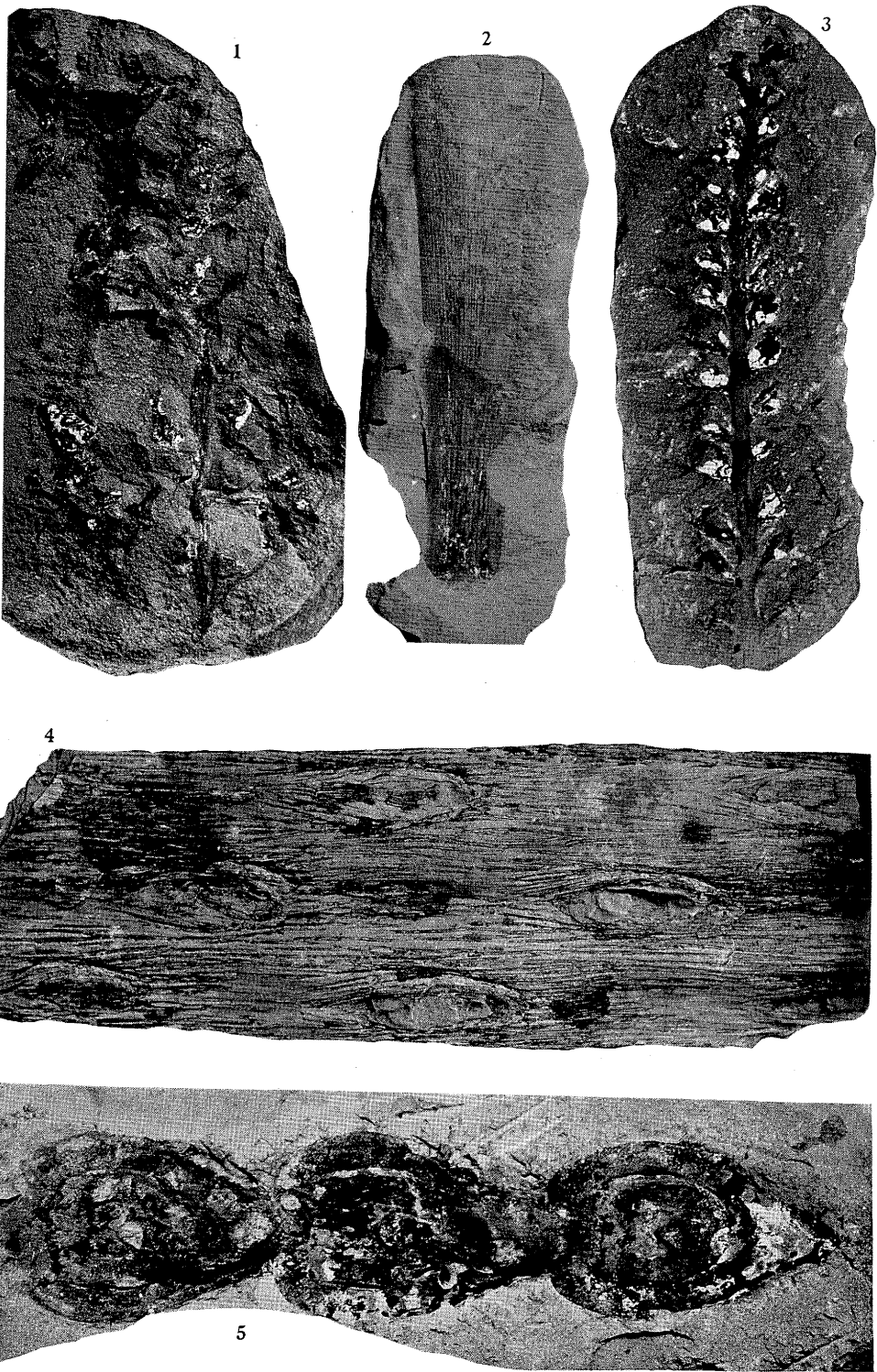


PLATE XLV. CYCADOFILICALES, CORDAITALES,
AND FERN STEMS

An extinct class of Paleozoic Gymnosperms is named Cordaitales in honor of the great paleobotanist Corda. Leaves, stems, and the reproductive organs have been found. The leaves belong to the genus Cordaites, the male reproductive organs to Cordaianthus and the seeds to Cardiocarpus. Specimens are illustrated in Plate XLV, figs. 2 and 3.

1. STAPHYLLOPTERIS SAGITTATUS Lesquereux, from *Mazon Creek*, K Coll.
2. CORDAITES GRANDIFOLIUS Lesquereux, from *Mazon Creek*, x 1/2, U C Coll. No. 32071.
3. CORDAIANTHUS GEMMIFER Grand'Eury, from *Mazon Creek*, U C Coll. No. 32072.
4. MEGAPHYTON SPEC., from *Braidwood*, x 3/1, U C Coll. No. 32073.
5. PTYCHOPTERIS SPEC., from *Coal City Willmington Star Coal Mining Co., Mine No. 7*, x 3/1, Property of Mining Company.



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